ICAT | INITIATIVE FOR Climate Action Transparency

TRANSFORMATIONAL CHANGE METHODOLOGY

Assessing the transformational impacts of policies and actions

ICAT SERIES OF
ASSESSMENT GUIDES

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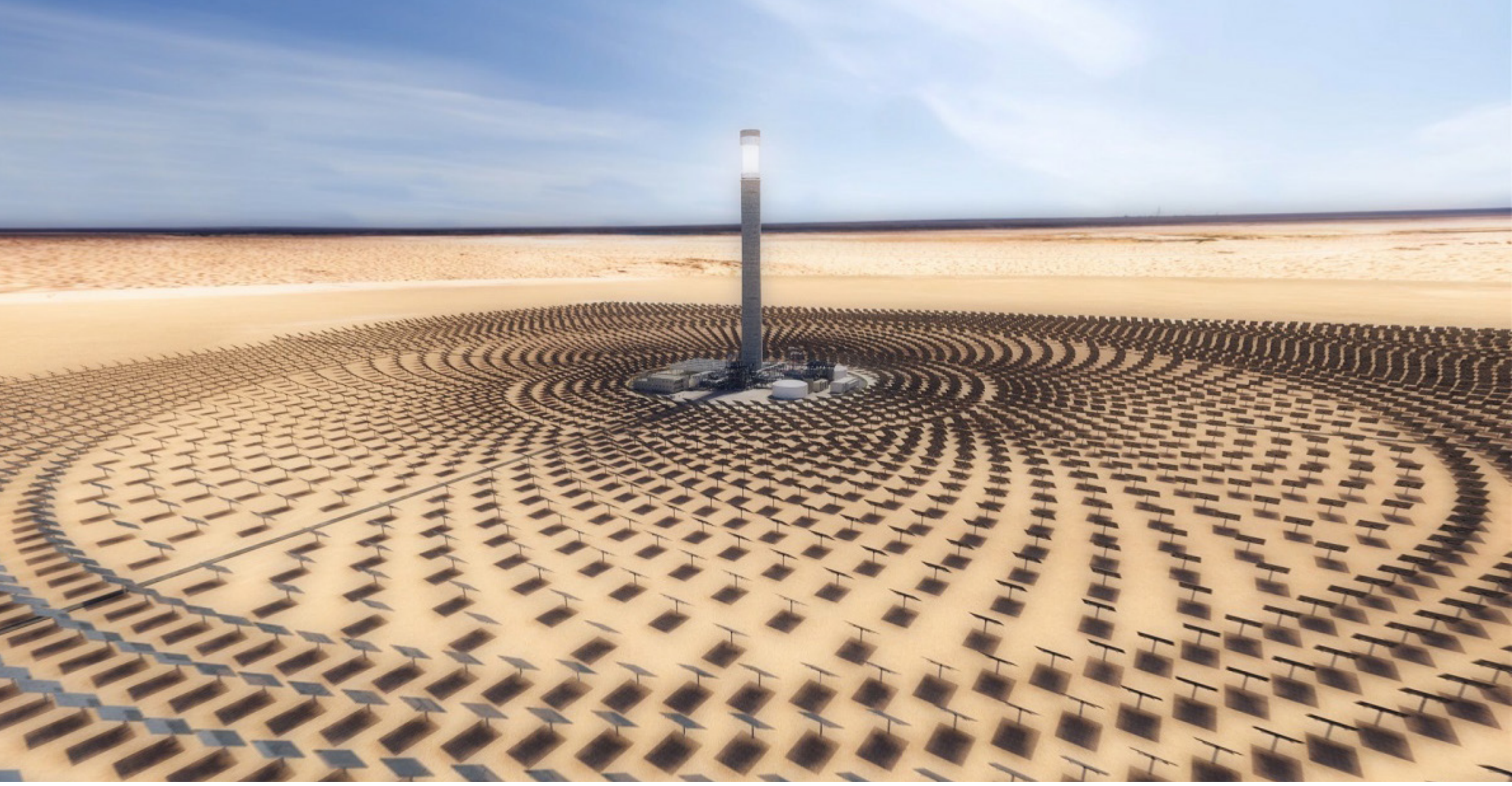

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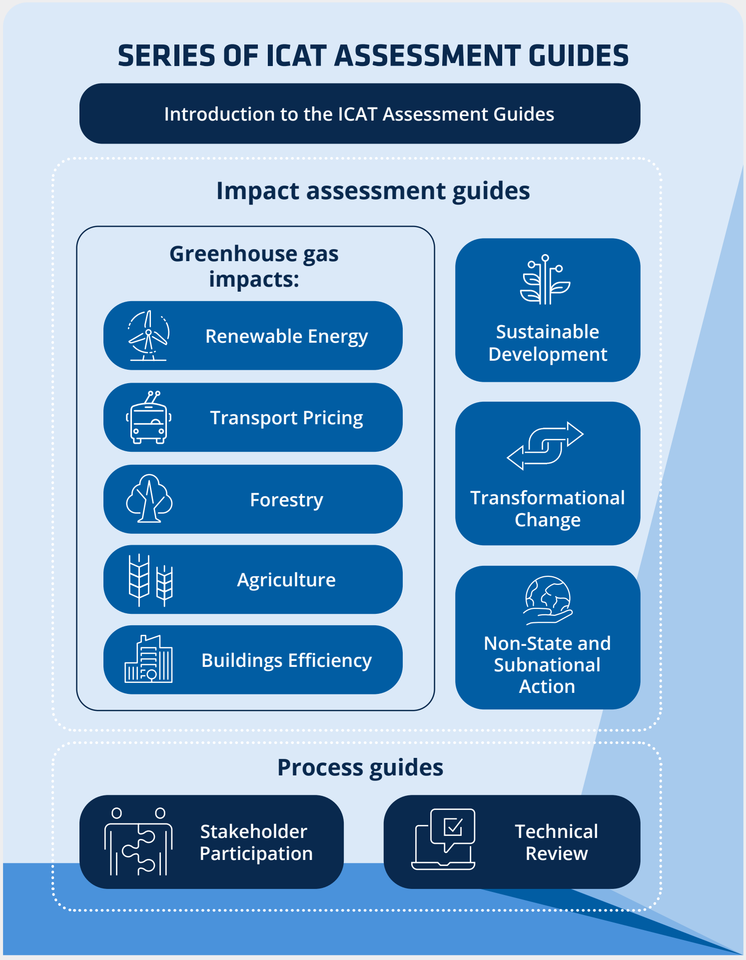
How to use the Assessment Guides

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



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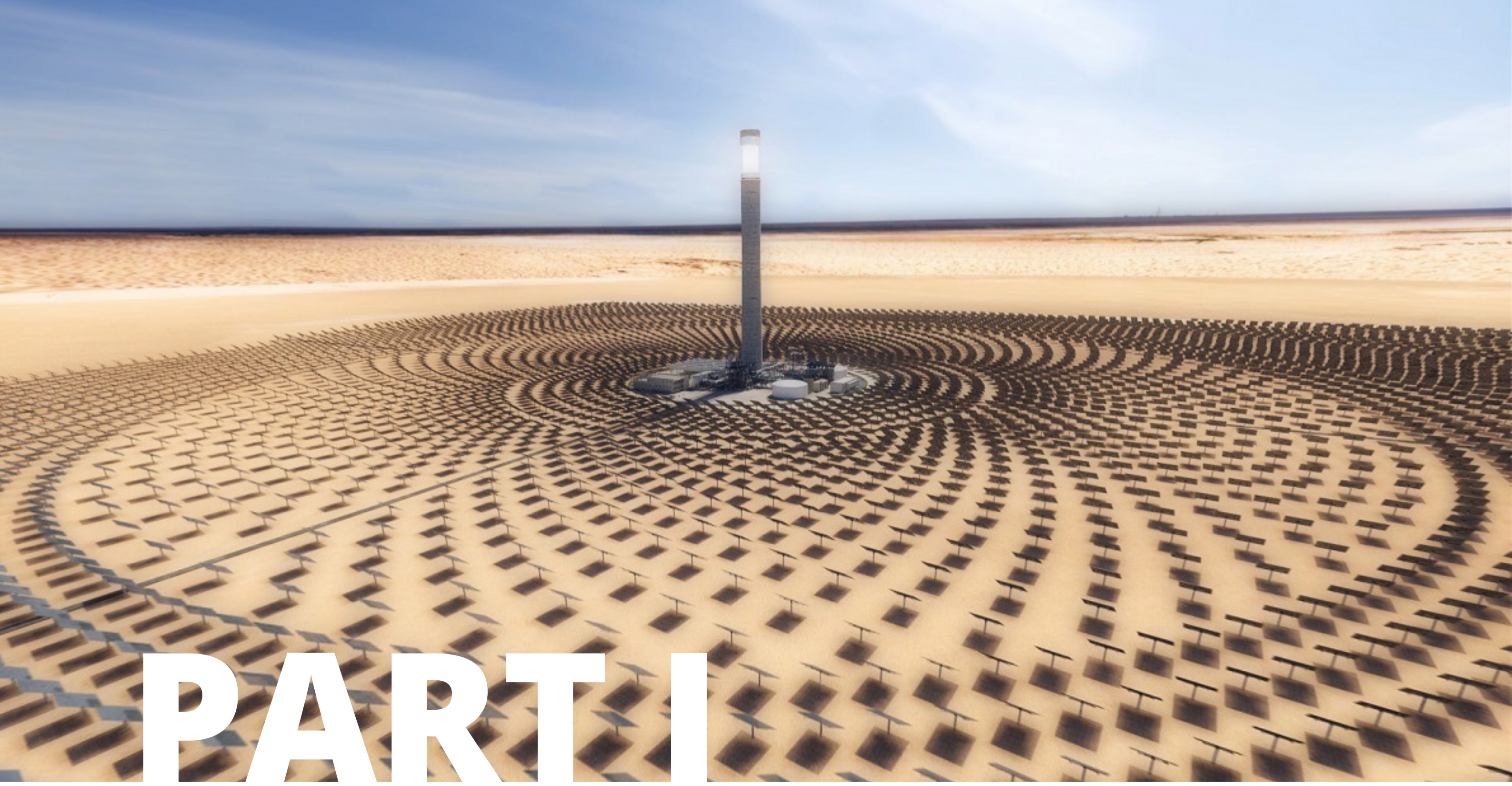


PART I

Introduction, objectives, definitions and steps

1 Introduction

The unprecedented challenge of climate change requires that society undergoes a fundamental, systemic change away from carbon-intensive and unsustainable pathways of development. The urgency of a transition towards sustainable development and net zero global greenhouse gas (GHG) emissions was underlined in the special report Global Warming of 1.5°C[1] *by the Intergovernmental Panel on Climate Change (IPCC). It is crucial that climate and development policies tackle GHG emissions by avoiding further investments in fossil fuel infrastructure, promoting clean technologies and enhancing sinks of GHGs, including forests, to ensure alignment with the Paris Agreement's temperature goal and the global Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development. In this context, there is an increasing need to assess the transformational impacts of policies and actions, and understand whether they can catalyse sustained paradigm shift in economic, political, social and technical systems.*

1.1 Purpose of the methodology

Countries have committed to limit global temperature rise to 1.5–2°C under the Paris Agreement. However, climate targets in nationally determined contributions (NDCs) are currently inadequate to achieve this global goal.[2] According to the United Nations Emissions Gap Report, the gap between emissions levels under full implementation of NDCs consistent with a 2°C target is 13–15 gigatonnes of CO_2 equivalent ($GtCO_2e$) in 2030. In the same year, the emissions gap for a 1.5°C target is 29–32 $GtCO_2e$. Pathways consistent with a 1.5°C temperature goal require rapid and deep transitions in all sectors and all parts of society away from the prevailing, carbon-intensive modes of production and consumption.[3] To achieve the temperature goals of the Paris Agreement, short-term strategies need to be aligned with long-term goals, and countries need to strengthen the mitigation ambition of NDCs and increase the effectiveness of domestic policy.

In response to this challenge, policymakers are designing long-term strategies, and developing policies and actions to fundamentally transform their energy, industrial, land, transport and other systems. The purpose of this methodology is to help users assess the expected or achieved transformational impacts of policies[4] that aim to reduce GHG emissions and contribute to widespread transition for sustainable development.

Transformational impacts can result from processes and outcomes of policies that drive structural changes in society towards climate change mitigation and sustainable development goals and targets, such as those envisaged in the Paris Agreement, NDCs, long-term low-emission strategies and the SDGs. Transformational changes can occur at international, national and subnational levels. Drivers of transformational change include changes in technology, social norms and behaviour, and economic and non-economic incentives and disincentives. When a policy's change is transformational, its impacts can alter the systemic structures of society to achieve climate and sustainable development outcomes that are large in scale and sustained over time.

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

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

[1] IPCC (2018).

[2] UNEP (2018).

[3] IPCC (2018).

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

- to support transparent and consistent monitoring and 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.

This methodology is part of the series of Initiative for Climate Action Transparency (ICAT) guides for assessing the impacts of policies and actions. It is intended to be used in combination with any other ICAT documents that users choose to apply. The series of assessment guides is intended to enable users who choose to assess GHG, sustainable development and transformational impacts of a policy to do so in an integrated and consistent way within a single impact assessment process. Refer to the ICAT *Introduction to the ICAT Assessment Guides*[5] for more information about the ICAT assessment guides and how to apply them in combination.[6]

1.2 Intended users

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

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

- Governments. Assess the expected impacts of policies to inform the design of transformational policies, monitor progress, and evaluate impacts of implemented policies 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.
- Businesses. Assess the impacts of private sector actions (e.g. voluntary commitments and implementation of new technologies), private sector financing or government policies on businesses and the economy.
- Research institutions and NGOs. Assess the extent to which policies are transformational, to generate new information to increase stakeholder awareness and support decision makers.

1.3 Scope and applicability of the methodology

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

The methodology is concerned with transformational change for climate mitigation and sustainable development. It is applicable to all types of policies in all sectors, although it draws mostly on examples from the energy sector to explain and illustrate various steps.[7] It is limited in scope by not including a definition of transformational change for adaptation; it is limited in depth by not taking a sector-specific approach to assessing transformational impacts. This means that characteristics of transformational change are developed as broad descriptions rather than as specific 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 A provides examples of indicators of transformational change characteristics for users to develop more specific indicators for their policy.

The methodology is intended to be flexible: it provides recommended steps rather than requirements, and is non-prescriptive to

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

6 https://climateactiontransparency.org/wp-content/uploads/2020/01/Transformational-Change-Methodology-Executive-summary.pdf

7 ICAT uses terminology that is consistent with the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* for sectors: energy; industrial processes and product use (IPPU); agriculture, forestry and other land use (AFOLU); waste; and other (e.g. indirect emissions from nitrogen deposition from non-agriculture sources). However, users can define boundaries for subsectors specific to the policy, as needed.

accommodate various national circumstances. Users should apply the methodology considering their own objectives and circumstances.

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

The document is organized into five parts (see Figure 1.1). Part I introduces the document and the concept of transformational change, including objectives, principles and an overview of steps. Part II provides steps to define the assessment. Part III discusses ex-ante and ex-post impact assessments. Part IV covers monitoring and reporting, and Part V discusses the use of assessment results for decision-making.

1.3.1 Types of policies and actions

In this methodology, "policy or action" refers to interventions taken or mandated by a government institution or other entity, such as a private sector entity or civil society. These can include laws, directives and decrees; regulations and standards; taxes, charges, subsidies and incentives; information

FIGURE **1.1**

Overview of the methodology

Part I: Introduction, objectives, definitions and steps

Understand the purpose, applicability and limitations of the methodology (Chapter 1)
Determine the objectives of the assessment (Chapter 2)
Understand what is meant by transformational change (Chapter 3)
Understand key concepts, steps and assessment principles (Chapter 4)

↓

Part II: Defining the assessment

Describe the policy or action to be assessed and the assessment boundary and period (Chapter 5)
Choose which transformational change characteristics to assess (Chapter 6)

↓

Part III: Impact assessment

Assess the starting situation (Chapter 7)
Estimate transformational change ex-ante (Chapter 8)
Estimate transformational change ex-post (Chapter 9)

↓

Part IV: Monitoring and reporting

Monitor the performance of the policy or action over time (Chapter 10)
Report the results and methodology used (Chapter 11)

↓

Part V: Decision-making and using results

Learning, decision-making and interpreting results (Chapter 12) instruments; voluntary agreements; introduction of technologies, processes or practices; and public or private sector financing and investments.

The terms “policy” and “action” refer to interventions at various levels of detail, from (1) broad strategies and plans that define high-level objectives or desired outcomes (e.g. 60% solar power in the grid by 2050); to (2) specific policy instruments to carry out a broad strategy or plan (e.g. a feed-in tariff for solar photovoltaic [PV] systems); to (3) implementation of technologies, processes or practices that result from policy instruments (e.g. mandating solar PV systems on rooftops of government buildings). These are illustrated in Figure 1.2, which shows the range of interventions, from more aspirational to more concrete.

This methodology is primarily designed to assess policy instruments and the implementation of technologies and processes that might influence or shape meaningful practices. Users who 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. Different policies or actions can be used to achieve the same long-term goal but have different impacts during implementation.

The methodology is applicable to policies:

- 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 extensions, modifications or eliminations of existing policies.

Table 1.1 presents general types of policies that may be assessed. The list is not exhaustive, and some users may have policies of other types.

FIGURE **1.2**

Types of interventions

TYPE OF INTERVENTIONS	EXAMPLE	APPLICABILITY OF METHODOLOGY
Broad strategies, plans or goals	Intent to increase energy efficiency by 30% by 2030	Partial; should further define the specific policy instruments to achieve the broad strategy
Policy instruments	Energy efficiency standard for appliances	Applicable
Implementation of technologies, processes or practices	Replacement of old appliances with new, efficient ones	Applicable

TABLE **1.1**

Types of policies

Type of policy	Description
Regulations and standards	Regulations or standards that specify abatement technologies (technology regulation or standard), or minimum requirements for energy consumption, pollution output or other activities (performance regulation or standard). They typically include penalties for non-compliance.
Taxes and charges	A levy imposed on each unit of activity by a source – for example, 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 provided by government to an entity for implementing a practice or performing a specified action – for example, social protection schemes for employees, families and communities related to shifts in employment and the economy.
Voluntary agreements or actions	Agreements, commitments or actions undertaken voluntarily by public or private sector actors, either unilaterally or jointly in a negotiated agreement. Some voluntary agreements include rewards or penalties associated with participating in the agreement or achieving the commitments.
Information instruments	Requirements for public disclosure of information. They include labelling programmes, emissions reporting programmes, rating and certification systems, benchmarking, and information or education campaigns aimed at changing behaviour by increasing awareness.
Emissions trading programmes	Programmes that establish a limit on aggregate emissions of various pollutants from specified sources; require sources to hold permits, allowances or other units equal to their actual emissions; and allow permits to be traded among sources. These programmes are also referred to as emissions trading systems or cap-and-trade programmes.
Research, development and deployment policies	Policies aimed at supporting technological advances, through direct government funding or investment, or facilitation of investment, in technology research, development, demonstration and deployment activities.
Public procurement policies	Policies requiring that specific attributes (such as GHG emissions) are considered as part of public procurement processes.
Infrastructure programmes	Provision of (or granting a government permit for) infrastructure, such as roads, water, urban services, and high-speed rail; and economic revitalization programmes for areas affected by systemic transitions.
Implementation of technologies, processes or practices	Implementation of technologies, processes or practices (e.g. those that reduce emissions compared with existing technologies, processes or practices).
Financing and investment	Public or private sector grants or loans – for example, those supporting development strategies or policies (e.g. development policy loans or development policy operations such as loans, credits and grants), private sector development grants in high-risk or small markets, or direct investments in human capital (e.g. retraining, alternative skill development, education).

Source: WRI (2014); based on Gupta et al. (2007).

1.4 When to use the methodology

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

- **before implementation** – to assess the extent of transformation expected from a policy (through ex-ante assessment)
- **during implementation** – to assess the extent of transformation achieved to date from a policy, ongoing performance and the extent of transformation expected in the future
- **after implementation** – to assess the extent of transformation achieved as a result of a policy (through ex-post assessment).

Depending on individual objectives and when the methodology is applied, users can implement the steps related to ex-ante assessment, ex-post assessment or both. Users carrying out an ex-post assessment only can skip Chapter 8. Users carrying out an ex-ante assessment only can skip Chapters 9 and 10.

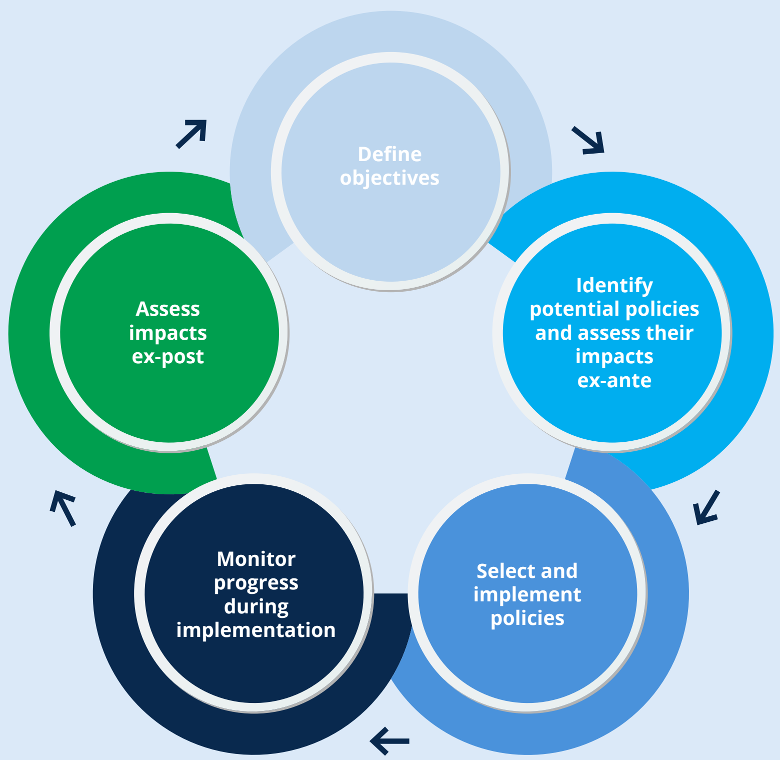
Figure 1.3 outlines a simplified sequence of steps to monitor and assess impacts at multiple stages in a policy design and implementation cycle. In the figure, the process is iterative, such that insights from previous experience inform improvements to policy design and implementation, and the development of new policies.

1.5 Key recommendations

The methodology includes key recommendations that are recommended steps to follow when assessing and reporting the extent of transformation expected or achieved. These recommendations are intended to help users produce high-quality impact assessments that are based on the principles of

FIGURE 1.3

Assessing impacts during a policy design and implementation cycle



Source: Adapted from WRI (2014).

relevance, completeness, consistency, transparency, accuracy and reflection on ambition.

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

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

1.6 Relationship to other methodologies and resources

This methodology is part of the ICAT series of guides for assessing impacts of policies and actions. It is intended to be used in combination with any other ICAT guides that users choose to apply, including:

- sector-level methodologies for assessing GHG impacts of policies in the agriculture, forestry, energy and transport sectors
- *Sustainable Development Methodology* on how to assess the environmental, social and economic impacts of policies
- *Stakeholder Participation Guide* on how to carry out effective stakeholder participation when designing, implementing and assessing policies, including when assessing transformational impacts using this guide
- *Technical Review Guide* on how to review assessment reports, including when assessing the extent of transformation expected or achieved using this guide.

For example, users assessing a renewable energy policy could follow both the ICAT *Renewable Energy Methodology* to assess the GHG impacts and this *Transformational Change Methodology* to assess transformational impacts within an integrated assessment. Refer to the *Introduction to the ICAT Assessment Guides* for more information about the ICAT guides and how to apply them in combination.

In Parts I and IV of this methodology, the basic structure and series of steps draw on the Greenhouse Gas Protocol *Policy and Action Standard*,[8] which provides guidance on estimating the GHG impacts of policies. Figures and tables adapted or reproduced from the *Policy and Action Standard* are cited, but for readability not all text taken directly or adapted from the standard is cited.

1.7 Process for developing the methodology

This methodology has been developed through an inclusive, multi-stakeholder process convened by ICAT. Development was led by UNEP DTU Partnership (lead) and the World Resources Institute (co-lead), who serve as the secretariat and guide the development process.

The first draft was developed by drafting teams, consisting of a subset of a broader Technical Working Group (TWG) and the secretariat. The TWG consists of experts and stakeholders from a range of countries identified through a public call for expressions of interest. The TWG contributed to the development of the technical content for the methodology through participation in regular meetings and written comments. A Review Group provided written feedback on the first draft.

The May 2018 version of this methodology was applied by ICAT participating countries and other non-state actors to ensure that it can be practically implemented. This version of the methodology was informed by the feedback gathered from that experience and includes case studies from those applications.

ICAT's Advisory Committee, which provides strategic advice to the initiative, reviewed the second draft. More information about the 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.

[8] WRI (2014).

2 Objectives of assessing transformational change

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

Checklist of key recommendations

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

Assessing the extent of transformation expected or achieved by policies is a key step towards developing strategies that promote climate and sustainable development goals. It enables policymakers to understand the relationship between policies 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 are listed below.

2.1 General objectives

- **Understand how the policy helps achieve multiple goals** at international, national or subnational levels through structural change in a sector or across multiple sectors. The goals may include mitigation and sustainable development goals, such as those contributing to the achievement of the Paris Agreement 1.5–2°C target, or outlined as part of a country's green growth plans, long-term vision on climate action (e.g. national five-year, mid-term or long-term climate policies and plans), NDCs or SDGs.

- **Attract finance** by demonstrating how a given policy facilitates a paradigm shift to low-carbon development. Increasingly, funds such as Climate Investment Funds, the NAMA Facility and the Green Climate Fund are paying more attention to operationalizing transformational change in climate finance.

- **Report and communicate** the extent of transformation expected or achieved by policies to demonstrate results and ambition, build coalitions of support, and raise social acceptance. The assessment results can be reported domestically or internationally, including under the Paris Agreement's enhanced transparency framework for ex-ante reporting of expected impacts or ex-post reporting of achieved impacts.

2.2 Objective of assessing expected impacts before policy implementation

- **Improve policy selection and design** by gaining a better understanding of the extent of transformation expected from a given policy. The assessment can also help compare and prioritize policies based on their potential for paradigm shift. Users can use the assessment results to select the most transformational policy, or adjust current policy objectives and design to increase the potential of the policy 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.

2.3 Objective of assessing impacts during or after policy implementation

- **Evaluate the transformational impact of a policy over time** to understand whether, and to what extent, it has been transformational. The assessment can also improve the likelihood of policies realizing their transformational potential when it is conducted regularly and policies are adjusted based on its findings.

- **Inform future policy design**, including reformulation of NDCs towards enhanced ambition, and decide whether to continue current actions, enhance current actions or implement additional actions.

- **Learn from experience and ongoing monitoring** to better understand the drivers of transformational change and enhance the effectiveness of policies.

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

Subsequent chapters provide flexibility to enable users to choose how best to assess the extent of transformation expected or achieved by policies 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 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[9] and defines transformational change for the purposes of this methodology.

3.1 Transformational change in the literature

In social science, many scholars have sought to understand how technological and societal changes occur, and conceptualize 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, to distil 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 shows some recent definitions of transformational change.[10]

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 and 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. (2014a)
Projects are considered as conducive to transformational change if they: • contribute to enabling either a significant evolution in terms of scope (e.g. scaling-up or replication), or enabling a faster and/or a significant shift from one state to another; • have a catalytic effect and include mechanisms to ensure the sustainability of the impacts, local ownership and political will, the involvement of the private sector and the use of innovative technologies and approaches; and • allow for systematic learning processes.	NAMA Facility (2014)

9 The literature tends to use "transition" and "transformation" interchangeably to describe processes that are referred to as "transformational change" in this methodology.

10 This list was prepared as part of discussions with the TWG and was later updated to include other examples from climate finance institutions.

TABLE **3.1,** continued

Examples of definitions of transformational change

Definition	Source
Paradigm shift potential, one of the investment criteria for the Green Climate Fund, is defined as the degree to which the proposed activity can catalyse (mitigation) impact beyond a one-off project or programme investment. It talks about the project/programme's potential for scaling up and replication, and its overall contribution to global low-carbon development pathways being consistent with a temperature increase of less than 2 degrees C.	Green Climate Fund (2015)
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 and Fenhann (2016)
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 and Thwaites (2016)
Irreversible, persistent adjustment in societal values, outlooks and behaviours of sufficient width and depth to alter any preceding situation.	TRANSIT (2017)
Strategic changes in targeted markets and other systems with large-scale, sustainable impacts that accelerate or shift the trajectory toward low-carbon and climate-resilient development.	Climate Investment Funds (2018)

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 period.
- Transformational change by itself has **no normative connotation**; values are added by **defining a transformation goal**.

Throughout this methodology, the term "system" is used to describe the part of society that is targeted by a particular policy. A system generally refers to a set of interconnected elements working together with some degree of harmony to fulfil various functions. These elements can be physical entities (e.g. humans or machines); legislative, institutional, political or fiscal structures; or financial rules and regulations organized to achieve a set of objectives and functions.

Box 3.1 further distinguishes transformational change from other types of change.

BOX **3.1**

Types of change

Policies are about planned interventions for change; this has always been the case. What is new and different about transformational change compared with other types of change? One way to answer this is to distinguish between incremental change, reform and transformation, as shown in Table 3.2. Incremental change often entails adjustments that allow the usual state of affairs to continue (e.g. increasing awareness about water conservation). Reform involves addressing a problem, which may alter business as usual but does not fundamentally change the system (e.g. charging higher rates to encourage consumers to reduce their water use). Transformational change explicitly leads to a new system – that is, a new paradigm or regime, and new attitudes and values – while questioning the old ones (e.g. cities and their residents investing in sustainably landscaped outdoor spaces). These are not mutually exclusive types of change; rather, the difference lies in the degree of change. For instance, incremental change and reform can contribute to an enabling environment for transformative change.

TABLE **3.2**

Types of change

	Type of change		
Example	**Incremental**	**Reform**	**Transformation**
Waste	Less waste (waste regime)	Waste recycling (waste regime)	Cradle to cradle (no-waste regime)
Energy	Increasing energy efficiency (low-carbon regime)	Promoting renewable energy while continuing to use fossil fuels (low-carbon regime)	Abandoning fossil energy, using 100% renewables (zero-carbon regime)

Source: GIZ (2020)

Societal systems are complex – they exhibit 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. However, even a partial understanding of the dynamics of change can help develop policy interventions that are more likely to lead to transformation. Processes that aim at transformational change are less likely to be effective if they target issues in isolation. In such a case, everyone involved could act 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 expecting and planning for transformations at many levels, ranging from the local level up to the national or even international levels. Large policy interventions have impacts at lower levels of governance, and local-level activities can also have impacts at higher levels – for example, through learning about successes, or when local interventions affect other regions or countries. Case studies of ongoing or planned transformations for low-carbon and sustainable development are available in the literature.[11] They include Germany's experience with transformation of parts of the energy system; the role of wind power

[11] Olsen and Fenhann (2015).

in electricity generation in Denmark; the transition to a sustainable transport system at city level in Bogotá, Colombia; and the potential leadership role of state-owned companies in South Africa to lead a transition away from carbon lock-in. There are also various examples that seemed transformational, but the change was reversed over time, underlining the importance of being able to sustain transitions over long periods. For instance, deforestation in Brazil declined by 75% during the decade from 2005 to 2014. However, it has been on the rise since 2014, demonstrating that transformational change experienced for a decade can continue to be vulnerable to political changes in governance.

3.2 Definition of transformational change in this methodology

Transformational change in this methodology is a conceptual framework to describe the impact of a change process. Transformations can lead to a better or 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 methodology is problem oriented towards promoting zero-carbon, climate-resilient, resource-efficient and sustainable societies, in line with the goals of the Paris Agreement and the SDGs.

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 methodology 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 goal to limit global warming to 1.5–2°C and the United Nations SDGs.**

The terms “carbon” and “CO_2” are used interchangeably in this methodology. Zero carbon refers to zero CO_2 equivalent (CO_2e) emissions, which takes into account other GHG emissions. Zero carbon means “net zero carbon”, which implies that some remaining CO_2 emissions can be compensated by the same amount of CO_2 uptake, provided that the net emissions to the atmosphere are zero. The global temperature goal and the SDGs indicate the desired direction and magnitude of change needed. Alignment with the global goals should inform the assessment, particularly the vision of the policy towards enhanced ambition for NDC implementation and the global stocktake of collective NDC efforts to meet the Paris Agreement goal.

Assessment of a policy's alignment with global goals and planetary boundaries can be assessed through absolute, quantitative approaches that downscale the global goals to a country, sector, company or other level. Box 3.2 explains this approach and provides an example from Uganda. However, absolute quantitative approaches to determine alignment with planetary boundaries are an emerging field of research. Currently, there is no political consensus on what constitutes a fair and just approach to share the global carbon budget. Therefore, this methodology takes a *qualitative* approach to define transformational change and assess alignment with the global goals.

Transformational change as defined above is characterized by:

- **large-scale outcomes or a multitude of smaller-scale changes leading to large-scale, system-wide impacts**
- **sustained, long-term outcomes that reinforce zero-carbon practices while avoiding carbon lock-in and dependence on fossil fuels.**

Transformational change as considered in this methodology is not an organic or incremental evolution in line with the self-organizing dynamics of a system. Instead, transformational change means that the general paradigm and existing standards of how to do things are challenged, and old path dependencies are disrupted. The kind of transformational change that this methodology focuses on is the “planned” transformation – that is, the transformation that is intended through the adoption of purposeful policy and regulation that aim to shift emissions trends towards zero-carbon and sustainable development goals. This requires an intentional, long-term change strategy for how the system can transform and what the outcome of transformation should be.

The methodology identifies four main drivers (or processes) of system change based on the existing literature:

- **technology change** – processes, skills and practices that drive research and development, early adoption and widespread scale-up of clean technologies

- **agents of change** – governments, entrepreneurs, the private sector and civil society, as well as cross-cutting coalitions and networks as agents of transformational change
- **incentives for change** – economic and non-economic incentives, along with disincentives, which play a critical role in shifting technology and societal change
- **norms and behavioural change** – include 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, if change is to occur, all four processes listed above are important and interdependent as elements of the system targeted for change. A long-term (e.g. 20 or more years) management strategy is equally necessary. 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.

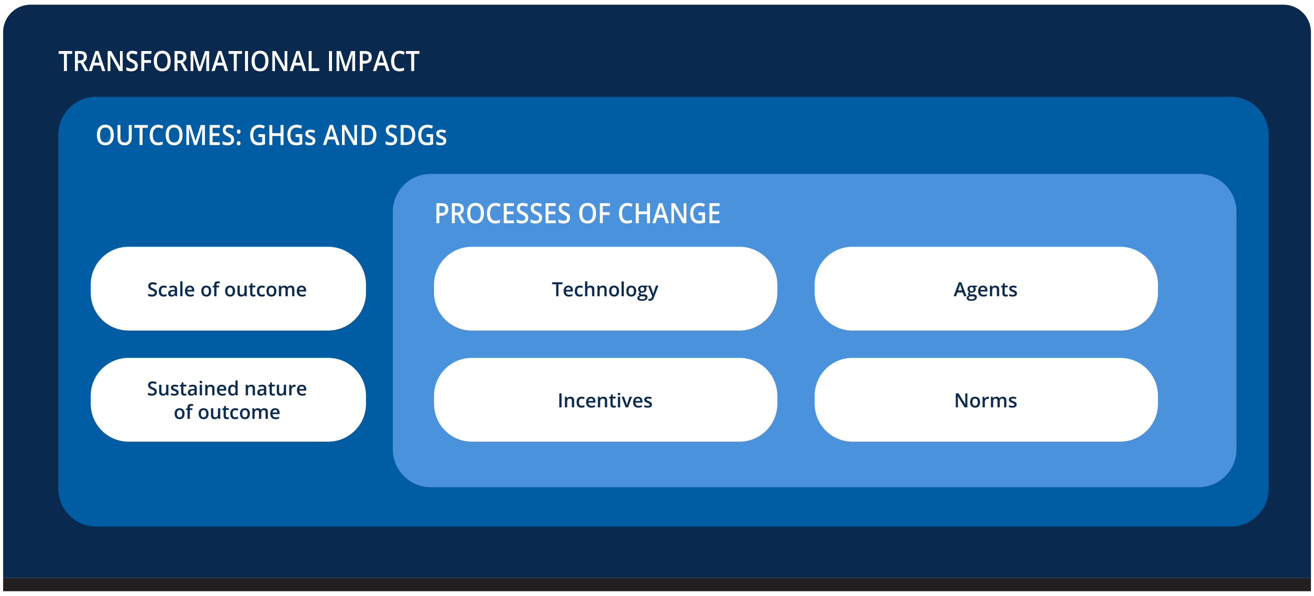
Figure 3.1 illustrates the logic of this methodology. Assessment of transformational impact consists of assessment of processes and outcomes of change, and is supported by a number of characteristics and indicators.

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's contribution to a system change towards zero-carbon and sustainable development goals.
- The outcomes of a transformational policy are determined through its contribution to achieving GHG mitigation and sustainable development at a large scale – in terms of the magnitude of change and how widespread it is – and sustained over time.
- The processes of a transformational policy comprise technologies, change agents, economic incentives, and a change in norms and behaviour, as well as effective change management that is open to continuous learning and integration of changing circumstances.

FIGURE **3.1**

Layers of transformational impact assessment



BOX **3.2**

Downscaling global goals for individual policies

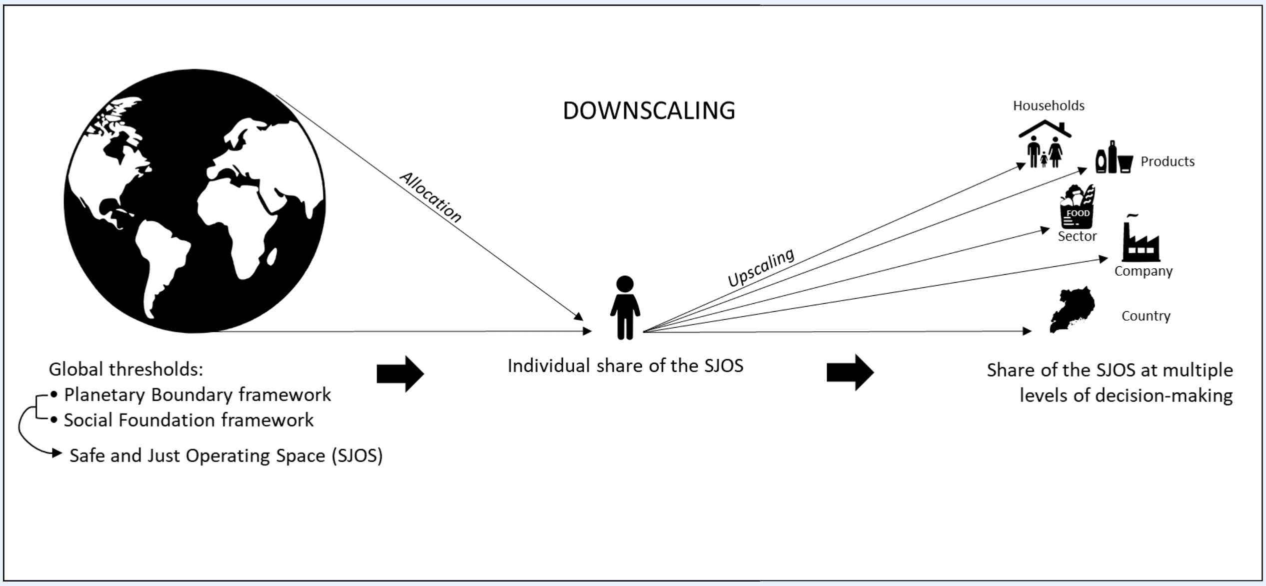
Scientists have proposed a set of nine Planetary Boundaries (climate change, biosphere integrity, land system change, freshwater use, biogeochemical flows, ocean acidification, atmospheric aerosol loading, stratospheric ozone depletion, and novel entities) to assess the environmental stability of the Earth System.[12] For the climate change Planetary Boundary, a prominent example is the IPCC SR1.5 global carbon budget approach to determine how much CO_2 can be emitted globally to limit global warming to 1.5°C.

The Science Based Targets initiative (SBTi)[13] is another example, which provides three methods (sector based, absolute based and economic based) for companies and other non-state actors to set targets in line with what the latest climate science says is necessary to align with the Paris Agreement goal.

To embrace social aspects of sustainability, the Safe and Just Operating Space (SJOS) defines a space for humanity to ensure that humans continue to enjoy a stable and resilient Earth.[14] Several attempts have been made to downscale thresholds for the global goals, so that they can be applied at multiple levels of decision-making, as illustrated in Figure 3.2.

FIGURE **3.2**

Downscaling of global thresholds



[12] Rockström et al. (2009).

[13] The SBTi (https://sciencebasedtargets.org) is a collaboration between CDP, the United Nations Global Compact, the World Resources Institute and the World Wide Fund for Nature (WWF).

[14] Raworth (2012).

BOX **3.2**, continued

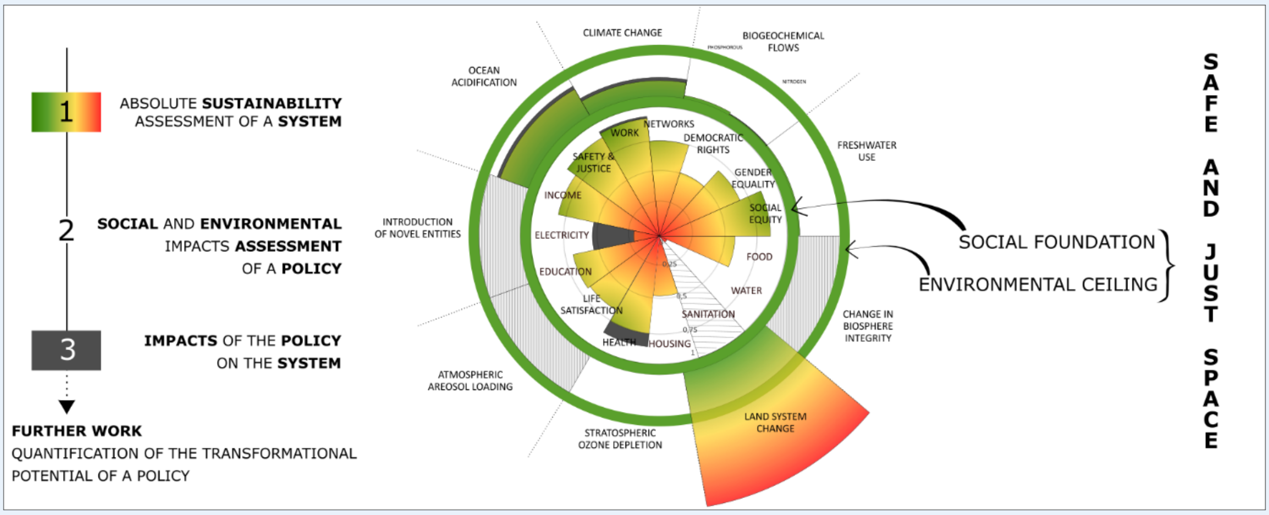
Downscaling global goals for individual policies

Downscaling of the global goals to determine the SJOS for a policy at different levels of decision-making is a normative process that involves considering different ethical principles (e.g. equal per capita shares, grandfathering, historical responsibility). Although there is no consensus yet in the global climate negotiations on the "right way" to allocate and share rights to impact the Earth System, emerging work from science provides a way to translate the Planetary Boundaries and Social Foundation Framework into policy-level targets that are consistent with the global goals for climate and sustainable development. An example is provided below.

To assess the transformational impacts of a Geothermal Energy Development Policy in Uganda using the ICAT *Transformational Change Methodology*, UNEP DTU Partnership, supported by the Clean Technology Centre and Network, applied a Planetary Boundaries approach. Global thresholds expressed by the Planetary Boundaries framework were downscaled to the national level using the egalitarian sharing principle, which allocates an equal share of the SJOS for all Planetary Boundaries to each individual on the planet. In practice, this means downscaling the nine global thresholds to the individual level and then upscaling them to the country level using population data. These territorial allocations serve as a benchmark for assessing goals of policies at the relevant scale. Results of the Ugandan assessment are shown in Figure 3.3.

FIGURE **3.3**

Results of the Ugandan assessment



The figure illustrates the state of Uganda in the baseline scenario (coloured areas) using the allocated share of the SJOS, and the social and environmental impacts (ex-ante assessment) of the policy (grey areas). The inner green circle represents the social foundation to be reached to achieve social sustainability, while the outer circle is the environmental ceiling not to be crossed to stay within the planetary limits.

4 Steps and assessment principles

This chapter provides an overview of the steps involved in the assessment of the extent of transformation expected or achieved by policies and 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 methodology is organized according to the steps a user follows in assessing the transformational impacts of a policy (see Figure 1.1). Depending on when the methodology is applied, users can select Chapter 8 or Chapters 9 and 10. For example, when the methodology is applied ex-ante before a policy is implemented, users can skip Chapters 9 and 10.

4.2 Planning the assessment

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

The time and human resources required to use the methodology in its entirety depend on a variety of factors, such as the complexity of the policy 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 have already been collected, and whether similar analysis relating to the policy has previously been done. An assessment template is provided for users on the ICAT website. The template indicates the type of data needed to arrive at assessment results, which is useful for planning the assessment.

4.2.1 Quantifying impacts of the policy

To assess the extent of transformation resulting from a policy, it is necessary to first understand the impacts of the policy on GHGs and sustainable development. To do so, users can apply other ICAT methodologies in combination with this methodology. To assess the GHG impacts of the policy, users can apply the GHG methodology that is relevant to the policy – that is, the *Renewable Energy Methodology*, *Buildings Efficiency Methodology*, *Transport Pricing Methodology*, *Agriculture Methodology* or *Forest Methodology*. To assess the sustainable development impacts of the policy, users can apply the ICAT *Sustainable Development Methodology*, which addresses many different types of impact across the environmental, social and economic dimensions, such as air quality, health, jobs, income, gender equality and energy security.

4.2.2 Planning stakeholder participation

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

- establishing a mechanism through which people who may be affected by, or can influence, a policy, have an opportunity to raise issues and have these issues considered before, during and after policy implementation
- raising awareness and enabling better understanding of complex issues for all parties involved, building their capacity to contribute effectively
- building trust, collaboration, shared ownership and support for policies among

stakeholder groups, leading to less conflict and easier implementation

- addressing stakeholder perceptions of risks and impacts, and helping to develop measures to reduce negative impacts and increase benefits for all stakeholder groups, including the most vulnerable
- increasing the credibility, accuracy and comprehensiveness of the assessment by drawing on diverse expert, local and traditional knowledge and practices – for example, to provide inputs on data sources, methods and assumptions
- increasing transparency, accountability, legitimacy and respect for stakeholders' rights
- enabling enhanced ambition and finance by strengthening the effectiveness of policies and credibility of reporting.

Various sections throughout this methodology explain where stakeholder participation is recommended – for example, in choosing which transformational change characteristics to assess (Chapter 6), identifying barriers to transformational change (Chapter 6), 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, users should consider how stakeholder participation can support the objectives, and include relevant activities and associated resources in assessment plans. It may be helpful to combine stakeholder participation for 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 conform with national legal requirements and norms for stakeholder participation in public policies. Requirements of specific donors, and of international treaties, conventions and other instruments that the country is party to should also be met. These are likely to include requirements for disclosure, impact assessments and consultations. They may include specific requirements for certain stakeholder groups (e.g. United Nations Declaration of the Rights of Indigenous Peoples, International Labour Organization Convention 169) or specific types of policies (e.g. United Nations Framework Convention on Climate Change guidance on safeguards for activities that reduce emissions from deforestation and degradation in developing countries).

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

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

4.2.3 Planning technical review (if relevant)

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

4.3 Assessment principles

Assessment principles underpin and guide the impact assessment process, particularly where the methodology 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:[15]

- **Relevance.** Ensure that 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 relating to a policy, and complete each relevant step in the assessment.
- **Consistency.** Use consistent approaches and data-collection methods to allow meaningful results and performance tracking over time. Document and report any changes to data, assessment methods or any other relevant factor.
- **Transparency.** Provide clear and complete information for 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 ensure an unbiased assessment, enhance accuracy and reliability of the results, and engage stakeholders. 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. Where accurate data are not available, strive to improve accuracy over time as better data become available.
- **Reflection on ambition.** Be problem oriented, always have a clear rationale, and focus on how the policy contributes to transformational change at every step of the assessment. Conduct iterative and reflexive monitoring, and adjust goals and strategies on an ongoing basis towards progression and ambition of policies to be more effective and efficient, and to scale up transformational impacts.

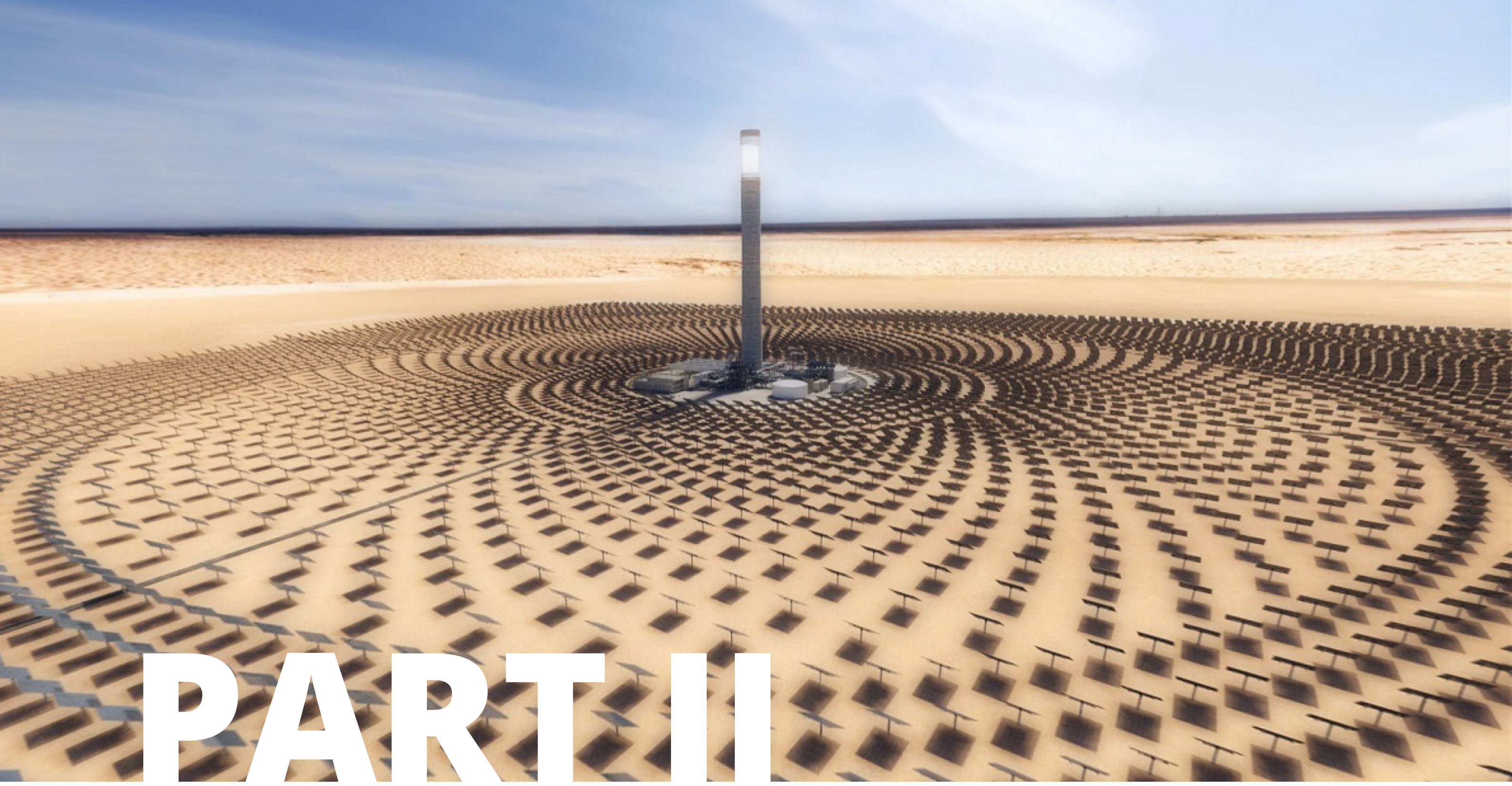
In addition to the principles above, users should follow the principle of comparability if it is relevant to their assessment objectives – for example, if the objective is to compare and prioritize multiple policies based on the extent of transformation they are expected to lead to:

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

The principle of comparability can be applied when a single entity will assess and compare multiple policies using the same methodology. If the objective is to compare 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 ensuring consistency in the assessment period, the characteristics and indicators assessed and monitored, the starting situation, calculation methods, data sources, and stakeholder engagement processes. 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 objectives. Over time, as the accuracy and completeness of data increase, the trade-off between these principles will likely diminish.

[15] These principles build on the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (IPCC 2006) to ensure quality in all steps of the assessment.



PART II

Defining the assessment

5 Describing the policy, and the assessment boundary and period

To assess the transformational impacts of a policy, users need to describe the policy, decide whether to assess an individual policy or a package of related policies, and choose whether to carry out an ex-ante or an ex-post assessment. This chapter also explains how to define the assessment boundary and assessment period.

Checklist of key recommendations

- Clearly describe the policy (or package of policies) that is being assessed
- Define the assessment boundary in terms of geographical and sectoral coverage of transformational characteristics selected for assessment
- Define the assessment period

5.1 Describe the policy to be assessed

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

When multiple policies are being developed or implemented in the same time frame, or as part of the same broad strategy or plan, users can assess the policies either individually or together as a package. When making this decision, it is useful to consider the assessment objectives, feasibility and the degree of interaction between the individual policies under consideration. Further guidance on whether to assess an individual policy or a package of policies is available in the ICAT sector-specific GHG methodologies and the *Sustainable Development Methodology*. Users who assess the GHG impacts and/or sustainable development impacts of a policy following other ICAT methodologies should describe the policy or policy package in the same way to ensure a consistent and integrated assessment, or explain why there are differences in how the policy is described across the assessments. When a package is assessed, users should explain which individual policies are included in the package and how they contribute to a transformational vision.

Table 5.1 can be used to document either the package as a whole or each policy in the package separately. It uses the hypothetical example of a grid-connected rooftop solar policy. In subsequent chapters, users follow the same general steps and methodology, whether they choose to assess an individual policy or a package of policies.

FIGURE **5.1**

Overview of steps in the chapter

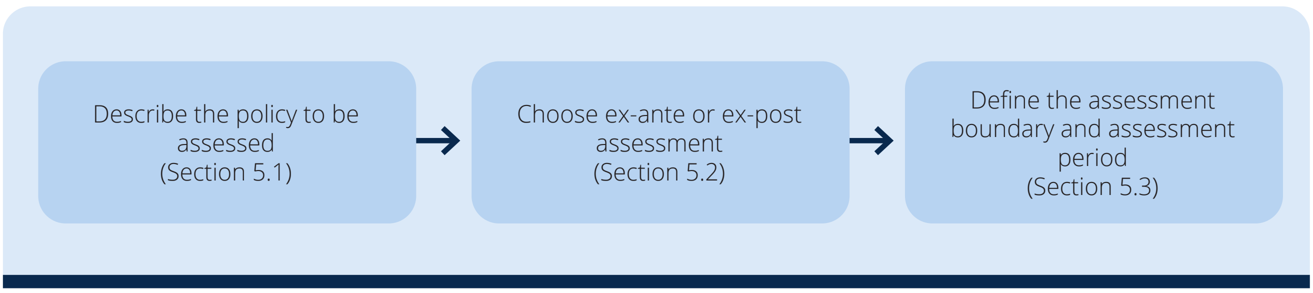


TABLE **5.1**

Checklist of recommended information to describe the policy being assessed

Information	Description	Hypothetical example
Title of the policy	Policy name	Grid-connected rooftop solar programme; referred to as the "solar PV policy" throughout this methodology
Type of policy	The type of policy, such as those presented in Table 1.1, or other categories of policies that may be more relevant	Financial incentive policy
Description of specific interventions	The specific intervention(s) carried out as part of the policy, such as the technologies, processes or practices implemented to achieve the policy	Description of financial incentives. The policy includes two specific interventions: • a financial subsidy up to 30% of project/benchmark cost for rooftop solar projects (up to 500 kW) in commercial, industrial, non-profit, single-family residential, multi-family residential, low-income residential and institutional buildings; it also provides concessional loans to rooftop solar project developers • a feed-in tariff for all new grid-connected rooftop solar and small solar power plants.
Status of the policy	Whether the policy is planned, adopted or implemented	The policy has been implemented (currently in effect).
Date of implemen-tation	The date the policy comes into effect (not the date that any supporting legislation is enacted)	1 January 2015
Date of completion (if relevant)	The date the policy ceases, such as the date a tax is no longer levied or the end date of an incentive scheme with a limited duration (not the date that the policy no longer has an impact)	Provision of financial incentives and feed-in tariff ends on 31 December 2022.
Implementing entity or entities	The entity or entities that implement(s) the policy, including the role of various local, subnational, national, international or any other entities	Government funds are disbursed by the ministry to state agencies, financial institutions, implementing agencies and other government-approved partners, including renewable energy service providers, system integrators, manufacturers, vendors and NGOs. The feed-in tariff is determined by an electricity regulatory authority for different regions, which may have different electricity rates, and is administered by the electricity utility companies.
Objectives and intended impacts or benefits of the policy	The intended impact(s) or benefit(s) of the policy (e.g. the purpose stated in the legislation or regulation), including specific goals for GHG emissions reductions and sustainable development impacts, where available	The policy is intended to increase deployment of solar energy, deepen solar technology penetration, increase access to clean energy, increase energy security, create jobs, reduce GHG emissions, and create an enabling environment for technology penetration, investment, installation, capacity-building, research and development in the solar energy sector. The policy has the following goals: • annual emissions reductions of 20 million tCO_2e by 2022 • 200,000 new green jobs (e.g. in solar PV installation and maintenance sectors) created by 2022.

TABLE **5.1**, continued

Checklist of recommended information to describe the policy being assessed

Information	Description	Hypothetical example
Level of the policy	The level of implementation, such as national, subnational, city, sector or project	National
Geographic coverage	The jurisdiction or geographic area where the policy is implemented or enforced, which may be more limited than all the jurisdictions where the policy has an impact	National
Sectors targeted	The sectors and subsectors that are targeted	Energy supply, grid-connected solar PV
Other related policies or actions	Other policies or actions that may interact with the policy assessed	The government targets installation of 100 GW of solar power by 2022, of which 20 GW is to be achieved through rooftop solar power plants through the solar PV policy.
Reference	A link or full reference to access further, detailed information about the policy	www.solarpvpolicy.org

5.2 Choose ex-ante or ex-post assessment

Users should choose whether to carry out an ex-ante assessment, an ex-post assessment, or a combined ex-post and ex-ante assessment. An assessment is classified as 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. Ex-post assessment is the process of assessing historical impacts of a policy. 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 and ex-post assessment depends on the status of the policy:

- If the policy is planned or adopted, but not yet implemented, the assessment will be ex-ante by default.
- If the policy is under implementation, the assessment can be either ex-ante, ex-post or a combination of the two. Users should carry out an ex-post assessment when the objective is to assess the extent of transformation achieved by the policy to date, an ex-ante assessment when the objective is to assess the extent of transformation expected in the future, or a combined ex-ante and ex-post assessment to assess the extent of transformation both expected and achieved by the policy.

5.3 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 transformational impacts covered, and the geographical and sectoral coverage of the policy.

This methodology 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 geographical and sectoral boundary within which the policy is implemented. For example, if a policy is implemented within one sector in a country but has significant impacts in other sectors or in neighbouring countries, users can consider an assessment boundary that includes impacts in these other sectors or countries, where feasible. All specific and relevant characteristics of transformational change identified are to be included in the assessment boundary.

A two-step approach to defining the assessment boundary and the assessment period is recommended. The first step is to define the boundaries based on the description of the policy. The second, iterative step is to revisit and revise the definition of boundaries after the transformational impacts have been selected in Section 6.5.

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 impacts covered, and the geographical and sectoral coverage as follows:

- **Impacts covered.** Along with GHGs, users should specify which sustainable development impact categories are selected for assessment. Each impact category will be separately assessed. The ICAT *Sustainable Development Methodology* (Chapter 5) provides a list of impact categories across the environmental, social and economic dimensions that can be assessed, such as jobs, air quality, health, gross domestic product (GDP), gender equality, water quality and energy security. For the hypothetical solar PV policy example, jobs is the only sustainable development impact category that has been selected for assessment (in addition to GHGs).

- **Geographical coverage.** Users can undertake the assessment at the global, national, state or city level. This may or may not be the same as the geographical 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 European Union region. For a national policy, users can conduct the assessment at a national level or at a state level, to understand whether the policy is likely to result in transformational change in a state. For the solar PV policy example, the assessment is undertaken at the national level.

- **Sectoral coverage.** Users should specify the sector(s) included in the assessment. These can be the same as, or a subset of, sectors targeted by the policy. 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. In the example used in the methodology, the assessment covers the solar PV subsector only.

The assessment period is the time period over which the extent of transformation expected or achieved by the policy is assessed. It is a *key recommendation* to define the assessment period. The assessment period can be different from the policy implementation period – that is, the period during which the policy is being implemented and is in effect. The assessment period should be selected to include the full range of relevant impacts, based on when they are expected to occur or have occurred.

System changes usually unfold over a longer period of time than individual impacts. The sustained nature of impacts may only become evident with time. Hence, users are encouraged to select a long assessment period (e.g. 15 years or more, with an end date such as 2040 or 2050) to align with longer-term plans and goals. It is also helpful to assess impacts for short- and medium-term goals to assess performance against specific targets and enable course correction, if needed. For example, where the objective is to understand the expected contribution of a policy towards achieving a country's NDC, users may use the NDC implementation period (e.g. ending in 2030) as a mid-term milestone. Similarly, to align the results with the achievement of SDGs under the 2030 Agenda for Sustainable Development, users may define a 2040 assessment period with a 2030 milestone. In the case of ex-post assessments, regular monitoring of impacts is encouraged to enable modification of strategies as needed. For the hypothetical solar PV policy example, the assessment period is 2015–2030 (15 years).

The timing and coverage of data collection to assess characteristics will depend on the user's reporting needs, as well as the indicators and data sources used. Users can choose to monitor the policy outside the assessment boundary and beyond the assessment period. Chapter 10 provides further methodology 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 other ICAT methodologies, provided that the assessment period is suitably long, in keeping with the guidance above. Alternatively, users can choose to do assessments for multiple points in time (e.g. for 2030 and 2050) to support short- and mid-term planning. For example, where users are assessing sustainable development impacts using the ICAT *Sustainable Development Methodology* in addition to assessing transformational impacts, the assessment period should be the same for both the sustainable development and transformational impact assessments if the former has a long assessment period. If the assessment period for sustainable development is, say, 2025, users should select 2025 as one of the points in time to assess impacts to align with the sustainable development impact assessment. In addition, they should choose a longer assessment period appropriate for assessing transformational impacts, given they often unfold over lengthier durations.

6 Choosing which transformational change characteristics to assess

This chapter provides a framework to understand transformational change characteristics. It outlines the steps and methodology to choose transformational change characteristics relevant to a policy. Identifying the phase of transformation provides an understanding of the starting situation – that is, the context in which the policy is implemented. This helps users to describe the historical background and the possible future pathway towards the vision for transformational change, as described by the user. Identifying barriers to transitioning the system that are specific to the phase of transformation is useful when choosing which transformational characteristics to assess.

Checklist of key recommendations

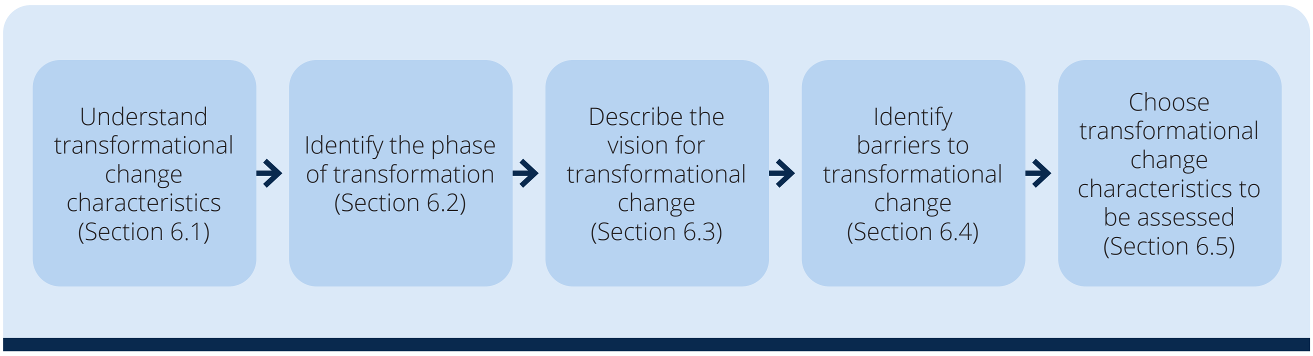
- Identify the phase of transformation to understand the context in which the policy is being planned or implemented
- Describe the transformational vision of the policy, through consultation with key stakeholders
- Identify barriers to transformational change specific to the phase of transformation of the economy in which the policy is operating
- Choose characteristics to be assessed based on their relevance to transformational change in the context of the policy and the society in which it is implemented
- Describe outcome and process characteristics relevant to the policy

6.1 Understand transformational change characteristics

This section explains characteristics of transformational change to help users understand the transformational impacts of a policy that are consistent with the definition given in Section 3.2. The climate and sustainable development goals included in the definition of transformational change indicate the desired direction and magnitude of

FIGURE **6.1**

Overview of steps in the chapter



change that are required to tackle climate change and sustainability transition at any level of society. The characteristics provide a generic framework to describe all transformational aspects of a policy. The methodology helps users analyse a policy's potential to fundamentally change systems and contribute to global goals over the long term. However, it is recognized that aligning individual policies with global goals can be done in multiple ways and there is no one "right way" or method to do so. One approach is downscaling of the global goals to a country, sector, company or other level, as explained in Box 3.2.

Figure 6.2 shows a framework of characteristics of transformational impact. There are two types of impacts: outcomes and processes. Within each type there are categories; within each category, there are characteristics. Together, the outcome and process impacts are used to determine the extent to which a policy is transformational within a given system. In later chapters, all policies are assessed against the framework of characteristics of transformational impact.

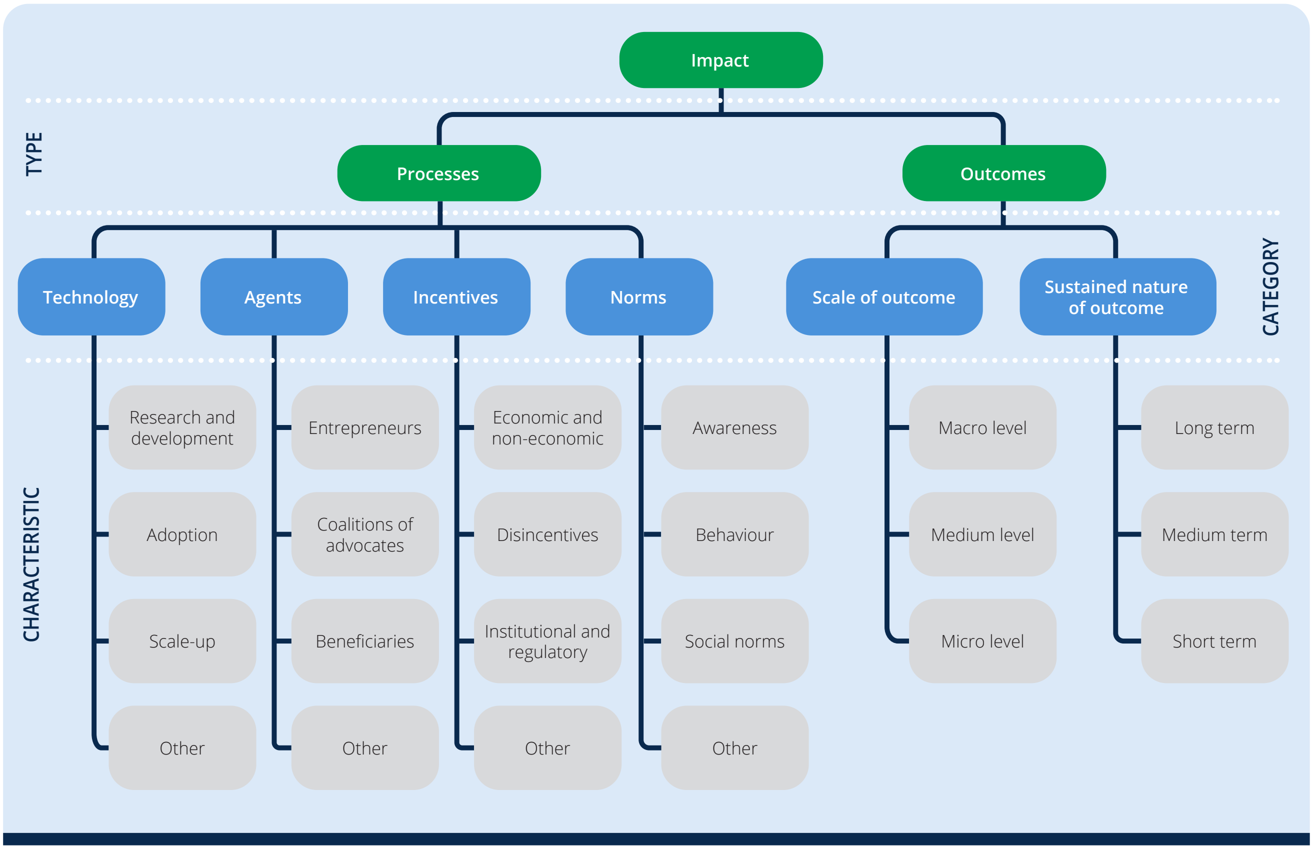
6.1.1 Outcome characteristics

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

The scale of outcomes is a combination of the magnitude (size) of impacts and how widespread they are. Making a policy more transformational involves enhancing the ambition of the policy from small-scale to large-scale outcomes, as well as affecting a greater population. Although the

FIGURE **6.2**

Characteristics of transformational impact



focus is on large-scale changes, it is important to note that many multi-level small-scale changes can collectively lead to large-scale changes, and a single small-scale change can trigger a large-scale change over time. What constitutes “large” depends on the context, including the role and share of the economy or sector that the policy contributes towards for alignment with global goals. For example, even though large emissions reductions at a sectoral level can be considerably smaller than what would be considered large at a national level, the level of reduction may be transformational for the chosen sector.

To assess the magnitude of impacts, users can refer to the ICAT GHG methodology documents (for assessing GHG impacts) and the ICAT *Sustainable Development Methodology* (for assessing the magnitude of 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 methodology on quantifying impacts).

This methodology acknowledges that several policies may contribute to system-level changes. For example, land-use policies relating to agricultural productivity and sustainability, or to strengthening indigenous land rights, may reduce pressure on forests and bring down deforestation rates. This may contribute to GHG reductions from the land sector and sustained land-use transition. Similarly, “just transition” and social protection policies to safeguard workers and communities are critical for sustaining transformation and ensuring smoother transition away from carbon-intensive technologies. However, these policies may not directly lead to quantifiable GHG impacts. Users should use their understanding of how the policy impacts various process characteristics (discussed below) and contributes to GHG impacts at the system level, as well as other resources (e.g. experts, literature and studies on related issues, stakeholder consultations), to inform and supplement their assumptions as they quantify GHG impacts. Proper documentation of assumptions and the underlying rationale, as well as limitations and uncertainties, will improve the credibility of the final assessment. Where applicable, users are encouraged to consult sector-specific resources (e.g. the ICAT GHG methodology documents, the *Policy and Action Standard*) for quantifying GHG impacts of policies.

Furthermore, policies may have negative as well as positive impacts on sustainable development and climate mitigation. Negative impacts may include loss of employment, transfer of jobs from one sector or subsector to another, reduced production in different sectors and loss of income, especially for fossil fuel–dependent economies such as coal and oil producers. The ICAT *Sustainable Development Methodology* helps users to assess synergies and trade-offs between multiple sustainable development impacts. Understanding and managing the negative impacts, and striking a balance across all kinds of impacts are crucial for achieving a just and sustained transformational change. The scale of transformational outcomes is assessed for climate and sustainable development through separate assessments. GHG emissions reductions are recognized as a priority to achieve a zero-carbon society.

The sustained nature of the outcomes of a policy refers to the durable nature of the effects of the policy. Making a policy transformational involves expanding support for the policy over time and preventing the removal or weakening of its transformational impacts. This helps to lock in the change and makes reversal more difficult.

Table 6.1 provides an overview of outcome characteristics. The magnitude of change at various levels of a system helps to show the scale of the outcome, while the period over which it can be sustained conveys how well entrenched the change is. These are assessed together to capture the desired ambition of the policy in the part of society targeted for change, aligned with the normative direction of change towards achievement of global goals. For example, increasing the share of natural gas in a country’s energy system may produce large emissions reductions over a long time frame, and may be mistakenly considered transformational when viewed in isolation. However, increasing the natural gas share does not disrupt established high-carbon practices in the long term, although it may lead to the decline of coal. Further, it does not avoid carbon lock-in, nor does it contribute to a zero-carbon society in line with the global goals.

It should be noted that the different levels described in Table 6.1 are absolute, to enable comparison of transformational impact assessments across different contexts, if this is desired. For example, the Nitric Acid Climate Action Group initiative targets more than 500 fertilizer plants (medium level – each plant is assessed in a national context) globally (macro level – the aggregated impact of all plants is likely to have a global impact) to abate nitrous oxide (N_2O) emissions from the sector (transformational impacts are possible at both macro and medium levels).

TABLE **6.1**

Outcome categories and characteristics of transformational change

Category	Characteristics	Description
Scale of outcome	Macro level	GHG outcome is large in magnitude at international/global level. Sustainable development outcome is net positive in magnitude at international/global level.
	Medium level	GHG outcome is large in magnitude at national or sectoral levels. Sustainable development outcome is net positive in magnitude at national or sectoral levels.
	Micro level	GHG outcome is large in magnitude at subnational, subsector, city or local levels. Sustainable development outcome is net positive in magnitude at subnational, subsector, city or local levels.
Time frame over which outcome is sustained	Long term	GHG outcome is achieved and sustained for ≥15 years from the starting situation. Sustainable development outcome is achieved and sustained for ≥15 years from the starting situation.
	Medium term	GHG outcome is achieved and sustained for ≥5 years and <15 years from the starting situation. Sustainable development outcome is achieved and sustained for ≥5 years and <15 years from the starting situation.
	Short term	GHG outcome is achieved and sustained for <5 years from the starting situation. Sustainable development outcome is achieved and sustained for <5 years from the starting situation.

6.1.2 Process characteristics

Process characteristics describe how a policy can drive changes in systems that enable achievement of transformational impacts. These can be understood as intermediate steps or means to realize transformational outcomes. For example, a combination of regulatory processes, financial incentives, research and development coalitions, entrepreneurs and incubators likely need to work in concert to enhance adoption and diffusion of disruptive, clean technologies to cause systemic shifts in society. The methodology brings these underlying drivers of system change together in the form of process characteristics that are organized into four categories (in no particular order of importance): technology, agents of change, incentives and norms. In Section 6.5, users will choose process characteristics relevant to their assessment.

Table 6.2 provides an overview of transformational process characteristics. The categories can be interpreted broadly with accompanying rationale and justification. For instance, for the transport sector, issues involving (re)design of urban spaces (e.g. compact cities, multi-use spaces, walkable/bikeable design) can be captured under “technology” because this category refers to technologies, practices, techniques, skills, processes and methods. Similarly, sustainable agriculture practices and methods to enhance agricultural productivity can also be considered in this category. Users can also add “Other” characteristics to each category if the policy triggers changes society that are not captured in this table (as shown in Figure 6.2).

TABLE **6.2**

Process categories and characteristics of transformational change of systems

Category	Characteristics	Description
Technology (technologies, practices, techniques, skills, processes and methods)	**Research and development (R&D):** Policy supports R&D for building technological capabilities favouring a low-carbon economy.	Technological research and development happens through support of science, innovation, specialization 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 leads to early adoption of promising low-carbon technologies.	Technology adoption can be facilitated by pilot projects, demonstrations, experimentation, and 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 new solutions. It can be understood as the initial phase when an entity first gains knowledge of, develops an understanding or opinion about, experiments with or rejects an innovation.
	Scale-up: Policy 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 application of innovative ways to conduct business and deliver products and services at a larger, more widespread scale.
Agents of change	**Entrepreneurs:** Policy 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 key agents of change that the policy can support to drive change. Entrepreneurship can be supported by providing an enabling environment to use initiative and take risks, and by facilitating exchange of information and ideas.
	Coalitions of advocates: Policy supports coalitions and networks that seek to broaden and deepen support for low-carbon development.	The agency of a wide range of stakeholders, including those that can provide checks and balances on those representing entrenched interests, can be exercised through political mobilization, coalitions, lobbying strategies and engagement in advocacy. New networks of various types of actors (e.g. labour and environmental movements, private–public actors, political and civil society organizations) may come together because of the way the policy was designed.
	Beneficiaries: Policy supports diverse groups of society affected by the transformational change, which subsequently support the policy.	Beneficiaries include those who benefit directly from the policy (e.g. solar producers) and those who are compensated if the policy has adverse effects (e.g. workers employed in the coal industry who lose their jobs). Beneficiaries can serve as agents of change, and play a role in ensuring that the policy is durable and strengthened over time.

TABLE **6.2,** continued

Process categories and characteristics of transformational change of systems

Category	Characteristics	Description
Incentives (incentives, institutions, regulations)	**Economic and non-economic:** Policy uses 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, value-added tax (VAT) exemption, import duty exemptions on new technology, and lowered land rates on renewable energy projects. Non-economic incentives include partnerships, transitional support to communities affected by phase-out of emissions-intensive activities (e.g. alternative employment, training), giving ownership to local initiatives and communities, long-term institutional and governance support, political power and support for transition, signing memoranda of understanding, and removing bureaucratic procedures.
	Disincentives: Policy de-incentivizes technologies and businesses contributing to a high-carbon economy.	Disincentives include taxes on carbon-intensive products, use of market-based instruments such as import duties, tariff structures that discourage investments in business-as-usual technologies, reduction or phase-out of fossil fuel subsidies, and increased or new fossil fuel taxes.
	Institutional and regulatory: Policy creates or reconfigures existing conditions, including availability of finance for implementation, and puts in place regulation and institutions favouring low-carbon development.	The policy leads to fertile ground for further institutional or regulatory change by the government. For example, a climate policy may lead to the creation of formal and informal institutions, or new regulations over time, or may create a steady budgetary allocation for policy implementation. The policy may also lead to development of intragovernmental processes for horizontal integration (e.g. interministerial coordination bodies) or multi-scale governmental processes facilitating vertical integration (e.g. national–state–local coordination entities).
Norms	**Awareness:** Policy supports awareness-raising and education for sustainability transition.	This includes raising awareness to increase support for low-carbon solutions to effect a change in norms and behaviour among diverse groups of stakeholders. Examples include awareness campaigns and sensitization of policymakers and consumers (e.g. to inform policymakers about falling prices of renewable energy technologies, to enable consumers to easily identify more efficient appliances through labelling programmes), addressing barriers to adopting new behaviours, disseminating information at various levels of governance, and using local organizations and media to spread information.
	Behaviour: Policy supports measures that discourage high-carbon lifestyle and practices, and promote low-carbon solutions.	Measures focused on influencing consumer behaviour include peak energy savings, credit provided by utilities, cash incentives for using alternative transport modes, congestion charges for driving in certain areas during busy hours, and rewarding recycling or use of public transport.
	Social norms: Policy 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. The policy contributes to a low-carbon lifestyle becoming the prevalent societal norm, which reflects broad and deeply entrenched support within society. Such impacts may change how natural resources are valued, encourage willingness to pay for pollution, or influence social norms relating to household energy consumption or sustainable behaviour in general.

Appendix A provides examples of indicators for process and outcome characteristics, largely applying to the energy sector, for a more detailed qualitative and quantitative description of characteristics.

Process characteristics help with understanding changes occurring beyond the policy level and are applicable to policies in any sector. The methodology asks users to consider these policies within a broader context (Sections 6.2–6.4) and investigate whether they have an impact at a system level (e.g. energy system, transport system). This is done by identifying the impacts of policies on process characteristics that are considered relevant for transformational change (Section 6.5). Users are encouraged to think beyond the direct policy impacts and look for likely pathways of change in individual process characteristics that the policy could trigger. Changes in process characteristics – the drivers of transformational change – represent changes at a system level. For example, "just transition" policies focused on economic revitalization, worker (re)training, social protection for affected communities, and so on, may not directly target technology scale-up. Traditionally, monitoring of such policies will not include indicators related to scale-up. But, when assessing such policies for their transformational impacts, if technological scale-up is identified as relevant for transformational change in a given context, the system-oriented approach described here challenges users to unpack how their "just transition" policy may contribute to scale-up. If there is no such impact, this approach provides an opportunity to modify the policy design so that it can contribute to transformational change.

This is not meant to be an exact mathematical, highly quantitative methodology. Instead, it should be seen as a thought exercise to challenge policymakers to design policies that help realize a transformational vision.

6.2 Identify the phase of transformation

Comprehensively assessing the phase of transformation of the economy in which the policy is operating is a critical step in understanding whether the policy is well suited to overcoming barriers and driving transformational change. The phase of transformation refers to the economic, social, institutional and political context in which the policy is being planned or implemented. This contextual understanding is important, to enable users to choose and assess process and outcome characteristics in subsequent steps. Different components of the system can be at different stages of transformation towards zero-carbon development. For example, although low-carbon regulation may be in place, institutional capacity to implement it may be lacking; although low-carbon technological solutions may exist, consumer demand to scale up these solutions may be too weak.

Figure 6.3 shows a framework for assessing and visualizing the current status of a system that is on a pathway of transformation towards zero-carbon and sustainable development. It helps answer the question "Where are we today and where are we heading?"

A system undergoing transformation to zero-carbon and sustainable development can be described as being in any of the following four phases.

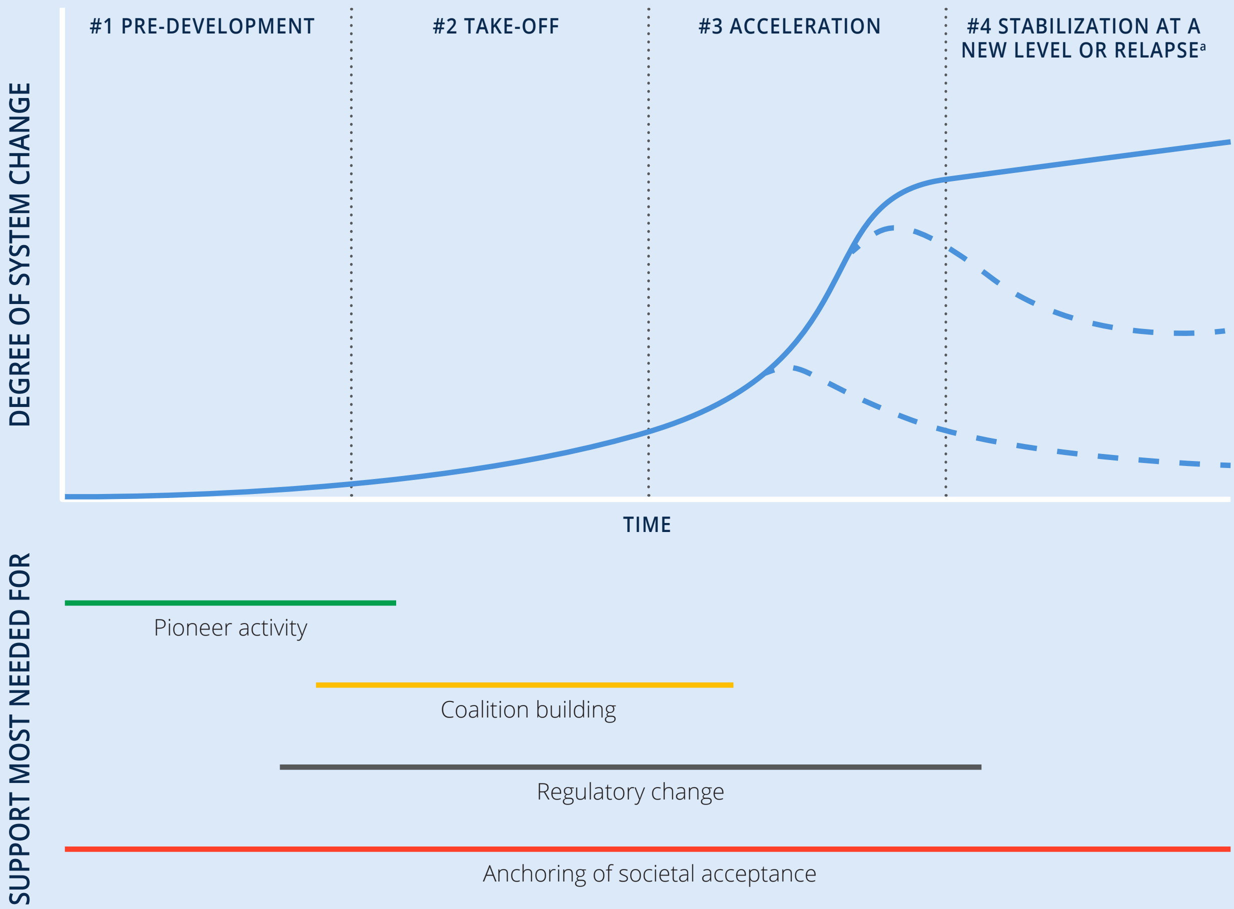
Pre-development
The pre-development phase could be described as the comfort zone phase. This is characterized, on the one hand, by visible and increasing pressure on government, and policies to make moves towards low-carbon and sustainable development. Often, such pressure is generated externally and/or from local civil society. On the other hand, the pre-development stage is also characterized by stability and the 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 characterized by observable moves to change 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 relating to unsustainable development and concrete attempts to devise possible solutions. Experimentation, innovation and alternatives are expanding and gaining momentum. However, there is still no consensus or common understanding about suitable solutions. Lobbying against the new and alternative solutions remains strong, fuelled by current regime elites who benefit from the existing 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 that profit from the high-carbon status quo, change is accelerating towards visible and concrete transformative low-carbon solutions for society and the economy.

FIGURE **6.3**

Phases of transformation



Source: Mersmann et al. (2014a), adapted from Rotmans et al. (2001).

[a] Dotted lines represent alternative scenarios of relapse.

Stabilization or relapse

In the stabilization phase, the system is fully transformed, and the new pathways are embraced broadly in society and the economy. Consequently, the rhythm and speed of change decrease significantly, 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 maintain momentum.

It is a *key recommendation* to identify the phase of transformation to understand the context in which the policy is being planned or implemented. This can help users to understand the starting situation, the main barriers to transformation and the context for the vision statement. Figure 6.4 can be used to identify the phase of the system at the starting situation. Box 6.1 illustrates various phases of transformation in a society, using a case study of how wind power development in Denmark has transformed the electricity production system.

FIGURE **6.4**

Criteria to identify the phase of transformation for a system

Pre-development

- Existence of pressure coming from local civil society or other actors
- Little or no questioning or challenging of existing paradigms; lack of open debate, and general level of awareness and mobilization is weak or low
- Visible signs of unsustainable development, but lack of or low collective awareness or action to embrace new pathways
- Solutions proposed to solve social and economic problems continue to follow predominant paradigms

Take-off

- Significant increase of pressure for new solutions and change
- Innovations and new paradigms are integrated and promoted (i.e. experiments gain importance and become widespread and visible)
- There is general optimism that new solutions and pathways are feasible and realistic
- Disagreement exists among parties on which options are the most suitable to address the problems
- Open competition for innovation is not yet promoted
- Business models that favour low-carbon pathways are not yet predominant
- Strong resistance from those benefiting from the existing paradigms is common

Acceleration

- Innovations and new solutions openly challenge and start pushing away established paradigms
- Innovations and new solutions are widely accepted and spreading
- The speed of change has increased significantly and is accelerating; existing paradigms are feeling the pressure to embrace innovation and new pathways or run the risk of being outpaced and pushed aside
- Systemic changes are happening, with visible interconnected dynamics between technological, economic, institutional and social changes

Stabilization or relapse

- Nearly all barriers to innovation and transformational change have been overcome
- New pathways and models may now have been widely adopted and accepted, and may have become the new model or dominant state
- The rate and magnitude of change and innovation have stabilized, resulting from the adoption and integration of new social and economic norms
- There may no longer be a visible risk of relapsing back to the old state of unsustainability and remaining locked into a high-carbon development model

BOX **6.1**

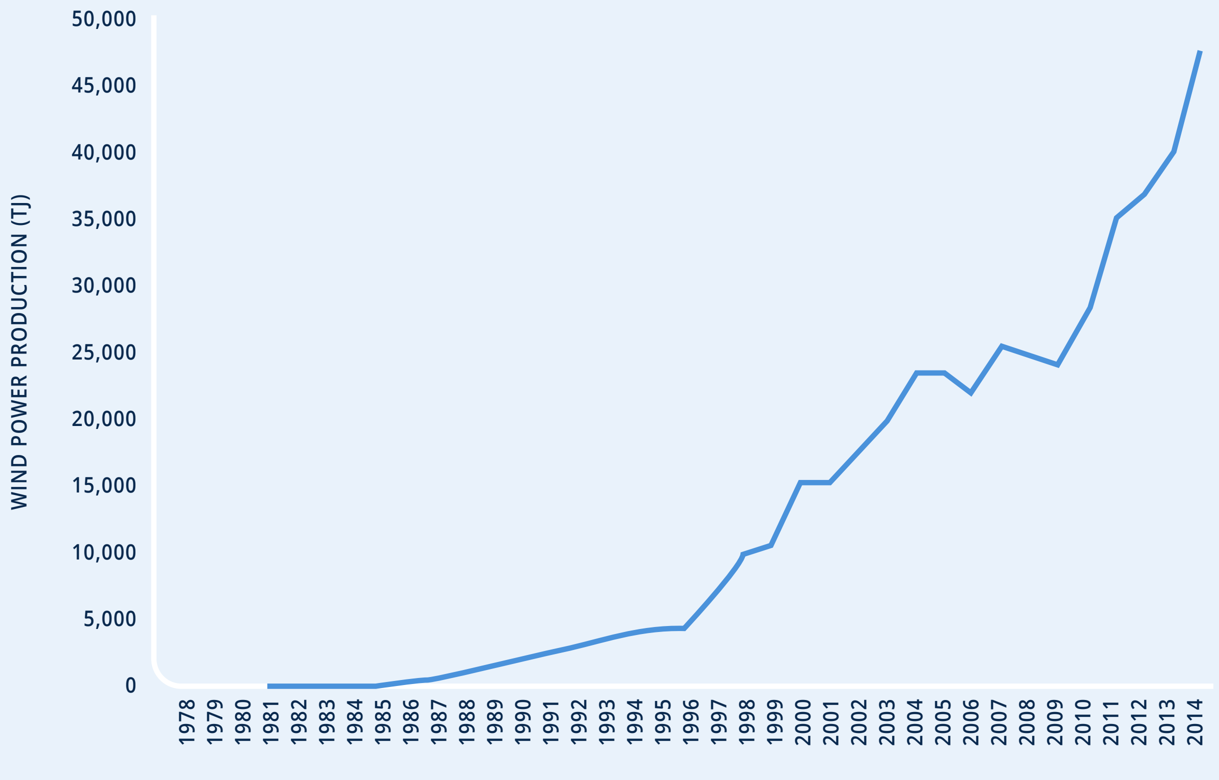
Wind power development in Denmark

The story of the Danish transformation of the electricity production system begins in the pre-development phase. A pioneer schoolteacher and meteorologist, Poul la Cour, built the first electricity-producing windmill in 1891. Before this, windmills in Denmark had been used to grind flour and pump water. For many decades, the political and economic interest in electricity production from windmills remained low, mainly driven by pioneer and research activities.

In the 1970s, the global oil crisis was felt. Denmark's dependency on oil-producing countries, fluctuations in oil prices and growing environmental awareness resulted in an increased interest in wind power development. Nuclear energy and renewable energy were widely debated as two alternative energy sources. An opposition movement to nuclear power grew strong, informing Danes about the risks of accidents, nuclear waste and misuse of nuclear fuel in conflict situations. With this backdrop, societal support for wind power development grew in the take-off phase (see Figure 6.5).

FIGURE **6.5**

Rise of wind power in Denmark



The acceleration phase for wind power development in Denmark started in the 1990s and is ongoing. Broad societal acceptance and favourable political interest, followed by legal interventions and economic subsidies, characterize the acceleration phase. The share of electricity generated from wind was almost 50% of the total electricity generated in Denmark in 2018.[16] Increasingly, wind power in Denmark is replacing fossil fuel–based electricity production.

The stabilization phase is expected to be achieved by 2050 when the Danish electricity production system is projected to become zero carbon.

Source: Pedersen (2015).

[16] REN21 (2019).

6.3 Describe the vision for transformational change of the policy

Transformational change can occur 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 can contribute to transformational change by reconfiguring high-carbon and unsustainable structures in society through intervention(s) at one or several interacting societal levels.

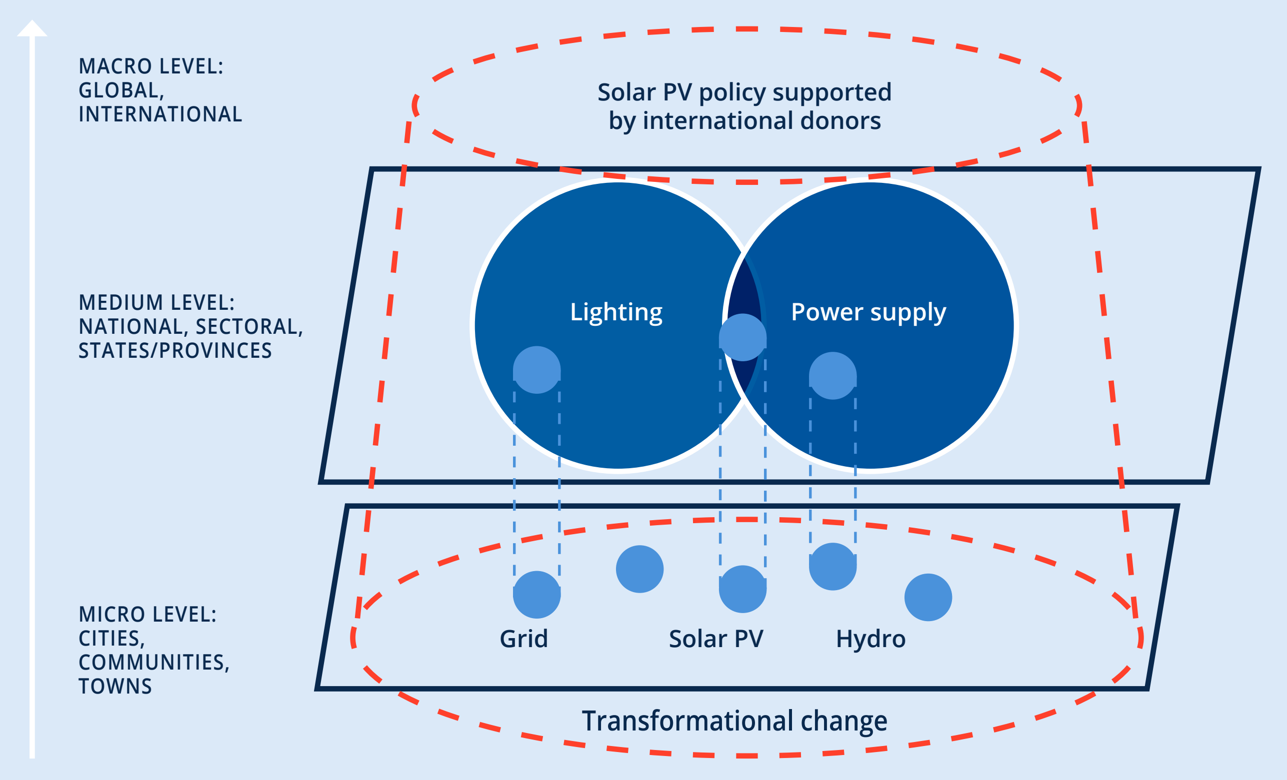
Figure 6.6 illustrates how the hypothetical solar PV policy contributes to changes at multiple levels. The policy, which is supported by international donors (macro level), is envisaged to create change in national policies for lighting and power supply (medium level), and in towns and local areas (micro level) by promoting solar PV systems and grid connection.

It is a *key recommendation* to describe the transformational vision of the policy, through consultation with key stakeholders. To identify how a policy seeks to change society towards zero-carbon and sustainable practices, it is useful to describe the vision for transformational change over time. Users are encouraged to describe the vision for transformation as moving from where the system is currently (i.e. the existing phase of transformation, as identified above) to where it should be to achieve the transformational shift desired. Table 6.3 provides a template for describing the vision for transformational change. Box 6.2 provides an example from Costa Rica of describing a vision for transformational change.

The description of a vision for transformational change helps to understand the ambition of a policy for contributing to zero-carbon and sustainable development goals. Scale and time aspects are defining characteristics of transformational change.

FIGURE **6.6**

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



Source: Adapted from Geels (2004); Bodoo and Olsen (2017).

In practice, however, transformational change cannot be determined a priori or in hindsight within a short period, if the ongoing changes are truly transformational in terms of being "locked in", sustained and resulting in large-scale impacts. Monitoring of indicators (Chapter 10) helps to assess whether the transformational change process and outcomes are on track towards the vision. The description of a vision for transformational change can help guide the selection of the assessment boundary and assessment period in Section 5.3.

Involving an inclusive network of key stakeholders (e.g. 10–15 people) from all spheres of society – including both those investing in a low-carbon future and those interested in maintaining the status quo – is useful to develop the vision and obtain 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, advisers and opinion leaders. Refer to the ICAT *Stakeholder Participation Guide* for more information on identifying and understanding stakeholders (Chapter 5), and establishing multi-stakeholder bodies (Chapter 6).

TABLE **6.3**

Description of the transformational change vision

Vision for desired societal, environmental and technical change	Example (solar PV policy)
Long term (≥15 years): Describe the long-term vision for transformational change – social, environmental and technological – including actions to be taken and impacts to be achieved in the future. Describe the vision for desired changes at different levels that are applicable in a given context – such as global, national, sectoral, provincial, cities and communities. A vision statement is not limited to what is promised by the policy. Rather, it describes the future, desired context to which the policy contributes.	Contributing to the global vision of zero-carbon and sustainable development, the desired future change is to achieve zero-carbon electricity production. The 2050 vision is to achieve 60% solar PV in the national electricity mix and create 2 million new green jobs. The policy, however, does not result in a significant change at the global level.
Medium term (≥5 years and <15 years): Describe the medium-term vision for transformational change, including actions to be taken and impacts to be achieved beyond the current planning cycle. Describe the vision for desired changes at different levels in terms of the development of coalitions, agendas and pathways that are planned to achieve the transformational vision.	The mid-term vision by 2030 is to achieve 30% solar PV in the national electricity mix and create 1 million new green jobs. In addition, the policy has set the following goals at the national/sectoral level: • annual emissions reductions of 20 million tCO_2e • 200,000 new green jobs (e.g. in solar PV installation and maintenance sectors).
Short term (<5 years): Describe the short-term vision for transformational change, including actions to be taken and impacts to be achieved immediately within the current planning cycle. Describe the vision for desired changes at different levels, and discuss how actors, political support and investments are mobilized to implement policies and actions for achieving transformation.	The short-term vision by 2022 is to install 20 GW of rooftop solar PV and create 200,000 new green jobs in doing so. 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.

BOX **6.2**

Guiding questions and example to describe a vision for transformational change

The guiding questions are informed by the Transition Management (TM) approach,[17] which views transformation as a multi-level, phased process of structural change in society. Transformational change towards a shared vision is manageable through four governance activities; strategic, tactical, operational and reflexive. Transformational change cannot be steered and controlled by a single actor or intervention. Rather, processes of change can be managed through networks of actors, coordination of actions, participatory processes of co-design and implementation, learning from experience, and iterative adjustments of the vision and the means to achieve it.

Guiding questions	Costa Rica example
Strategic governance: What is the long-term (≥15 years) vision for social, environmental and technological change?	Costa Rica has adopted a national Decarbonisation Plan to achieve a net zero carbon emissions economy by 2050, in line with the objectives of the Paris Agreement. Ten focus areas have been identified to achieve decarbonization. For each focus area, a transformational vision is stated. For example, by 2050, electric power will be a primary source of energy for transport, and for residential, commercial and industrial services, among others (Focus Area 4 of the national Decarbonisation Plan).
Tactical governance: What structures, institutions, behaviour and values need to change over a mid-term period (≥5 years and <15 years) to achieve the overall vision?	By 2030, the electrical grid is capable of operating at 100% with renewable energies (Focus Area 4). To track progress of NDC implementation to achieve the mid-term and long-term milestones in all focus areas in the context of national sustainable development goals, Costa Rica has set up a National Metrics System of Climate Change (SINAMECC). Assessment of sustainable development impacts of climate policies helps to identify benefits and negative effects, to promote synergies and minimize trade-offs under the Decarbonisation Plan.
Operational governance: Which actions and projects within the short term (<5 years) enable the desired change?	ICAT supports Costa Rica to develop SINAMECC in implementing the ambitious climate targets in a transparent and evidence-based manner. Costa Rica is using the ICAT *Sustainable Development Methodology* and the ICAT *Transformational Change Methodology* to lay the foundation for policies that drive the transformation to a net zero carbon society and support national and global sustainable development goals.
Reflexive governance: Do the assessment results lead to new insights and knowledge to revise and adjust the vision for transformational change?	Results of the transformational impact assessment inform the design and implementation of NDC policies specific to each sector or subsector. Insights from the assessment on the processes and outcomes of change may lead to revised vision statements for sectors or subsectors.

Source: Informed by Loorbach (2010); Mersmann et al. (2014b); Government of Costa Rica (2018).

6.4 Identify barriers to transformational change

Analysis of barriers is important for the assessment of transformational change. If different types of barriers are not taken into account, the policy could be less effective than envisaged. Users who consider all relevant barriers to the policy are better prepared to overcome resistance and make use of opportunities that arise. An understanding of barriers helps with choosing relevant process characteristics in Section 6.5. It is a *key recommendation* to identify barriers to

[17] Loorbach (2010).

transformational change specific to the phase of transformation of the economy in which the policy is operating.

A barrier adversely affects the achievement of a target.[18] It is an obstacle to reaching the full mitigation potential of a system, which can be overcome by designing and enacting measures to prevent the undesired effect.[19] Barriers can either hinder desired effects or lead to undesired effects. The removal of barriers can itself be a mitigation measure (e.g. removal of fossil fuel subsidies).

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 Guide* (Chapter 8).

Barriers can be categorized in different ways. Categorization can help to ensure that all relevant issues are covered by the analysis. Barriers include:

- **political barriers** – opposition to change due to ideological, financial or other interests; lack of commitment to find solutions to the challenges of climate change; power struggles between the losers and winners of transformational change

- **institutional and regulatory barriers** – prevalence of institutions and laws that help maintain the status quo; resistance to new institutional arrangements and regulations; lack of risk cover instruments; existence of incentives that favour carbon-intensive modes of production; non-existent, unclear, complicated or conflicting policies and regulations (e.g. permitting procedures that are lengthy and expensive); overlapping responsibilities across multiple institutions; lack of coordination between national and subnational agencies

- **social barriers** – lack of awareness of low-carbon options, benefits and opportunities; reluctance to accept the introduction of low-carbon technologies, especially when replacing conventional technologies; lack of demand for low-carbon options; lack of social acceptance and trust in equitable distribution of benefits from mitigation projects; lack of local empowerment to make decisions that favour a low-carbon economy

- **technology barriers** – dependence on import of low-carbon technologies; lack of domestic production facilities or insistence on domestic sourcing of technology; low quality of available technology; lack of availability of equipment for production and maintenance

- **capacity constraints** – lack of trained personnel for production, installation and maintenance of low-carbon technologies, policies and practices; 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; absence of, or insufficiently resourced, institutions (e.g. for regulation, data collection or enforcement)

- **financial and investment constraints** – lack of financing and investment availability, or high cost for financing low-carbon technologies; locked-in investment in high-carbon technologies and practices; lack of risk cover instruments; existence of counterproductive subsidies or import regulation.

Users should describe the barriers relevant to the policy, considering the six categories above, and identify the characteristics affected. A single barrier may impact several characteristics, and a single characteristic may be affected by several barriers. Table 6.4 provides an example of identifying barriers for the hypothetical solar PV policy.

6.5 Choose transformational change characteristics to be assessed

This section explains how to choose transformational change characteristics to be assessed in greater detail in subsequent steps. It also explains how to describe process and outcome characteristics specifically for the policy.

The relevance of process characteristics is determined based on the objectives of the assessment, national circumstances, the phase of transformation, barriers and stakeholder priorities. It is a *key recommendation* to choose characteristics to be assessed based on their relevance to transformational change in the context of the policy and the society in which it is implemented. It is also

[18] Nygaard and Hansen (2015).

[19] Halsnæs et al. (2007).

TABLE **6.4**

Template for describing identified barriers and affected characteristics (using hypothetical solar PV policy example)

Barrier	Explanation	Characteristics affected	Barrier directly targeted by the policy
Lack of popular support and political will to promote a transition	Vested interests in existing coal- and oil-dependent production actively resist climate policies and regulations. The scale of subsidies to fossil fuels is greater than those to renewables, and political power is held by those with strong interests in maintaining current subsidy levels.	Economic and non-economic incentives	Yes
Lack of a strategy to discourage fossil fuel–based energy	Existing or foreseeable energy strategy dominantly envisages expansion of coal-fired generation capacity and only limited expansion of solar PV. A comprehensive strategy that integrates renewable resources is lacking.	Institutional and regulatory changes	No
Challenges related to grid interconnectivity	Grid integration and energy storage are among the biggest technical, institutional and economic challenges to scaling up rooftop solar PV in the country.	Scale-up	No
Lack of technical personnel for installation and maintenance	Lack of trained technicians for solar PV installation and maintenance slows down a potential scale-up of PV technology.	Scale-up	No
High upfront financial investment needed for solar PV	Lack of financial instruments to support customers in financing solar PV impedes the growth of private market and entrepreneurs in this field.	Entrepreneurs	Yes

a *key recommendation* to describe outcome and process characteristics relevant to the policy.

Characteristics are classified as "relevant", "possibly relevant" or "not relevant", as shown in Table 6.5.

For example, if the solar PV policy is implemented in a country where awareness of solar solutions is not a limiting factor to scaling up solar, the "awareness" characteristic can be considered not relevant in the assessment. However, where lack of awareness is one of the reasons for slow uptake of solar, this process characteristic should be considered relevant, irrespective of whether the policy is directed at improving awareness. Although all solar policies are not expected to address every aspect of the sector, a transformational policy is expected to consider how and when to influence relevant process characteristics to bring about systemic, lasting change. Further, the policy need not directly address all relevant process characteristics through various measures, but may envisage an indirect impact over time (e.g. subsidies lead to increased penetration of solar technologies, which in turn enhances awareness). This broader interpretation of relevance ensures that changes relating to process characteristics that are critical for transformational change in the given context are regularly monitored.

Process characteristics classified as relevant and possibly relevant are assessed in subsequent steps.

Relevant process characteristics are identified by seeking a wide range of stakeholder opinions and

TABLE **6.5**

Determining the relevance of process characteristics

Relevance	Description
Relevant	Reason to believe that a characteristic is important for transformational change in the context of the policy.
Possibly relevant	Not clear whether the characteristic is important for transformational change in the context of the policy. Where the relevance is unknown or cannot be determined, the characteristic should be monitored over time.
Not relevant	Reason to believe that the characteristic is not important for transformational change in the context of the policy.

priorities. The ICAT *Stakeholder Participation Guide* (Chapter 8) provides information on designing and conducting consultations.

The relevance of process characteristics can vary over time, as a result of changes in underlying conditions and circumstances. Users may find that process characteristics described as possibly relevant or not relevant become relevant over time, or that some process characteristics become no longer relevant. Therefore, users are encouraged to revisit the relevance of process characteristics regularly during the monitoring phase. This involves revisiting Table 6.6 and updating it at regular intervals, as per the monitoring plan described in Chapter 10. Users can also choose to monitor process characteristics classified as not relevant in less detail. Expert judgment, literature review, proxy data or stakeholder inputs can be used to identify any changes in these characteristics.

Users should describe all characteristics of outcomes and processes relevant to the policy. It is important to clearly describe characteristics in such a way that they are mutually exclusive and collectively comprehensive, while recognizing that they 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 6.6 provides a template to describe which process characteristics are selected as relevant or possibly relevant for detailed analysis in subsequent steps of the impact assessment, and to justify the choice. For completeness, transparency and reflection on ambition, users should provide rationale and justification for the choice of process characteristics included in, or excluded from, the assessment. In justifying their choice, users can describe the existing context and prevailing hindering factors that make a characteristic relevant or not relevant.

Table 6.7 provides a template to describe outcome characteristics. Users should describe outcome characteristics for GHG and selected sustainable development impacts separately, so that they can assess each individually.

Users should include all relevant transformational impacts in the assessment boundary and the assessment period. Outcome or process characteristics referring to levels or time periods that are outside the assessment boundary or period should not be included. However, to ensure a comprehensive approach to the assessment of all transformational impacts relevant to the policy, users should revisit and update the definition of the assessment boundaries in Section 5.3, as needed.

TABLE **6.6**

Template for choosing process characteristics relevant to a policy (using solar PV policy example)

Category	Process characteristic	Characteristic (specific to policy)	Relevant/possibly relevant/not relevant, and justification
Technology	Research and development (R&D)	The policy leads to increased R&D investment in the country that would enhance the uptake of solar power.	Relevant R&D efforts are needed for developing cost-effective energy storage options and to achieve better grid interconnectivity that will support more solar PV in the distribution system.
	Adoption	The policy leads to early adoption of solar grid rooftop among residential, commercial, industrial, institutional and other consumers.	Relevant Adoption rate for solar grid rooftop is quite low across the country and needs targeted interventions. High capital cost of rooftop systems and longer payback periods have discouraged their widespread adoption by small consumers in various sectors.
	Scale-up	The policy leads to large-scale deployment of rooftop solar PV installations as new business models emerge for service and delivery to capitalize on the policy incentives and preferential tariff.	Relevant Rooftop solar 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 solar PV (e.g. lack of modern flexible grids that can absorb solar power, need for a range of cost-effective storage options given the intermittent nature of solar power, lack of grid parity, lack of highly skilled workforce, high upfront cost).
Agents of change	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 in the country. There is acknowledgement that the 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.
	Coalitions of advocates	The policy indirectly provides a fertile ground for coalitions and networks of stakeholders to engage in the common goal of increased solar uptake.	Possibly relevant It is not clear whether this is an important constituency to catalyse transformational change in solar PV in the country. Business associations and think tanks are active in convening stakeholders and policymakers, and providing a forum to discuss issues relating to renewable energy.
	Beneficiaries	No description necessary, since this characteristic is not relevant.	Not relevant The political context in the country, with constraints on civil society organizations, makes beneficiaries an ineffective group that is not seen to play a role in scale-up. Formation of organizations such as advocacy groups, users' associations and lobbying groups is not encouraged.

TABLE **6.6,** continued

Template for choosing process characteristics relevant to a policy (using solar PV policy example)

Category	Process characteristic	Characteristic (specific to policy)	Relevant/possibly relevant/not relevant, and justification
Incentives	Economic and non-economic	The policy uses financial incentives to catalyse growth in the solar sector.	Relevant Financial subsidy and feed-in tariff are key ways to increase technology penetration and promote grid-connected rooftop solar uptake. Incentives for integrating energy storage into the distribution grid can further encourage diffusion of solar. 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, biomass).
	Disincentives	The policy does not employ disincentives for carbon-intensive energy generation.	Possibly relevant The assessment is limited to the solar PV sector. It is not clear whether disincentives applied to fossil fuels will be strong enough to cause any impact in the solar PV sector.
	Institutional and regulatory	The policy leads to the formation of new agencies, institutions and regulations at subnational level.	Relevant Development of new agencies is needed at the subnational level to promote solar in states. Although there is a dedicated agency at the national level to promote renewable energy, there is no counterpart in states. A robust regulatory and institutional set-up to design and implement measures, enhance coordination and build capacity at all levels does not exist yet.
Norms	Awareness	No description necessary, since this characteristic is not relevant.	Not relevant There is a high level of awareness in the country, and this is not considered a hindering factor.
	Behaviour	The solar PV policy affects the behaviour of consumers to opt for solar PV.	Relevant Awareness has not led to change in behaviour, possibly because of factors relating to financing and upfront costs. This is an area that needs more attention.
	Social norms	The solar PV policy may have an influence on societal attitudes in favour of rooftop solar PV technologies.	Possibly relevant Societal norms favour less carbon-intensive lifestyles in general, and it is not clear whether norms are holding back solar PV. There is a greater push for green, clean living in urban centres as pollution increases and environmental resources are depleted.

TABLE **6.7**

Template for describing outcome characteristics for a policy (using solar PV policy example)

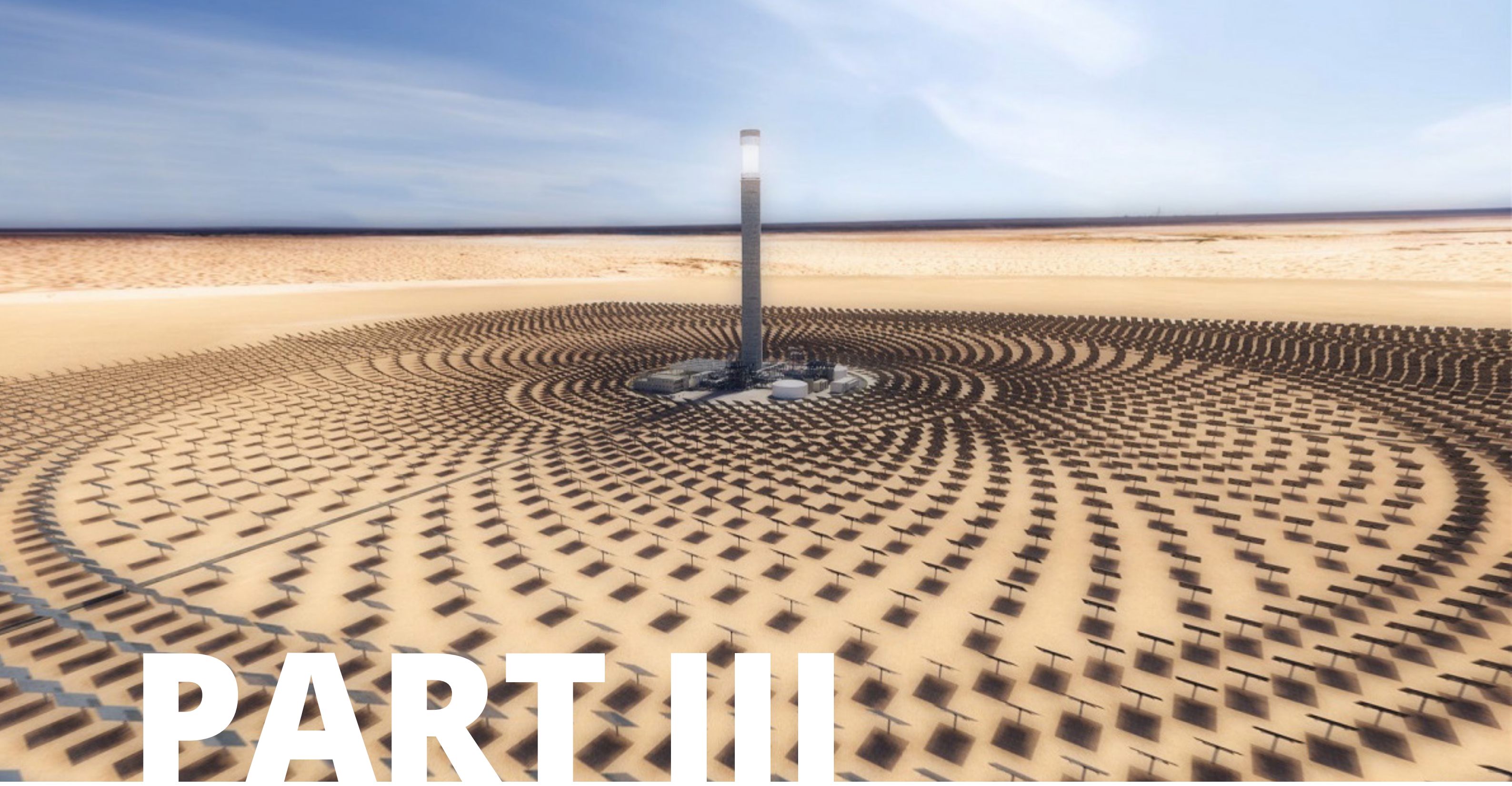
Category[a]	Outcome characteristic	Description (specific to policy, including status at beginning of assessment period)
Scale of outcome – GHGs	Macro level: GHG outcome is large in magnitude at international/global level.	This level is outside the assessment boundary. No description necessary.
	Medium level: GHG outcome is large in magnitude at national or sectoral levels.	The policy has set a goal of annual emissions reductions of 20 million tCO_2e nationally. The 2030 vision is to reduce emissions by 40 million tCO_2e annually. Solar PV has a 5% share in the national electricity mix in 2015.
	Micro level: GHG outcome is 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 two northern rural provinces of the country, solar PV contributes 20% of the electricity mix in 2015.
Scale of outcome – sustainable development	Macro level: Sustainable development outcome is net positive in magnitude at international/global level.	This level is outside the assessment boundary. No description necessary.
	Medium level: Sustainable development outcome is net positive in magnitude at national or sectoral levels.	The solar PV policy aims to create 200,000 new green jobs in the sector (e.g. in solar PV installation and maintenance) by 2022 and up to 2 million new jobs by 2050. There are currently 10,000 jobs in the solar PV sector nationally.
	Micro level: Sustainable development outcome is net positive in magnitude at subnational, subsector, city or local levels.	In rural districts and towns, new jobs are created through installation and operation of solar PV mini-grids. In the two northern provinces, there are about 600 jobs in the solar PV industry in each province.
Time frame over which outcome is sustained – GHGs	Long term: GHG outcome is achieved and sustained for ≥15 years from the starting situation.	The period is longer than the assessment period. No description necessary.
	Medium term: GHG outcome is achieved and sustained for ≥5 years and <15 years from the starting situation.	The solar PV policy aims to achieve its mid-term (2030) vision of 30% solar PV in the national electricity mix, and sustain the trend of a growing share of solar PV in the country. Currently, solar PV has a 5% share in the national electricity mix. It is a new policy, and insufficient time has passed to clearly show that the policy impacts are sustained.
	Short term: GHG outcome is achieved and sustained for <5 years from the starting situation.	The policy aims to install 20 GW of rooftop solar PV by 2022 and trigger increased emissions reductions over the assessment period. There are no clear indications so far that the policy impacts will be sustained.

TABLE **6.7,** continued

Template for describing outcome characteristics for a policy (using solar PV policy example)

Category[a]	Outcome characteristic	Description (specific to policy, including status at beginning of assessment period)
Time frame over which outcome is sustained – sustainable development	Long term: Sustainable development outcome is achieved and sustained for ≥15 years from the starting situation.	The period is longer than the assessment period. No description necessary.
	Medium term: Sustainable development outcome is achieved and sustained for ≥5 years and <15 years from the starting situation.	The solar PV policy aims to achieve its mid-term (2030) vision of 1 million new green jobs and sustain the trend of increasing jobs in the country. It is too early to see signs of sustained job growth.
	Short-term: Sustainable development outcome is achieved and sustained for <5 years from the starting situation.	The solar PV policy aims to achieve its short-term goal of 200,000 new green jobs in the solar PV installation and maintenance sectors. There is no evidence yet that the policy's impact on jobs is sustained, although jobs are expected to show an upward trend with a rise in the share of solar PV.

[a] Users should add new rows for assessing each impact category.



PART III

Impact assessment

7 Assessment of the starting situation

This chapter provides the methodology to assess the starting situation for transformational change. The starting situation describes the state of the system and the status of transformational change characteristics at the beginning of the assessment period. Assessment of the starting situation is useful to understand the extent to which a policy triggers a shift away from carbon-intensive and unsustainable pathways. The starting situation can refer to a historical year of reference in the case of ex-post assessment or the current year (or the most recent year for which data are available) in the case of ex-ante assessment.

Checklist of key recommendations

- Identify indicators to describe the starting situation of characteristics impacted by the policy and provide indicator values

7.1 Describe the starting situation of relevant characteristics

Knowledge of the starting situation – that is, the status of the system and relevant characteristics – helps with assessing change. It can provide useful insights into the existing barriers at the phase of transformation in which the policy operates. It is a *key recommendation* to identify indicators to describe the starting situation of characteristics impacted by the policy and provide indicator values.

The indicators for characteristics considered relevant or possibly relevant in Section 6.5 are identified in this step. 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 A.

Indicators are important to assess how the policy is leading to a system change that is fundamental, disruptive and sustained. To understand transformational impacts, in addition to indicators for policy monitoring, users should select indicators that provide insight into the magnitude and direction of broader system-level changes occurring over time, recognizing that a number of factors may be contributing to these changes. For instance, system-wide indicators can demonstrate whether an overall employment gain occurred after a policy was implemented, or whether jobs were transferred from one sector or subsector to another.

Users should consult stakeholders in selecting key indicators, and deciding when and how frequently to monitor them. Policies may directly impact only selected characteristics, although transformational policies would be expected to have an indirect impact on several relevant process characteristics. For example, a measure focused on influencing behaviour change towards products with a zero- or low-carbon footprint may indirectly trigger a technological change as a result of increased demand for such products. Users are encouraged to look beyond the expected impact to analyse

FIGURE **7.1**

Overview of steps in the chapter

Identify indicators to describe the starting situation (Section 7.1) → Provide values for indicators to describe the starting situation (Section 7.1) how policies may indirectly affect a wide range of relevant process characteristics. Some of these may be outside the immediate scope of the policy, and proxy indicators may be identified to monitor effects; for example, technology change can be observed in the number of scientific articles published and patent applications.

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 a policy.

The idea of scale can be captured both horizontally (e.g. innovation spreading across sectors, more people applying solar PV technology) and vertically (e.g. an incentive programme at city level being adopted at regional or national level). The same indicators used to assess the starting situation can be projected for ex-ante assessment and observed for ex-post assessment to assess transformational change. Further information 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. Tables 7.1 and 7.2 provide a template and an example (for the hypothetical solar PV policy) of using indicators to describe the starting situation of selected process and outcome characteristics. The indicators given here are illustrative and are not a comprehensive list for assessing the solar PV policy. Users' assessments will have many more indicators for monitoring impacts at the policy and system levels to signal systemic shifts over time. (Appendix A provides more examples of indicators that are particularly relevant to the energy sector.) These tables build on the information generated in the earlier step, which is shown in the grey columns. The tables will be further built on as users complete subsequent steps.

TABLE **7.1**

Template for describing the starting situation for selected process characteristics (using hypothetical solar PV example)

Category	Process characteristic	Description (specific to policy)	Indicator	Indicator value at starting situation (2015)[a]
Technology	Research and development (R&D)	Relevant R&D efforts are needed for developing cost-effective energy storage options and to achieve grid interconnectivity that will support more solar PV in the distribution system.	Amount of related public and private R&D investment in the country	$100,000
	Adoption	Relevant Adoption rate for solar grid rooftop is quite low across the country and needs targeted interventions. High capital cost of rooftop systems and longer payback periods have discouraged its widespread adoption by small consumers in various sectors.	Number of new demonstration projects for rooftop solar PV initiated	2

TABLE **7.1,** continued

Template for describing the starting situation for selected process characteristics (using hypothetical solar PV example)

Category	Process characteristic	Description (specific to policy)	Indicator	Indicator value at starting situation (2015)[a]
Technology, continued	Scale-up	Relevant Rooftop solar 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 solar PV (e.g. lack of modern flexible grids that can absorb solar power, need for a range of cost-effective storage options given the intermittent nature of solar power, lack of grid parity, lack of highly skilled workforce, high upfront cost).	Share of installed rooftop solar PV in the solar sector (nationwide or statewide)	5%
			Share of solar power (utility scale, rooftop, off-grid) in the electricity sector	8%
			Share of RE in the country as a percentage of electricity consumption	10%
Agents of change	Entrepreneurs	Relevant These are some of the most important change agents for the solar PV policy in the country. There is acknowledgement that the 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.	Volume of venture capital investments	$100 million
	Coalitions of advocates	Possibly relevant It is not clear whether this is an important constituency to catalyse transformational change in solar PV in the country. Business associations and think tanks are active in convening stakeholders and policymakers, and providing a forum to discuss issues relating to renewable energy.	Number of projects/research centres involving university–industry collaboration	1
	Beneficiaries	Not relevant The political context in the country, with constraints on civil society organizations, makes beneficiaries an ineffective group that plays no role in scale-up. Formation of organizations such as advocacy groups, users' associations and lobbying groups is not encouraged.	Users can choose to monitor indicators for "not relevant" characteristics.	-

TABLE **7.1,** continued

Template for describing the starting situation for selected process characteristics (using hypothetical solar PV example)

Category	Process characteristic	Description (specific to policy)	Indicator	Indicator value at starting situation (2015)[a]
Incentives	Economic and non-economic	Relevant Financial subsidy and feed-in tariff are key ways to increase technology penetration and promote grid-connected rooftop solar uptake. Incentives for integrating energy storage into the distribution grid can further encourage diffusion of solar. 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, biomass).	Number of new economic incentives in place for grid rooftop solar	1
			Number of new incentives for solar (all kinds of technologies)	1
			Number of new incentives to promote different forms of RE	2
	Disincentives	Possibly relevant The assessment is limited to the solar PV sector. It is not clear whether disincentives applied to fossil fuels will be strong enough to cause any impact in the solar PV sector.	Number of new disincentives to discourage use of fossil fuels to generate electricity	1
			Size of fossil fuel subsidy	$10 million
	Institutional and regulatory	Relevant Development of new agencies is needed at the subnational level to promote solar in states. Although there is a dedicated agency at the national level to promote renewable energy, there is no counterpart in states. A robust regulatory and institutional set-up to design and implement measures, enhance coordination and build capacity at all levels does not exist yet.	Number of new regulations and institutions set up to promote solar	3
			Number of new regulations and institutions set up to promote RE	3

TABLE **7.1,** continued

Template for describing the starting situation for selected process characteristics (using hypothetical solar PV example)

Category	Process characteristic	Description (specific to policy)	Indicator	Indicator value at starting situation (2015)[a]
Norms	Awareness	Not relevant There is a high level of awareness in the country, and this is not considered a hindering factor.	Users can choose to monitor "not relevant" characteristics.	-
	Behaviour	Relevant Awareness has not led to change in behaviour, possibly because of factors relating to financing and upfront costs. This is an area that needs more attention.	Number of new measures to influence consumer behaviour in favour of solar/ renewable energy	None
	Social norms	Possibly relevant Societal norms favour less carbon-intensive lifestyles in general, and it is not clear whether norms are holding back solar PV. There is a greater push for green, clean living in urban centres as pollution increases and environmental resources are depleted.	Number of emerging leaders/role models favouring renewables (e.g. states leading the transition to renewable energy)	None

Abbreviation: RE, renewable energy

[a] Indicator values are purely illustrative and only meant to show change over time.

TABLE **7.2**

Template for describing the starting situation for selected outcome characteristics (using hypothetical solar PV example)

Category	Outcome characteristic	Description of the starting situation (same as the Description column in Table 6.7)	Indicators	Indicator value at starting situation (2015)[a]
Scale of outcome – GHGs	Global or international (macro) level	This level is outside the assessment boundary. No description necessary.	Users can choose to monitor characteristics outside the assessment boundary.	-
	National or sectoral (medium) level	The policy has set a goal of annual emissions reductions of 20 million tCO_2e nationally. The 2030 vision is to reduce emissions by 40 million tCO_2 annually. Solar PV has a 5% share in the national electricity mix in 2015.	Installed capacity of grid-connected rooftop solar power plants (up to 500 kW) at national level	1 GW
			GHG emissions avoided (annually) as a result of solar PV deployment (calculated assuming solar PV generation replaced a baseline scenario of fossil fuel mix generation)	50,000 tCO_2e
			Other indicators such as installed capacity disaggregated by state, size, market segment, subsidized vs non-subsidized rooftop solar PV, solar PV installed costs in various segments	-
	Subnational (micro) level	The solar PV policy is implemented at subnational levels, supported by incentives for private sector involvement and knowledge development. In two northern rural provinces of the country, solar PV contributes 20% of the electricity mix in 2015.	% of rooftop solar PV in the electricity mix at a subnational level	5% for state 1 10% for state 2
			Other indicators such as installed capacity disaggregated by size, market segment, subsidized vs non-subsidized rooftop solar PV, solar PV installed costs by state	-
Scale of outcome – sustainable development	Global or international (macro) level	This level is outside the assessment boundary. No description necessary.	Users can choose to monitor characteristics outside the assessment boundary.	-

TABLE **7.2,** continued

Template for describing the starting situation for selected outcome characteristics (using hypothetical solar PV example)

Category	Outcome characteristic	Description of the starting situation (same as the Description column in Table 6.7)	Indicators	Indicator value at starting situation (2015)[a]
Scale of outcome – sustainable development, continued	National or sectoral (medium) level	The solar PV policy aims to create 200,000 new green jobs in the sector (e.g. in solar PV installation and maintenance) by 2022 and up to 2 million new jobs by 2050. There are currently 10,000 jobs in the solar PV sector nationally.	Net employment generation in solar sector at national level (calculated assuming the employment created by alternative technology – fossil fuels – of same capacity)	10,000
			Other indicators related to quality of employment, such as permanent vs temporary jobs), (net) new jobs generated, employment by sector/subsector, national employment data	-
	Subnational (micro) level	In rural districts and towns, new jobs are created through installation and operation of solar PV mini-grids. In the two northern provinces, there are about 600 jobs in the solar PV industry in each province.	Net employment generation in solar sector in province X (calculated assuming the employment created by alternative technology – fossil fuels – of same capacity)	600 in state 1 1,000 in state 2
			Other indicators, such as those related to employment generated in renewable energy vs coal vs natural gas industry (rate), net new jobs in energy sector in the state	-
Time frame over which outcome is sustained – GHGs	Long term: ≥15 years from the starting situation	The period is longer than the assessment period. No description necessary.	Users can choose to monitor characteristics beyond the assessment period.	-
	Medium term: ≥5 years and <15 years from the starting situation	The solar PV policy aims to achieve its mid-term (2030) vision of 30% solar PV in the national electricity mix, and sustain the trend of a growing share of solar PV in the country. Currently, solar PV has a 5% share in the national electricity mix. It is a new policy, and insufficient time has passed to clearly show that the policy impacts are sustained.	Trend in installed capacity of grid-connected rooftop solar power plants (up to 500 kW)	-
			Time-series data for other indicators highlighted above	-

TABLE **7.2,** continued

Template for describing the starting situation for selected outcome characteristics (using hypothetical solar PV example)

Category	Outcome characteristic	Description of the starting situation (same as the Description column in Table 6.7)	Indicators	Indicator value at starting situation (2015)[a]
Time frame over which outcome is sustained – GHGs, continued	Short term: <5 years from the starting situation	The policy aims to install 20 GW of rooftop solar PV by 2022 and trigger increased emissions reductions over the assessment period. There are no clear indications so far that the policy impacts will be sustained.	Trend in installed capacity of grid-connected rooftop solar power plants (up to 500 kW)	-
			Time-series data for other indicators highlighted above	-
Time frame over which outcome is sustained – sustainable development	Long term: ≥15 years from the starting situation	The period is longer than the assessment period. No description necessary.	Users can choose to monitor characteristics beyond the assessment period.	-
	Medium term: ≥5 years and <15 years from the starting situation	The solar PV policy aims to achieve its mid-term (2030) vision of 1 million new green jobs and sustain the trend of increasing jobs in the country. It is too early to see signs of sustained job growth.	Trend in employment generation in solar sector	-
			Time-series data for other indicators highlighted above	-
	Short term: <5 years from the starting situation	The solar PV policy aims to achieve its short-term goal of 200,000 new green jobs in the solar PV installation and maintenance sectors. There is no evidence yet that the policy's impact on jobs is sustained, although jobs are expected to show an upward trend with a rise in the share of solar PV.	Trend in employment generation in solar sector	-
			Time-series data for other indicators highlighted above	-

Abbreviation: -, not applicable

[a] Indicator values are purely illustrative and only meant to show change over time.

8 Estimating transformational impacts ex-ante

This chapter introduces the steps for conducting an ex-ante assessment of policies to understand the extent of transformation expected in the future. The steps 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. The chapter describes a qualitative approach to assessing transformational impacts ex-ante and compiling the assessment towards an overall assessment.

Checklist of key recommendations

- Assess and qualitatively score each characteristic and explain the underlying assessment
- Aggregate the results for all characteristics and barriers to the process and outcome level

8.1 Assess characteristics

Undertaking a forward-looking assessment of outcome and process characteristics is a key step in understanding the extent of transformation expected. It is a *key recommendation* to qualitatively assess each characteristic and explain the underlying assessment. Table 8.1 provides scales for qualitatively assessing each characteristic; different scales are used to assess process and outcome characteristics. Tables 8.2 and 8.3 provide templates for explaining the assessment of process and outcome characteristics.

Ex-ante assessment of transformational change is a qualitative analysis based on comparison of the starting situation with the expected situation 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 7.1) to assess the extent of transformation expected.

Appendix A provides examples of indicators for process and outcome characteristics. For outcome characteristics, indicators relating to GHG and sustainable development impacts can be quantified using the ICAT methodologies for GHG impacts and sustainable development impacts.

When scoring individual characteristics, it is important to consider the overall level of ambition (described in Chapter 3), vision of transformational change (described in Chapter 5), alignment with the Paris Agreement temperature goal and the SDGs, and barriers. These are the aspirations against which individual characteristics are assessed while considering potential barriers. Alignment with the Paris Agreement temperature goal and the SDGs should inform the assessment, but users are not expected to translate these aspirational goals into quantitative benchmarks to assess their policies against. When scoring, the question to consider is the extent to which the policy can realistically be

FIGURE **8.1**

Overview of steps in the chapter

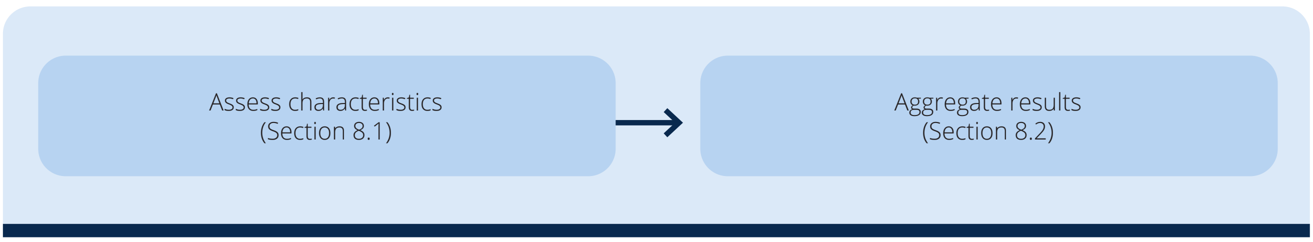


TABLE **8.1**

Scale for scoring characteristics

Score[a]	Description
Process characteristics	
4	It is very likely (e.g. a probability of 90–100%) that the policy will have a significant positive impact on this characteristic over the assessment period.
3	It is likely (e.g. a probability of 66–90%) that the policy will have a significant positive impact on this characteristic over the assessment period.
2	It is possible (e.g. a probability of 33–66%) that the policy will have a significant positive impact on this characteristic over the assessment period. Instances where the likelihood is not fully known or cannot be determined with certainty should be considered possible.
1	It is unlikely (e.g. a probability of 10–33%) that the policy will have a significant positive impact on this characteristic over the assessment period.
0	It is very unlikely (e.g. a probability of 0–10%) that the policy will have a significant positive impact on this characteristic over the assessment period.
Outcome characteristics – scale (for GHG and sustainable development impacts)	
3	The policy will result in GHG impacts that represent large emissions reductions, relative to the starting situation, at the level of assessment targeted. The policy will result in large net positive sustainable development impacts, relative to the starting situation, at the level of assessment targeted.
2	The policy will result in GHG impacts that represent moderate emissions reductions, relative to the starting situation, at the level of assessment targeted. The policy will result in moderate net positive sustainable development impacts, relative to the starting situation, at the level of assessment targeted.
1	The policy will result in GHG impacts that represent minor emissions reductions, relative to the starting situation, at the level of assessment targeted. The policy will result in minor net positive sustainable development impacts, relative to the starting situation, at the level of assessment targeted.
0	The policy will not result in GHG impacts relative to the starting situation at the level of assessment targeted. The policy will not result in sustainable development impacts, relative to the starting situation, at the level of assessment targeted.
–1	The policy will result in GHG impacts that represent a net increase in emissions, relative to the starting situation, at the level of assessment targeted. The policy will result in net negative sustainable development impacts, relative to the starting situation, at the level of assessment targeted.

TABLE **8.1,** continued

Scale for scoring characteristics

Score[a]	Description
Outcome characteristics – time for which outcome is sustained (for GHG and sustainable development impacts)	
3	The policy will result in GHG impacts that are very likely (e.g. a probability of 90–100%) to be sustained over the assessment period. The policy will result in sustainable development impacts that are very likely (e.g. a probability of 90–100%) to be sustained over the assessment period.
2	The policy will result in GHG impacts that are likely (e.g. a probability of 66–90%) to be sustained over the assessment period. The policy will result in sustainable development impacts that are likely (e.g. a probability of 66–90%) to be sustained over the assessment period.
1	The policy will result in GHG impacts that will possibly (e.g. a probability of 33–66%) be sustained over the assessment period. Instances where the likelihood is unknown or cannot be determined should be considered possible. The policy will result in sustainable development impacts that will possibly (e.g. a probability of 33–66%) be sustained over the assessment period. Instances where the likelihood is unknown or cannot be determined should be considered possible.
0	The policy will result in GHG impacts that are less likely (e.g. a probability of 10–33%) to be sustained over the assessment period. The policy will result in sustainable development impacts that are less likely (e.g. a probability of 10–33%) to be sustained over the assessment period.
–1	The policy will result in GHG impacts that are unlikely (e.g. a probability of 0–10%) to be sustained over the assessment period and risk being reversed to negative impacts. The policy will result in sustainable development impacts that are unlikely (e.g. a probability of 0–10%) to be sustained over the assessment period and risk being reversed to negative impacts.

[a] The scale uses numbers as a simple reference to qualitative scores explained in this table. When aggregating across characteristics, the number scores should not be used in a numerical way (e.g. they should not be averaged to obtain category-level scores).

expected to achieve the desired transformation described by a characteristic within the assessment boundary and assessment period defined by the user. A policy is more likely to impact any given characteristic if the characteristic represents a key element of the policy and the policy includes measures to address existing barriers. Impacts that are expected to happen after the assessment period can be captured by conducting a later 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 support the qualitative assessment of characteristics and inform the scoring, users are encouraged to use qualitative and quantitative indicators provided in Appendix A and discussed in Chapter 10. It can be helpful to collect data on the current values of selected indicators and assess their expected future values to arrive at the qualitative assessment of characteristics. It may not be necessary to collect information on all indicators required for ex-post assessment and monitoring, particularly when the objective of analysis is to decide between different measures. However, starting with data collection at an early stage of implementation will improve the ability to monitor and evaluate at later stages.

To minimize subjectivity and bias, it is advisable to involve a wide range of stakeholders and experts in the exercise. A multi-stakeholder process to assess 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 Guide* provides information on identifying and understanding stakeholders (Chapter 5), and establishing multi-stakeholder bodies (Chapter 6).

TABLE **8.2**

Template for ex-ante assessment for process characteristics (using hypothetical solar PV policy example)

Category	Characteristics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transformation (2030)[a]
Technology	Research and development (R&D)	0	The policy does not channel resources into R&D, although it is recognized that increased investment in R&D for energy storage and grid flexibility is needed to support deployment of solar at larger scales.	Amount of related public and private R&D investment in the country	$100,000	$500,000
	Adoption	3	Financial subsidies and feed-in tariffs have been widely used to increase adoption of clean technology around the world, and a similar result can be realistically expected in this case. These incentives are likely to kick-start the local rooftop industry, thus addressing the barrier of a weak domestic solar industry.	Number of new demonstration projects for rooftop solar PV initiated (annual)	2	10
				% of annual electricity consumption supplied by rooftop solar PV	Less than 1%	10%

TABLE **8.2,** continued

Template for ex-ante assessment for process characteristics (using hypothetical solar PV policy example)

Category	Character-istics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transfor-mation (2030)[a]
Technology, continued	Scale-up	2	Financial subsidies and feed-in tariffs have been widely used to scale up clean technology around the world. Together, these will address the barrier of high upfront financial investment needed for rooftop solar PV and improve the payback period on solar. Greater availability of solar panels and skilled workforce for installation and maintenance by kick-starting the local service industry will support the growing demand. But the limited focus on rooftop solar PV does not help in realizing the full potential of solar. It is not expected that this policy alone will facilitate scale-up of a broader set of solar technologies in the country and support grid readiness, which is necessary for systemic transition.	Share of installed rooftop solar PV in the solar sector (nationwide or statewide)	5%	30%
				Share of solar power (utility scale, rooftop, off-grid) in the electricity sector	8%	40%
				Share of RE in the country as a percentage of electricity consumption	10%	50%
Agents of change	Entrepre-neurs	2	The policy is likely to influence entrepreneurs and investors to invest in solar-related businesses and capitalize on the financial incentives available. High upfront financial investment is a significant barrier in the country that is currently preventing businesses and entrepreneurs from investing in rooftop solar technology. The broader solar sector is likely to remain untapped, however, and not likely to see a similar influx of new investments in the absence of targeted measures to fuel growth in the sector.	Volume of venture capital investments	$100 million	$1 billion

TABLE **8.2**, continued

Template for ex-ante assessment for process characteristics (using hypothetical solar PV policy example)

Category	Character-istics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transfor-mation (2030)[a]
Agents of change, continued	Coalitions of advocates	1	The solar PV policy is not likely to support the creation of coalitions and networks. It is not likely to facilitate engagement between relevant actors to develop an ecosystem that encourages other forms of solar that are more suitable to achieving scale or increased R&D.	Number of projects/ research centres involving university–industry collaboration	1	10
	Beneficiaries	-	Not relevant	-	-	-
Incentives	Economic and non-economic	3	The solar PV policy will use subsidies and feed-in tariff 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 barriers such as lack of technical personnel for installation and maintenance, and give a boost to grid-connected solar.	Number of new economic incentives in place for grid rooftop solar	1	5
				Number of new incentives for solar (all kinds of technologies)	1	15
				Number of new incentives to promote different forms of RE	2	15
	Disincentives	0	The solar PV policy is not likely to use disincentives 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 for barriers, the country lacks a comprehensive strategy to discourage fossil fuel use, 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 use of fossil fuels to generate electricity	1	1
				Size of fossil fuel subsidy	$10 million	$15 million

TABLE **8.2,** continued

Template for ex-ante assessment for process characteristics (using hypothetical solar PV policy example)

Category	Character-istics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transfor-mation (2030)[a]
Incentives, continued	Institutional and regulatory	2	The solar PV policy is likely to lead to the development of new agencies and regulations to facilitate implementation in states. However, a time lag is expected, with some front runners leading the way, while other states gradually follow as experience builds. This experience, and creation of institutions and regulatory mechanisms will support the overall sector in the long run.	Number of new regulations and institutions set up to promote solar	3	10
				Number of new regulations and institutions set up to promote RE	3	6
Norms	Awareness	-	Not relevant	-	-	-
	Behaviour	1	The solar PV policy is unlikely to influence consumer behaviour and shift preferences away from carbon-intensive electricity in a significant manner. Further, in the absence of a strategy to discourage fossil fuel use, as identified for barriers, and deployment of solar (or RE) across different technologies to achieve scale, there is not expected to be any widespread change in behaviour.	Number of new measures to influence consumer behaviour in favour of solar/RE	None	1
	Social norms	0	The solar PV policy is not likely to influence societal norms.	Number of emerging leaders/ role models favouring renewables (e.g. states leading the transition to RE)	None	1 or 2

Abbreviations: -, not applicable; RE, renewable energy

Note: The table builds on the information generated in the previous step, which is shown in the grey columns.

[a] Indicator values are purely illustrative and only meant to show change over time.

TABLE **8.3**

Template for ex-ante assessment for outcome characteristics (using hypothetical solar PV policy example)

Category	Charac-teristics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transfor-mation (2030)[a]
Scale of outcome – GHGs	Macro level	-	Outside the assessment boundary	Users can choose to monitor characteristics outside the assessment boundary.	Indicator value if monitoring outside the assessment boundary	Indicator value if monitoring outside the assessment boundary
	Medium level	1	The policy aimed at national-level impacts is likely to achieve its 2022 target and mid-term vision, which are ambitious for rooftop solar PV. But, given the size of the electricity sector and the demand, there is potential to deploy far greater amounts of renewable energy, including solar, to replace fossil fuel–based power.	Installed capacity of grid-connected rooftop solar power plants (up to 500 kW) at national level	1 GW	25 GW
				GHG emissions avoided (annually) as a result of solar PV deployment (calculated assuming solar PV generation replaced a baseline scenario of fossil fuel mix generation)	50,000 tCO_2e	10 million tCO_2e
	Micro level	2	A few states are expected to be front runners and lead in rooftop solar; others are likely to achieve moderate growth in solar over the assessment period.	% of rooftop solar PV in the electricity mix at a subnational level	5% for state 1 10% for state 2	20% for state 1 25% for state 2
Scale of outcome – sustain-able develop-ment	Macro level	-	Outside the assessment boundary	Users can choose to monitor characteristics outside the assessment boundary.	Indicator value if monitoring outside the assessment boundary	Indicator value if monitoring outside the assessment boundary
	Medium level	1	Growth in solar is expected to be accompanied by a minor boost to employment in this sector at national level.	Net employment generation in solar sector at national level (calculated assuming the employment created by alternative technology – fossil fuels – of same capacity)	10,000	1 million

TABLE **8.3,** continued

Template for ex-ante assessment for outcome characteristics (using hypothetical solar PV policy example)

Category	Characteristics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transformation (2030)[a]
Scale of outcome – sustainable development, continued	Micro level	2	In some regions, a net large positive impact on job creation is expected, whereas in many others the impact is likely to be moderate.	Net employment generation in solar sector in province X (calculated assuming the employment created by alternative technology – fossil fuels – of same capacity)	600 in state 1 1,000 in state 2	40,000 in state 1 30,000 in state 2
Time frame over which outcome is sustained – GHGs	Long term	-	Beyond the assessment period (2015–2030)	Users can choose to monitor characteristics beyond the assessment period.	Indicator value if monitoring beyond the assessment period	Indicator value if monitoring beyond the assessment period
	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 rooftop solar power plants (up to 500 kW)	-	Sustained growth from 2022 to 2030
	Short term	3	In the short term, no reversal of impacts is expected, and the gains achieved are likely to be sustained over the assessment period and beyond.	Trend in installed capacity of grid-connected rooftop solar power plants (up to 500 kW)	-	Sustained growth through 2022
Time frame over which outcome is sustained – sustainable development	Long term	-	Beyond the assessment period (2015–2030)	Users can choose to monitor characteristics beyond the assessment period.	Indicator value if monitoring beyond the assessment period	Indicator value if monitoring beyond the assessment period
	Medium term	2	Employment generation is likely to be sustained with increase in rooftop solar projects.	Trend in employment generation in solar sector	-	Sustained growth from 2022 to 2030
	Short term	3	Employment generation is highly likely to be sustained over the short term with increase in rooftop solar projects.	Trend in employment generation in solar sector	-	Sustained growth through 2022

Abbreviations: -, not applicable

Note: The table builds on the information generated in the previous step, which is shown in the grey columns.

[a] Indicator values are purely illustrative and only meant to show change over time.

8.2 Aggregate results

To arrive at a more general conclusion on the transformational potential of a policy, 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 Tables 8.4, 8.5 and 8.6, and Figure 8.2.

8.2.1 Aggregating to the category level

Assessment at the category level of processes (i.e. technology, agents of change, incentives, norms – Table 8.4) and outcomes (scale of outcome, time frame over which outcome is sustained – Table 8.5) is based on the assessment of individual characteristics in Tables 8.2 and 8.3.

Users should use the scale in Table 8.1 to score each process and outcome category. This process should include consultation with experts and stakeholders to qualitatively assess each category and assign a score informed by the scores for individual characteristics, with documentation of the rationale. Tables 8.4 and 8.5 provide templates for describing the results. These tables do not assess or score how well the policy is being implemented; rather, they show the potential impact of implementation of the policy in realizing transformational change in a given context.

When assessing the potential impact of a policy at the category level, it is important to assess the degree to which categories of transformational processes 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. In contrast, a focus on norms may be more critical in a context where solar PV technology is available but vested interests promote coal-based electricity for lighting. Users can document the relative importance of each process category by using percentages, as shown in Table 8.4. The relative importance of each category is expressed as a share of 100%. The relative importance of all four process categories should add up to 100%.

Users should arrive at a score at the category level in Table 8.5 based on the individual scores for outcome characteristics in Table 8.3, and provide adequate justification. They should consider the relative importance of each characteristic within a category to arrive at a score for the category. For example, large-scale emissions reductions in one or two subnational regions with very little impact at the national level may not translate to a high score for the GHG category. Changes that are sustained over the long term, even though there may have been some challenges in the short and medium terms, may receive a higher score at the category level. This is because the outcome suggests that challenges are being overcome and changes are becoming more entrenched over time.

TABLE **8.4**

Template for describing results of the ex-ante analysis at process category level (using solar PV policy example)

Category	Score	Rationale for scoring	Relative importance of category and rationale
Technology	2	The policy will possibly positively influence the penetration of rooftop solar PV in the country. However, with the narrow focus on rooftop solar, it is not likely to result in adoption and scale-up of other forms of solar technologies, which can bring about a large-scale, systemic change in the sector. Research and development on issues such as grid integration and energy storage options are not likely to be addressed as part of the policy, and this further prevents large-scale deployment of solar (and other renewable energy technologies).	30% The country is still in the pre-development phase, which emphasizes the importance of introducing solar PV technology.

TABLE **8.4,** continued

Template for describing results of the ex-ante analysis at process category level (using solar PV policy example)

Category	Score	Rationale for scoring	Relative importance of category and rationale
Agents of change	2	Overall, the policy is likely to engage entrepreneurs in deploying rooftop solar PV.	30% Entrepreneurs and coalitions who can introduce and lead technology penetration are equally important to technology change.
Incentives	2	The policy is likely to fully use financial incentives, and institutions and regulations; however, it is not likely to use disincentives to discourage use of fossil fuels. Incentives that focus on rooftop solar are not likely to give a boost to utility-scale solar.	30% In a developing country context, financial incentives and institutional capacity at all levels are crucial to support technology and agents of change.
Norms	0	The policy is not likely to bring about 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 **8.5**

Template for describing results of the ex-ante analysis at outcome category level (using solar PV policy example)

Category	Score	Rationale for scoring
Scale of outcome – GHGs	1	The policy is expected to result in minor GHG and sustainable development impacts, relative to the starting situation, at national level.
Scale of outcome – sustainable development	2	A net positive moderate increase in jobs is likely, even though some regions in the country are expected to experience below-average employment generation.
Time frame over which outcome is sustained – GHGs	3	Based on the policy's expected impact on adoption and scale-up, it is highly likely that the policy will lead to sustained reductions in emissions through increasing rooftop solar PV over time.
Time frame over which outcome is sustained – sustainable development	2	It is likely that all regions will experience sustained growth in employment in the solar sector over time.

8.2.2 Aggregating to the impact level

Next, users should arrive at an overall assessment at the impact level, informed by the assessment of processes and outcomes at the category level (as described in Tables 8.4 and 8.5). Users apply the scale provided in Table 8.6 to qualitatively score the extent of transformation expected from the policy at both the outcome level and the process level. Users should arrive at the final result based on the scores in Tables 8.4 and 8.5 through objective analysis of these scores, and with inputs from stakeholders and experts. The final assessment result indicates the extent and sustained nature of transformation expected from the policy, and how likely it is that this expected transformation can be realized, given the design of the intervention (which contributes to both the scale and entrenchment of the change).

Figure 8.2 illustrates the matrix of possible qualitative scores for process and outcome impacts. If the final result for the policy falls in the green area, the policy is expected to be transformational. If it is in the red area, the policy is not expected to be transformational. The colour gradient of the matrix reflects the qualitative nature of the analysis and the high level of uncertainty of the assessment.

Users can illustrate their final result in the figure, as has been done in Figure 8.2 for the hypothetical solar PV policy example. Users should also document the underlying rationale for their final assessment result and explain the contribution of process characteristics to achieving (or not) the transformational outcome.

For the hypothetical solar PV policy example, it is possible that the policy will facilitate transformation, even though the extent of potential transformation is expected to be minor (Figure 8.2). The policy is likely to give a boost to solar PV in the country, particularly within the rooftop solar subsector, and is expected to be well implemented and produce sustained results. An increase in solar PV penetration can create the foundation for institutional and regulatory structures to support renewables more broadly, contribute to energy access, engage entrepreneurs and markets, develop relevant skills, generate jobs and make solar power more visible. However, the policy is expected to fall short of bringing about a systemic transition across the solar or renewable energy sector. Systemic changes across the broader solar/renewable energy sector may be aided by some of the developments under the rooftop policy, but this policy alone is not able to drive further transformative changes in the sector. Complementary policies that facilitate solar energy deployment at a utility scale, and technological advances in grid integration and energy storage to absorb increased amounts of intermittent renewable power are needed to potentially scale up the share of solar in the country. It would be useful to assess a potential package of policies in the sector that go beyond rooftop solar to understand their collective impact on transforming the renewable energy sector.

Box 8.1 provides a case study example of how results of an ex-ante assessment of transformational impacts are presented and illustrated, for the Tonga Energy Efficiency Master Plan.

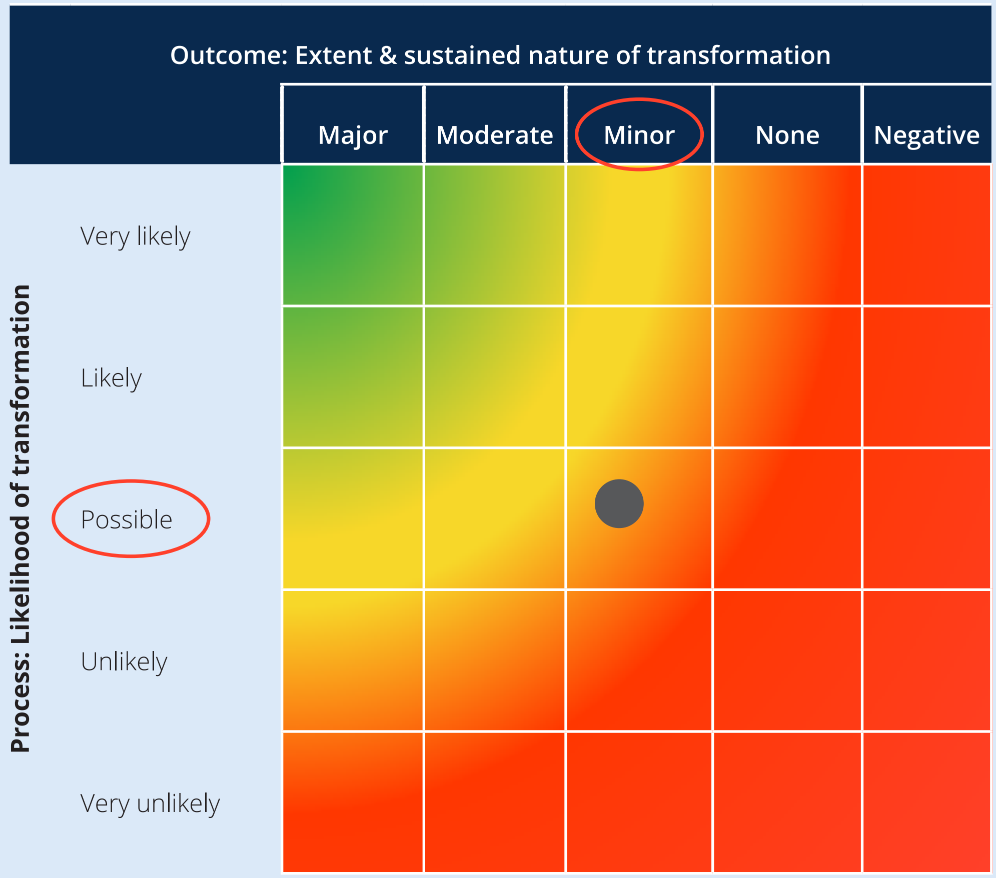
TABLE **8.6**

Scale for scoring process and outcome

Outcome – extent and sustained nature of transformation	Score	Process – likelihood of transformational outcome	Score
Major	3	Very likely	4
Moderate	2	Likely	3
Minor	1	Possible	2
None	0	Unlikely	1
Negative	–1	Very unlikely	0

FIGURE **8.2**

Transformational impact matrix (using the solar PV policy example)



BOX **8.1**

Case study – Tonga Energy Efficiency Master Plan

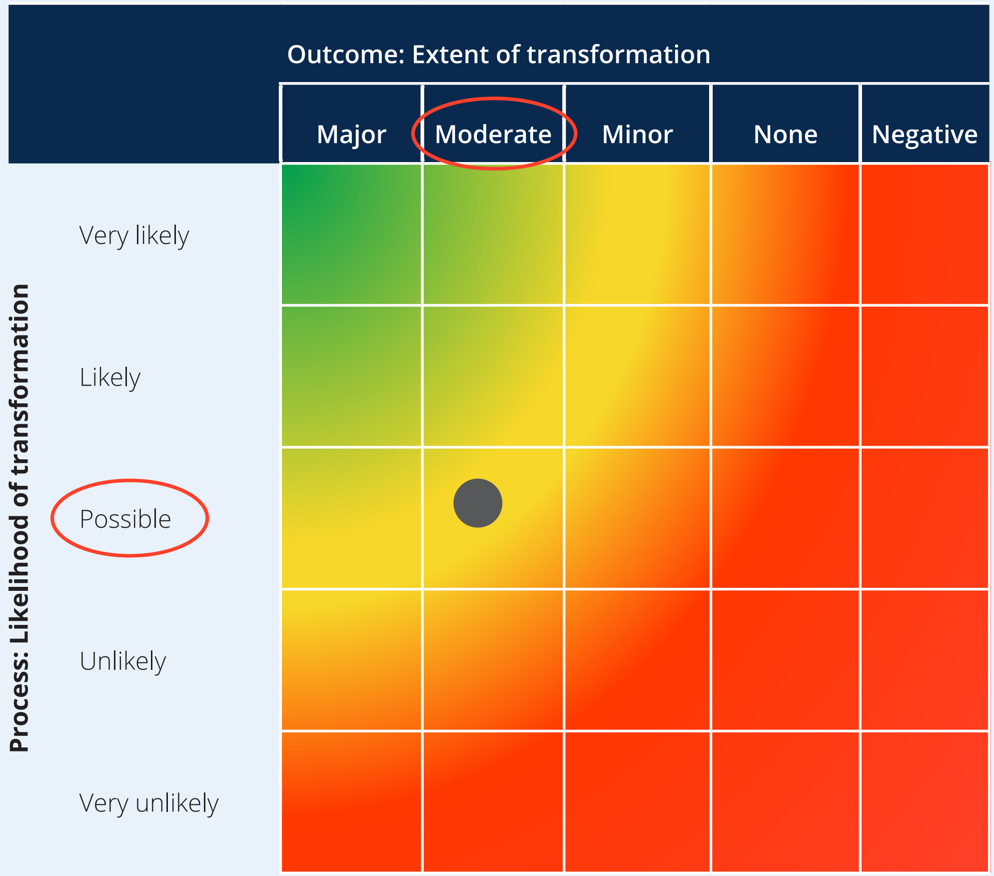
At the request of the Government of Tonga, the Climate Technology Centre and Network (CTCN) worked closely with the Tongan Energy Department in 2018 to develop a Tonga Energy Efficiency Master Plan (TEEMP) for adjustment and adoption by the relevant Tongan entities. The TEEMP encompasses electricity use and ground transportation, and complements the approach of the 2009 Tonga Energy Road Map 2010–2020 (TERM). The TERM focuses on reducing Tonga's fossil fuel dependence through increased energy efficiency and improved supply chains, to mitigate the price volatility of imported products, reduce GHG emissions and improve national energy security.

The CTCN applied the ICAT *Transformational Change Methodology* to assess the expected transformational impact of TEEMP. In doing so, the CTCN also gained insights into how the Technology Mechanism can play a strategic role in promoting transformational change, as requested in the Technology Framework of the Paris Agreement to the United Nations Framework Convention on Climate Change. The assessment was performed ex-ante from January to April 2019.

The assessment concluded that the extent of transformation expected to be achieved by the TEEMP is moderate, and the outcome will possibly be sustained over time, as shown below.

FIGURE **8.3**

Transformational impact matrix for the Tongan example



BOX **8.1**, continued

Case study – Tonga Energy Efficiency Master Plan

The basis for this conclusion on the expected transformational impact of the policy is the aggregation of results in the previous steps. Assessment at the category level of processes and outcomes (i.e. technology, incentives, norms, scale of outcome, sustained nature of outcome) is based on the assessment of individual characteristics. Figures 8.4–8.6 illustrate a breakdown of the overall assessment result to the level of disaggregated process and outcome characteristics.

FIGURE **8.4**

Ex-ante assessment of process characteristics

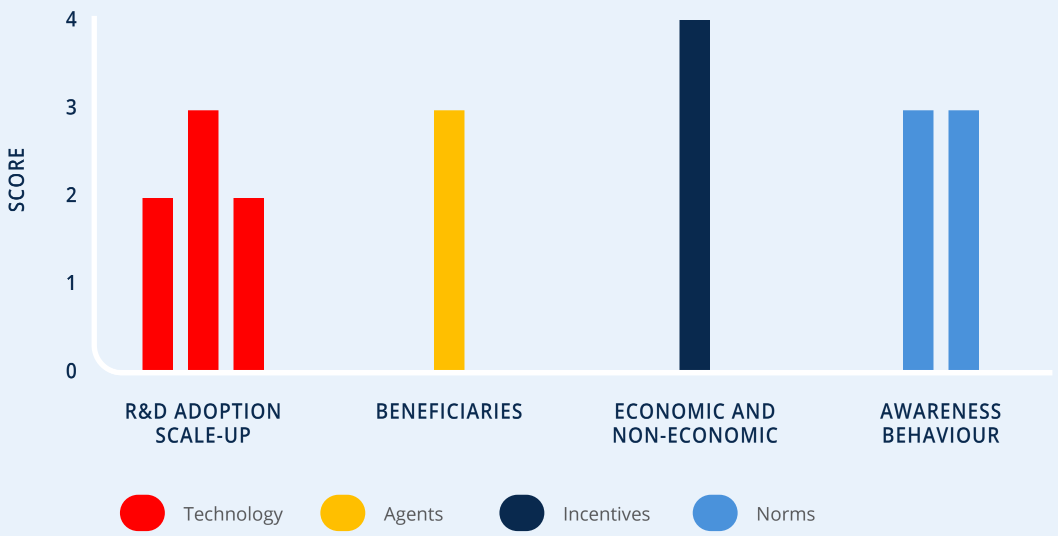
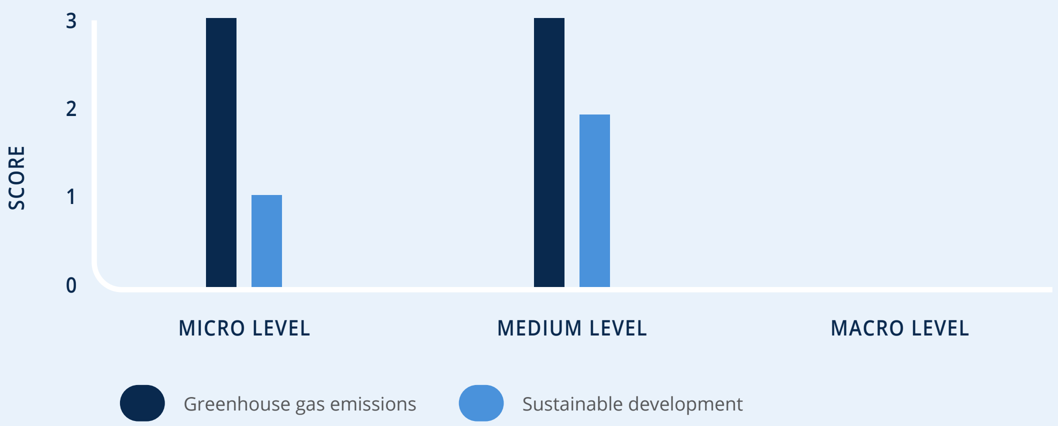


Figure 8.5 illustrates the extent to which the TEEMP may result in GHG and sustainable development impacts, relative to the starting situation, at the levels of assessment targeted.

FIGURE **8.5**

Scale of outcome



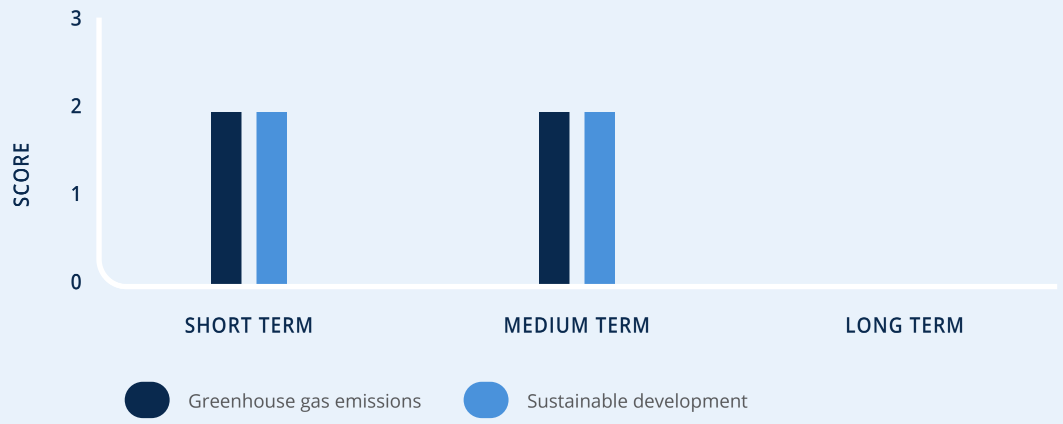
BOX **8.1**, continued

Case study – Tonga Energy Efficiency Master Plan

Figure 8.6 illustrates the extent to which policies may result in GHG or sustainable development impacts that are likely to be sustained over the assessment period.

FIGURE **8.6**

Likelihood of outcome being sustained over time



The overall and disaggregated assessment results indicate that the TEEMP, if implemented, is expected to result in GHG emissions reductions and moderate sustainable development impacts, such as job creation, energy security and reduced energy intensity at multi-scale levels.

The expected transformational impact may be achieved through:

- scaling up national capacity
- increasing access to energy efficiency technologies and conservation measures
- engaging agents of change such as consumers and beneficiaries
- using financial and other incentives and regulations for behavioural change
- strengthening national institutions to implement the proposed policies in the TEEMP.

The results suggest that the TEEMP is potentially transformational if some critical local conditions are met:

- The TEEMP is adopted, adjusted and implemented by relevant Tongan entities.
- Further attention is given to some of the process and outcome characteristics to ensure sustained technical capacity-building.
- A more comprehensive focus on adoption and scale-up of proposed energy efficiency technologies and conservation measures is put in place, to avoid a relapse to a high-carbon pathway.

9 Estimating transformational impacts ex-post

This chapter explains the steps for conducting an ex-post assessment of a policy to understand the extent of transformation achieved. The steps are almost the same as for an ex-ante assessment. The ex-post assessment includes collecting data for indicators that are most relevant to assessment of impacts achieved.

Checklist of key recommendations

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

9.1 Collect data

Ex-post assessment is a backward-looking qualitative and/or quantitative assessment of indicators. This is important to measure the extent to which a policy – including unintentional changes[20] – contributes to transformational change to low-carbon and sustainable development. The assessment provides users with observed information about the implementation process to understand whether and how policies 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. It is a *key recommendation* to collect data for selected indicators. Tables 9.2 and 9.3 provide templates for collecting data. Refer to Section 7.1 for information on selection of indicators and to Appendix A for examples of indicators.

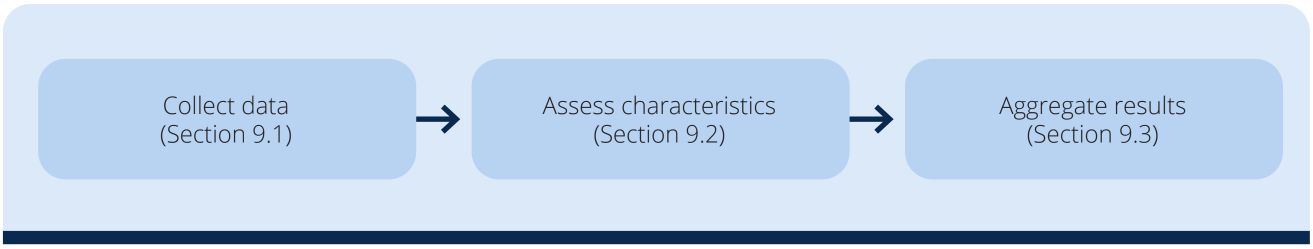
The nature of an indicator determines the method of assessment and whether the value of the indicator is better assessed quantitatively or qualitatively. Qualitative indicators enable descriptive and narrative data for characteristics, whereas quantitative indicators are estimated or measured to demonstrate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

A specific method of assessment is determined for each indicator, as appropriate. Methods of assessment can be classified as either bottom-up or top-down methods. Top-down methods are often 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 are available and feasible to collect.

[20] Transformational change is highly uncertain and may not unfold as planned, although managed transition is the focus of this assessment. To include unintentional changes in the assessment, a broad approach is taken to monitor all characteristics of a system that could be relevant to the policy (see Chapter 7). Users can choose to monitor indicators for characteristics that are judged to be "not relevant", to take a comprehensive approach.

FIGURE **9.1**

Overview of steps in the chapter



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 kilowatt hour), sampling or use of default values from similar policies, 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 using 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 Appendix A, which provide examples of indicators of transformational change characteristics.

9.2 Assess characteristics

The next step is to assess the policy's impact on process and outcome characteristics by comparing indicator values for the starting situation with value for the ex-post situation.

It is a *key recommendation* to assess characteristics using indicators to assess the extent of transformation achieved by the policy (using the scale in Table 9.1, and templates in Tables 9.2 and 9.3). The ex-post indicator value is based on observed data and shows the extent to which the policy 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 transformational characteristics based on the indicator values. Table 9.1 provides scales for scoring process and outcome characteristics. Assessing outcome characteristics helps users understand the degree of transformational change achieved. Ex-post assessment of process characteristics gives insights into the drivers that helped achieve the outcome and can be used to improve policy design or inform new policies. It shows whether barriers were overcome, and to what extent and how, which can also help in future policymaking.

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 Guide* (Chapter 8) for information on designing and conducting consultations.

TABLE **9.1**

Scale for scoring characteristics

Score[a]	Description
Process characteristics	
4	It is very likely (e.g. a probability of 90–100%) that the policy had a significant positive impact on this characteristic over the assessment period.
3	It is likely (e.g. a probability of 66–90%) that the policy had a significant positive impact on this characteristic over the assessment period.
2	It is possible (e.g. a probability of 33–66%) that the policy had a significant positive impact on this characteristic over the assessment period. Instances where the likelihood is unknown or cannot be determined should be considered possible.
1	It is unlikely (e.g. a probability of 10–33%) that the policy had a significant positive impact on this characteristic over the assessment period.
0	It is very unlikely (e.g. a probability of 0–10%) that the policy had a significant positive impact on this characteristic over the assessment period.

TABLE **9.1,** continued

Scale for scoring characteristics

Score[a]	Description
Outcome characteristics – scale (for GHG and sustainable development impacts)	
3	The policy resulted in GHG impacts that represent large emissions reductions, relative to the starting situation, at the level of assessment targeted. The policy resulted in significant positive sustainable development impacts, relative to the starting situation, at the level of assessment targeted.
2	The policy resulted in GHG impacts that represent moderate emissions reductions, relative to the starting situation, at the level of assessment targeted. The policy resulted in moderate positive sustainable development impacts, relative to the starting situation, at the level of assessment targeted.
1	The policy resulted in GHG impacts that represent minor emissions reductions, relative to the starting situation, at the level of assessment targeted. The policy resulted in minor positive sustainable development impacts, relative to the starting situation, at the level of assessment targeted.
0	The policy did not result in GHG impacts, relative to the starting situation, at the level of assessment targeted. The policy did not result in sustainable development impacts, relative to the starting situation, at the level of assessment targeted.
–1	The policy resulted in GHG impacts that represent a net increase in emissions, relative to the starting situation, at the level of assessment targeted. The policy resulted in negative sustainable development impacts, relative to the starting situation, at the level of assessment targeted.
Outcome characteristics – time for which outcome is sustained (for GHG and sustainable development impacts)	
3	The policy resulted in GHG impacts that are very likely (e.g. a probability of 90–100%) to be sustained over the assessment period. The policy resulted in sustainable development impacts that are very likely (e.g. a probability of 90–100%) to be sustained over the assessment period.
2	The policy resulted in GHG impacts that are likely (e.g. a probability of 66–90%) to be sustained over the assessment period. The policy resulted in sustainable development impacts that are likely (e.g. a probability of 66–90%) to be sustained over the assessment period.
1	The policy resulted in GHG impacts that will possibly (e.g. a probability of 33–66%) be sustained over the assessment period. Instances where the likelihood is unknown or cannot be determined should be considered possible. The policy resulted in sustainable development impacts that will possibly (e.g. a probability of 33–66%) be sustained over the assessment period. Instances where the likelihood is unknown or cannot be determined should be considered possible.
0	The policy resulted in GHG impacts that are less likely (e.g. a probability of 10–33%) to be sustained over the assessment period. The policy resulted in sustainable development impacts that are less likely (e.g. a probability of 10–33%) to be sustained over the assessment period.
–1	The policy resulted in GHG impacts that are unlikely (e.g. a probability of 0–10%) to be sustained over the assessment period and risk being reversed to negative impacts. The policy resulted in sustainable development impacts that are unlikely (e.g. a probability of 0–10%) to be sustained over the assessment period and risk being reversed to negative impacts.

[a] The scale uses numbers as a simple reference to qualitative scores explained in this table. When aggregating across characteristics, the number scores should not be used in a numerical way (e.g. they should not be averaged to obtain category-level scores).

TABLE **9.2**

Template for ex-post assessment for process characteristics (using hypothetical solar PV policy example)

Category	Charac-teristics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transfor-mation (2030)[a]
Technology	Research and develop-ment (R&D)	1	The policy did not channel resources into R&D. The investment in R&D increased slightly over the assessment period. It is largely directed at developing commercial energy storage solutions and enhancing grid flexibility.	Amount of related public and private R&D investment in the country	$100,000	$5 million
	Adoption	2	The financial subsidy and feed-in tariff have helped increase the adoption of clean technology and kick-started the local rooftop solar PV industry.	Number of demonstration projects for rooftop solar PV initiated (annual)	2	7
				% of annual electricity consumption supplied by rooftop solar PV	Less than 1%	Less than 5%
	Scale-up	2	The financial subsidy and feed-in tariff have facilitated the uptake of solar in the country over the assessment period, while enhancing the availability of skilled workforce for installation and maintenance. They have helped kick-start the local service industry. But the level of scale-up necessary to achieve systemic transition across the sector has not occurred because of the focus on rooftop solar PV alone. Advances in grid integration and energy storage that would help deploy solar at a larger scale across all forms of technologies and RE more broadly have not occurred.	Share of installed rooftop solar PV in the solar sector (nationwide or statewide)	5%	20%
				Share of solar power (utility scale, rooftop, off-grid) in the electricity sector	8%	33%
				Share of RE in the country as a percentage of electricity consumption	5%	20%

TABLE **9.2,** continued

Template for ex-post assessment for process characteristics (using hypothetical solar PV policy example)

Category	Charac-teristics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transfor-mation (2030)[a]
Agents of change	Entrepre-neurs	2	The policy has triggered investments and entrepreneurship in solar-related businesses compared with the starting situation, when high upfront financial investment was a significant barrier. However, the broader solar sector has remain untapped in terms of receiving a similar influx of new investments and market interest.	Volume of venture capital investments	$100 million	$500 million
	Coalitions of advocates	1	The solar PV policy has not supported the creation of coalitions and networks.	Number of projects/ research centres involving university–industry collaboration	1	6
	Beneficiaries	-	Not relevant	-	-	-
Incentives	Economic and non-economic	3	The solar PV policy used subsidies and preferential tariffs to increase technology penetration. These incentives have promoted consumer demand, which in turn has promoted the local service industry. However, broader changes across the sector without policies for different kinds of solar technologies (e.g. utility scale, off-grid) are lacking.	Number of new economic incentives in place for grid rooftop solar	1	4
				Number of new incentives for solar (all kinds of technologies)	1	10
				Number of new incentives to promote different forms of RE	2	15

TABLE **9.2,** continued

Template for ex-post assessment for process characteristics (using hypothetical solar PV policy example)

Category	Charac-teristics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transfor-mation (2030)[a]
Incentives, continued	Disincentives	0	The solar PV policy did not use disincentives to achieve its goals. There is a growing recognition of a need for a comprehensive strategy, but no steps have been taken in this direction yet.	Number of new disincentives to discourage use of fossil fuels to generate electricity	1	1
				Size of fossil fuel subsidy	$10 million	$15 million
	Institutional and regulatory	2	The solar PV policy has led to the development of new agencies and regulations to promote solar in a few front-runner states. This experience, and creation of institutions and regulatory mechanisms can potentially be leveraged in future for broader sector-level changes.	Number of new regulations and institutions set up to promote solar	3	6
				Number of new regulations and institutions set up to promote RE	3	6
Norms	Awareness	-	Not relevant	-	-	-
	Behaviour	2	The solar PV policy has somewhat influenced consumer behaviour and shifted preferences away from carbon-intensive electricity, as a result of targeted financial incentives. However, in the absence of a strategy to discourage fossil fuel use and a broader solar/RE policy, a widespread change in behaviour has not occurred.	Number of new measures to influence consumer behaviour in favor of solar/RE	None	1
	Social norms	0	Although one or two states have emerged as leaders in the solar industry, a sustained change in societal norms favouring solar or RE in general has not been observed yet.	Number of emerging leaders/ role models favouring renewables (e.g. states leading the transition to RE)	0	1 or 2

Abbreviations: -, not applicable; RE, renewable energy

Note: The table builds on the information generated in the previous step, which is shown in the grey columns.

[a] It is assumed that the ex-post assessment is done after 2030. Indicator values are purely illustrative and only meant to show change over time.

TABLE **9.3**

Template for ex-post assessment for outcome characteristics (using hypothetical solar PV policy example)

Category	Charac-teristics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transfor-mation (2030)[a]
Scale of outcome – GHGs	Macro level	-	Outside the assessment boundary	Users can choose to monitor characteristics outside the assessment boundary.	Indicator value if monitoring outside the assessment boundary	Indicator value if monitoring outside the assessment boundary
	Medium level	1	The policy achieved its 2022 rooftop solar target, but in 2030. The emissions reductions impacts are significant but are not sufficiently large to facilitate transformational change. Given the size of the electricity sector and the demand, far greater renewable energy, including solar, capacity can be deployed to replace fossil fuel–based power.	Installed capacity of grid-connected rooftop solar power plants (up to 500 kW) at national level	1 GW	20 GW
				GHG emissions avoided (annually) as a result of solar PV deployment (calculated assuming solar PV generation replaced a baseline scenario of fossil fuel mix generation)	50,000 tCO_2e	7 million tCO_2e
	Micro level	1	Although one state led in rooftop solar scale-up, achieving high levels of penetration, others showed moderate growth over the assessment period.	% of rooftop solar PV in the electricity mix at a subnational level	5% for state 1 10% for state 2	40% for state 1 20% for state 2
Scale of outcome – sustain-able develop-ment	Macro level	-	Outside the assessment boundary	Users can choose to monitor characteristics outside the assessment boundary	Indicator value if monitoring outside the assessment boundary	Indicator value if monitoring outside the assessment boundary
	Medium level	1	Growth in solar was accompanied by a minor boost in employment in this sector, but the growth was much smaller than anticipated.	Net employment generation in solar sector at national level (calculated assuming the employment created by alternative technology – fossil fuels – of same capacity)	10,000	190,000

TABLE **9.3**, continued

Template for ex-post assessment for outcome characteristics (using hypothetical solar PV policy example)

Category	Characteristics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transformation (2030)[a]
Scale of outcome – sustainable development, continued	Micro level	2	A large part of the employment growth was concentrated in two states. Other regions were not able to reap the benefits as much.	New employment generation in solar sector in province X (calculated assuming the employment created by alternative technology – fossil fuels – of same capacity)	600 in state 1 1,000 in state 2	30,000 in state 1 15,000 in state 2
Time frame over which outcome is sustained – GHGs	Long term	-	Beyond the assessment period (2015–2030)	Users can choose to monitor characteristics beyond the assessment period	Indicator value if monitoring beyond the assessment period	Indicator value if monitoring beyond the assessment period
	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 rooftop solar 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. There was a significant risk of policy reversal due to political changes in the first 5 years of policy implementation.	Trend in installed capacity of grid-connected rooftop solar power plants (up to 500 kW)	-	Sustained growth through 2022

TABLE **9.3,** continued

Template for ex-post assessment for outcome characteristics (using hypothetical solar PV policy example)

Category	Characte-ristics	Score	Rationale for score	Indicator	Indicator value at starting situation (2015)[a]	Indicator value for expected transfor-mation (2030)[a]
Time frame over which outcome is sustained – sustainable develop-ment	Long term	-	Beyond the assessment period (2015–2030)	Users can choose to monitor characteristics beyond the assessment period	Indicator value if monitoring beyond the assessment period	Indicator value if monitoring beyond the assessment period
	Medium term	2	Employment generation was sustained and showed an increasing trend through the assessment period, with a steady increase in rooftop solar projects.	Trend in employment generation in solar sector	-	Sustained growth during the assessment period
	Short term	1	Employment generation in the beginning was not steady, as the risk of policy reversals affected investor confidence, and held back the growth in rooftop solar projects and consequently jobs.	Trend in employment generation in solar sector	-	Flat trend through 2022

Abbreviations: -, not applicable
Note: The table builds on the information generated in the previous step, which is shown in the grey columns.
[a] Indicator values are purely illustrative and only meant to show change over time.

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 at the category level, then the process and outcome level, and finally use it to understand the extent of transformation achieved by the policy.

It is a *key recommendation* to aggregate the results for all characteristics to the process and outcome levels, and describe the overall assessment.

9.3.1 Aggregating to the category level

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. Tables 9.4 and 9.5 provide templates to describe category-level qualitative scores. These do not assess or score how well the policy was implemented; rather, they show the impact of implementation of the policy in achieving transformational change in a given context.

Table 9.4 asks users to 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 of change (30%) and incentives (30%) categories are relatively more important than the norms category (10%) in the example shown in Tables 9.4 and 9.5. For outcomes, each category – scale of outcome and sustaining of outcome over time – is considered equally important for transformational change. Users should arrive at a score at the category level in Table 9.5 based on the individual scores for outcome characteristics in Table 9.3, and provide adequate justification.

Ex-post assessment focuses on observed indicator values. Barriers are inherent in these values, as they would have affected the performance of the policy, which is captured by the indicator in the assessment. Therefore, barriers are not assessed separately in ex-post assessment. Users can nevertheless choose to analyse barriers following the methodology in Section 8.2 – for example, to understand the underlying reasons for a 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 (using hypothetical solar PV policy example)

Category	Score	Rationale for scoring	Relative importance of category and rationale
Technology	2	The policy possibly positively influenced the penetration of solar in the country. But, with its limited focus on rooftop solar, the policy does not facilitate adoption and scale-up of other forms of solar technologies, which are necessary to bring about a large-scale, systemic change in the sector. Further, issues relating to grid integration and energy storage are not addressed, thus preventing large-scale deployment of solar (and other RE technologies) in the country.	30% Given the starting situation, technology, incentives and agents are considered equally important to achieve transformational change in the solar sector.
Agents of change	1	Although the policy had a positive impact on businesses, and influenced entrepreneurs and investors, it did not leverage market forces and engage stakeholders to support the development of a strong constituency for large-scale solar deployment in the country.	30% Given the starting situation, technology, incentives and agents of change are considered equally important to achieve transformational change in the solar sector.
Incentives	2	The policy used financial incentives at its core, which led to the development of enabling institutions and regulations in a few front-runner states. However, it failed to spur new actions involving disincentives to discourage the use of fossil fuels or facilitate utility-scale solar, thus limiting its ability to cause transformational change.	30% Given the starting situation, technology, incentives and agents of change are considered equally important to achieve transformational change in the solar sector.
Norms	0	The policy did not bring about significant shifts in this category. Societal norms and behaviour continue to favour carbon-intensive forms of energy.	10% Changing norms in society is considered less important in the pre-development phase, until the technology has proved its benefits, given the costs, and is ready for take-off.

9.3.2 Aggregating to the impact level

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 the extent and sustained nature of transformation achieved (outcome), and how this transformational outcome is realized (process), contributing to both the scale and entrenchment of the change achieved. Table 9.6 provides the scale for scoring outcome and process impacts.

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, the policy is transformational. If it is 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 Tables 9.4 and 9.5, the ex-post assessment for this hypothetical

TABLE **9.5**

Template for describing results of the ex-post analysis at outcome category level (using hypothetical solar PV policy example)

Category	Score	Rationale for scoring
Scale of outcome – GHGs	1	The policy achieved a minor change in GHG emissions reductions and sustainable development impacts, relative to the starting situation.
Scale of outcome – sustainable development	1	A large net increase in jobs was seen in some regions, but this was not distributed evenly across the country.
Time frame over which outcome is sustained – GHGs	2	The policy's GHG impacts were sustained over the assessment period. There is only a small risk that the gains made may be reversed by removal of the feed-in tariff and subsidies.
Time frame over which outcome is sustained – sustainable development	1	Sustained growth in employment was not seen across the country and was limited to a few pockets.

TABLE **9.6**

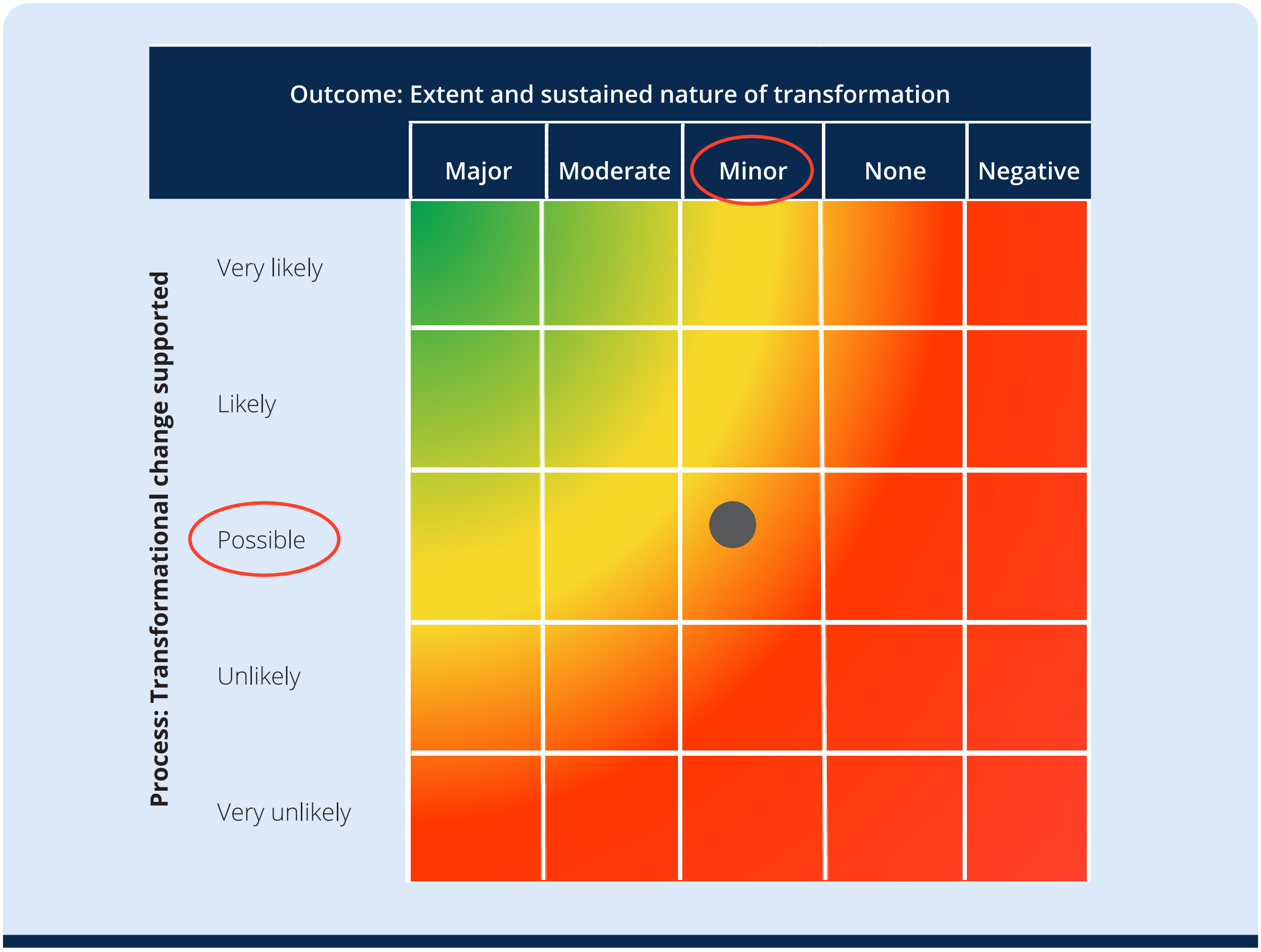
Scale for scoring outcome and process categories

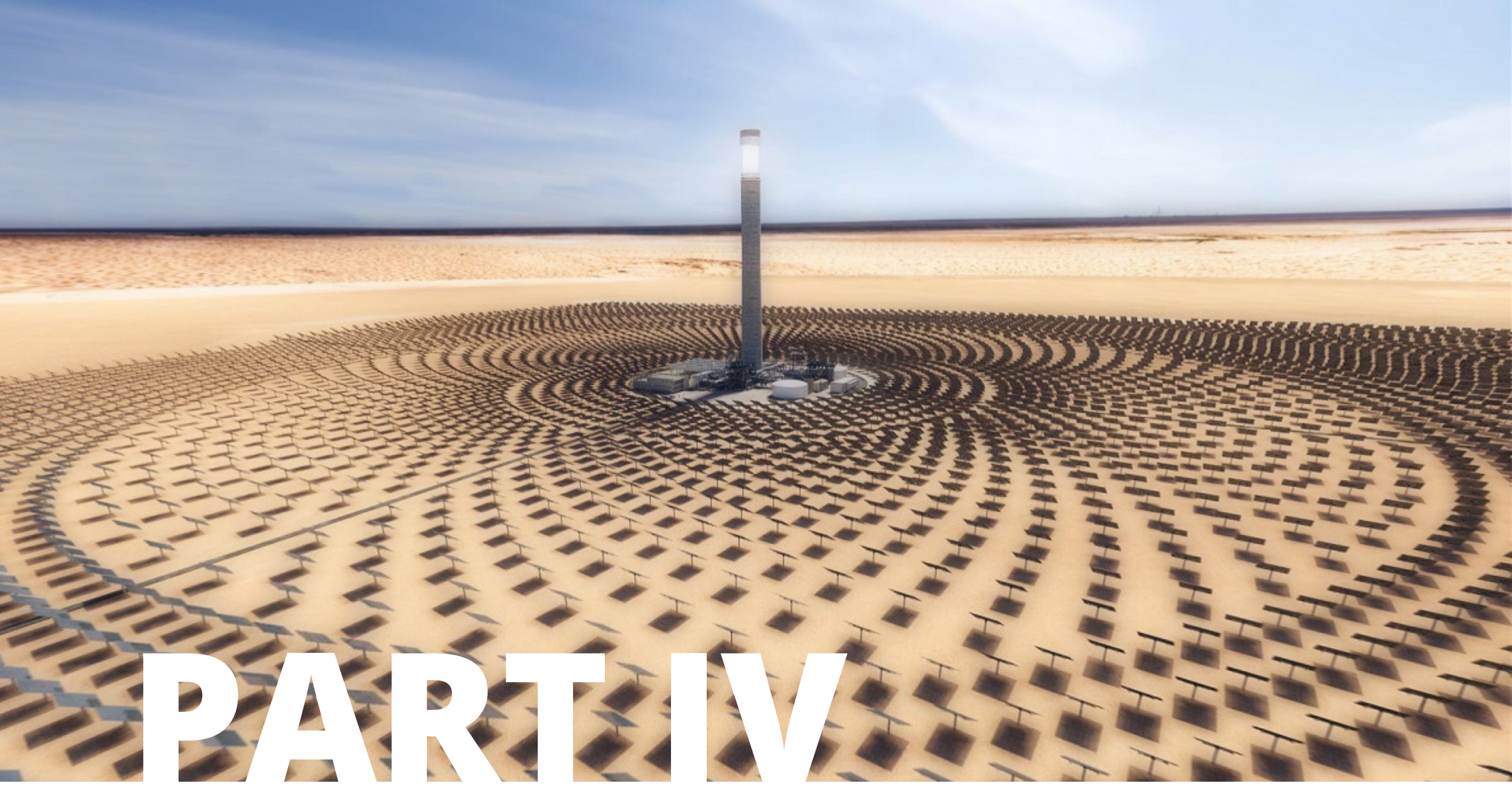
Outcome – extent and sustained nature of transformation achieved	Score	Process – transformational outcome	Score
Major	3	Very likely	4
Moderate	2	Likely	3
Minor	1	Possible	2
None	0	Unlikely	1
Negative	–1	Very unlikely	0

policy concludes that the process has possibly supported transformation, but the extent of transformation achieved is minor. The policy has given a boost to rooftop solar PV in the country, particularly within the rooftop solar subsector, has been well implemented, and produced sustained results. The policy has built foundational institutional and regulatory structures to support renewables more broadly, contributed to energy access, engaged entrepreneurs and markets, developed relevant skills, generated jobs and made solar power more visible. However, it falls short of driving systemic transition across the solar or renewable energy sectors. Complementary policies that facilitate solar energy deployment at a utility scale, and technological advances in grid integration and energy storage to absorb increased amounts of intermittent renewable power are urgently needed to scale up the share of solar in the country – along with the focus on rooftop solar PV. The policy falls short of facilitating transformational change as a result of its limited focus on rooftop solar, which alone is not able to cause systemic shifts.

FIGURE **9.2**

Transformational impact matrix (using solar PV policy example)





PART IV

Monitoring and reporting

10 Monitoring performance over time

Monitoring performance of key indicators over time helps users assess progress and understand whether a policy is on track to achieve the desired transformational impacts. This chapter provides information on developing a monitoring plan and regularly following the performance of a policy. Users conducting ex-ante assessment can choose to skip this 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 are used to track performance of the policy 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 that is useful for assessing trends. It also provides an opportunity for modifications of policies during the implementation period if progress is not as planned. The first step is to define the monitoring period and monitoring frequency.

10.1.1 Monitoring period

The monitoring period is the time period over which the policy is monitored. It is a *key recommendation* to define a monitoring period that is long enough to capture the full range of transformational change impacts.

The monitoring period includes the assessment period, which is the time period over which GHG impacts resulting from the policy are assessed. There may be a number of assessments (and therefore assessment periods) during the monitoring period.

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 begin before implementation starts. Monitoring in advance of the implementation period can help define the starting situation. It also improves the ability to monitor and evaluate at later stages. In general, the longer the monitoring period, the more robust the impact assessment.

10.1.2 Monitoring frequency

The monitoring frequency is generally decided at the beginning of the monitoring period. Users can

FIGURE **10.1**

Overview of steps in the chapter

Define the monitoring period and frequency (Section 10.1) → Develop a monitoring plan (Section 10.2) → Monitor indicators over time (Section 10.3) 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 the ICAT *Stakeholder Participation Guide* for engaging stakeholders in this regard (Chapter 5).

Deciding on the 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 and an understanding of existing data-collection practices are helpful to determine frequency. For example, if a policy goal is to create green jobs over 20 years, the indicator relating 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 relating to the 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 includes short-term, medium-term and long-term targets, monitoring should take place at a minimum at the critical milestones. For example, 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 solar PV share in the 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 identify early warning signs, underlying causes and possible intervention strategies to ensure that progress continues. For example, awareness-raising, capacity-building and high-level advocacy can be important for encouraging diffusion and scale-up of solar PV technologies when they are first introduced to a market. Therefore, indicators relating 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 NDCs 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, users should 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 the 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. Section 10.1 discusses these in detail.

- **Collecting and managing data.** Identify the databases, tools or software systems that are used to collect and manage data and information. Understand what data exist and in what format, how the data are collected, and critical data gaps. Use this knowledge to develop a process to collect information, such as a description of the indicator, whether qualitative or quantitative data are needed, the 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 that the quality of data enhance confidence in the assessment results. QA is a planned review process conducted by personnel who are not directly involved in data collection and processing. QC is a procedure or routine set of steps 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.

- **Continual improvement.** Include processes for improving the methods for collecting and analysing data, and monitoring impacts.

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

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

10.3 Monitor indicators over time

Monitoring of indicators helps users track performance of the policy over time. It is a *key recommendation* to identify the key performance indicators that are 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 over time. Appendix A provides examples of indicators for process and outcome characteristics of transformational change. Section 7.1 also discusses selection of indicators to assess a policy's impact in relation to the starting situation. When selecting indicators, users should consider the intended objectives of monitoring, the nature of the policy, characteristics being assessed, stakeholder priorities, and feasibility. Feasibility may depend on data availability, resources needed and technical capacity to collect data. If data are not available or it is not cost-effective to collect data for an indicator, users can either consider using proxy data or select another indicator (where possible). Reasons for selecting indicators and data-related assumptions should be explained and justified.

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

TABLE **10.1**

Template for data collection (using the hypothetical solar PV policy example)

Indicator	Type of data (quantitative/ qualitative)	Monitoring frequency and date of collection	Data source and collection method	Responsible entity	Observed data (unit)
Number of new solar PV installation businesses	Quantitative	Annual (January 2015)	Business licence applications	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%

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, they should document the differences and use the monitoring results to update the ex-ante estimates.

10.3.1 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 the range of 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 where responsibilities are delegated to different institutions. For greater efficiency, users may wish to entrench these roles in institutions responsible for monitoring of long-term strategies, NDCs, or national climate or development plans. This also reduces the risk of funding gaps for monitoring over long periods. Further, depending on the data sources identified, it may be worthwhile pursuing formal partnerships or memorandums of understanding (MOUs) for longer-term data collection, and assessing opportunities such as a 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 monitoring, reporting and verification (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. If necessary, the coordination body should be provided with a legal mandate to collect and monitor information. Given the long-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 the information listed in Section 11.1)

11.1 Recommended information to report

It is a *key recommendation* to report information about the assessment process and the transformational impacts resulting from the policy (including the information listed below). A reporting template is provided for users on the ICAT website. Where two or more methodology documents are applied to a policy, the general information and policy description only need to be reported once. The list below does not cover all chapters in this document because some chapters provide information not relevant to reporting. Refer to the ICAT *Stakeholder Participation Guide* (Chapter 7) to learn more about providing information to stakeholders.

Chapter 2: Objectives of assessing transformational change

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

Chapter 4: Steps and assessment principles

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

Chapter 5: Describing the policy, and the assessment boundary and period

- Whether the assessment applies to an individual policy or a package of related policies; if a package is assessed, which policies are included in the package
- A description of the policy (or package of policies), including the information in Table 5.1
- Whether the assessment is ex-ante, ex-post, or a combination of ex-ante and ex-post
- The assessment boundary, in terms of impacts covered, and geographical and sectoral coverage
- The assessment period

Chapter 6: Choosing which transformational change characteristics to assess

- The phase of transformation, to understand the context in which the policy is being implemented
- The policy's vision for transformational change, including the information in Table 6.3
- Identified barriers to transformational change, including the information in Table 6.4
- Relevant transformational change characteristics of the policy, including the information in Tables 6.6 and 6.7

Chapter 7: Assessment of the starting situation

- The starting situation for characteristics impacted by the policy, including the information in Tables 7.1 and 7.2

Chapter 8: Estimating transformational 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 realized over the assessment period, including the underlying rationale

- Disaggregated results in terms of the policy's expected impact on individual characteristics, including the information in Tables 8.2, 8.3, 8.4 and 8.5

Chapter 9: Estimating transformational 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's impact on individual characteristics, using indicators, including the information in Tables 9.2, 9.3, 9.4 and 9.5

Chapter 10: Monitoring performance over time

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

Chapter 12: Learning, decision-making and interpreting results

- Insights gained from the assessment, and how results are used to revise ongoing or future policies

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 information on how to understand the assessment results, and apply insights gained at different stages of planning and implementation in the policy cycle.

Checklist of key recommendations

- Describe insights gained from the assessment, and how results are used in revising objectives, and in design, planning and implementation of ongoing or future policies

12.1 Understanding assessment results

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

The assessment that has been described in this document 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 interacting 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 was 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 way in which complex systems evolve over the long term. Uncertainty increases when the objective is to deviate from established pathways. This uncertainty limits the degree to which users can rely solely on established methods of predicting future development based on past experiences of trends and drivers. Ascertaining what triggers the deviation and what magnitude of change can be expected is highly speculative. This is one reason why this methodology focuses on the transparency of reporting of assumptions and choices made.

Much flexibility is provided at each step of the assessment framework, because the methodology is applicable to a wide variety of policies. Different choices made during the assessment limit the comparability of results between different assessments.

Despite these limitations, the assessment results can greatly aid in prioritizing 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 some aspects of the results of the assessment described in this methodology. Also, depending on the case, disaggregated and singular results (e.g. 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 (e.g. a numerical score at the category level stating that the expected impact of a policy for technology change is 3).

12.2 Applying 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 different types of results from the assessment (e.g. at a more or less aggregate level) depends strongly on:

- the objective of the assessment
- the status of the policy in the implementation cycle.

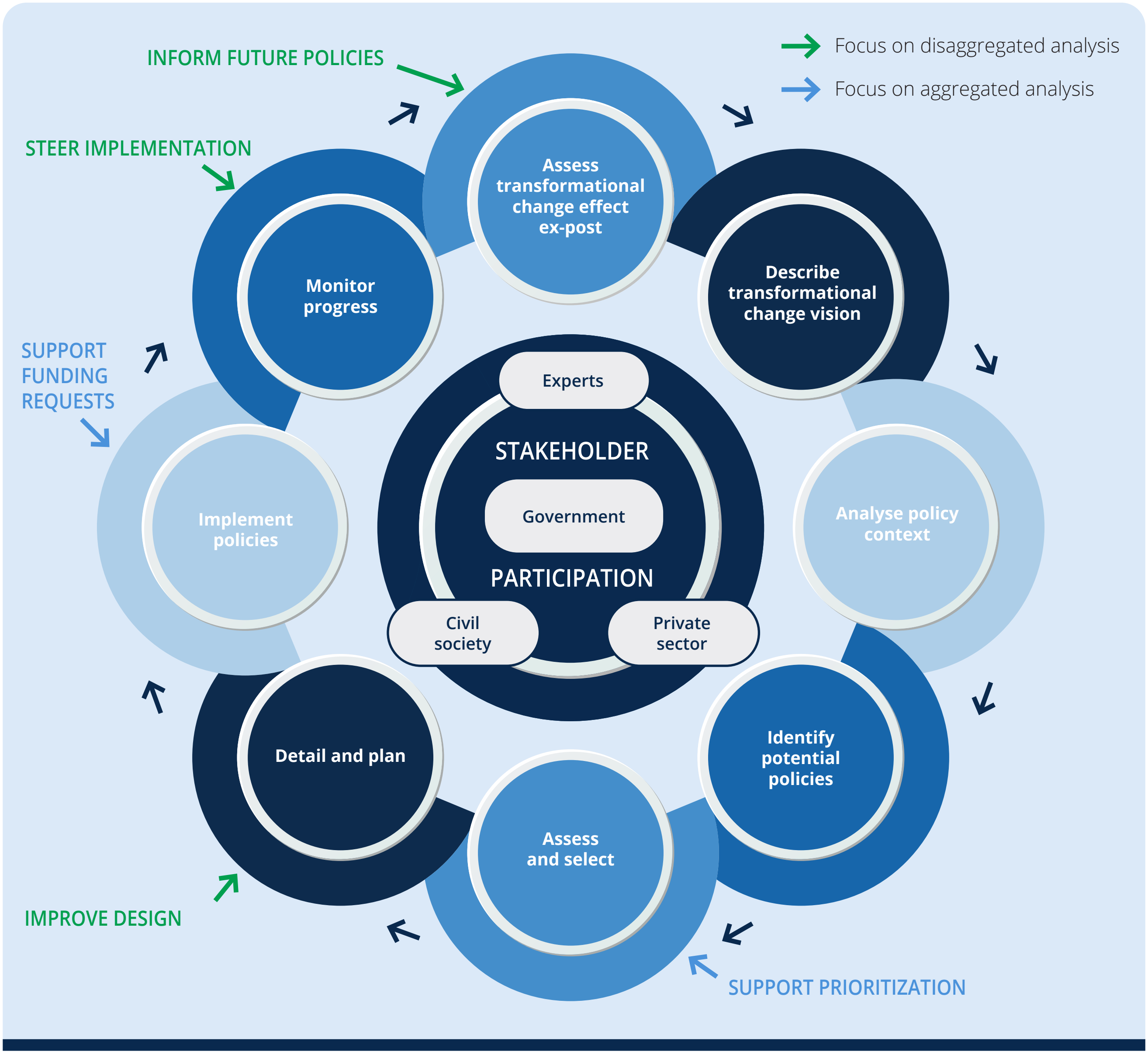
It is a *key recommendation* to describe insights gained from the assessment, and how results are used in revising objectives, and in design, planning and implementation of ongoing or future policies.

The assessment will be carried out either by the entity (or entities) that is planning and implementing the policy (or commissioned by this entity) or by an independent user who is not responsible for policy implementation. Independent users could be research organizations, private consultants or civil society groups. The objectives of assessing a policy 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. The following discussion therefore concentrates 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. See 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



12.2.1 Support prioritization and inform policy design options

An aggregated result describes the extent of transformation expected or achieved by the policy, as well as how likely it is that the impact can be achieved. This enables comparison and prioritization 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 (e.g. resources needed, effects on stakeholders, sustainable development benefits) considered in decision-making.

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

12.2.2 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 organizations may have different definitions and criteria for transformational change from the one used in this methodology document. At the same time, there is sufficient flexibility in the methodology to enable users to use the results for various purposes.

12.2.3 Steer implementation and inform future policies

Detailed results from assessments conducted during policy implementation help users understand whether the policy is on track, modify the course of the policy as needed (instead of ending potentially transformative policies too soon) and address new barriers or barriers that may have been overlooked in the design stage. Disaggregated information from ex-post assessment can also inform the design of future policies, including informing updates of NDCs or long-term strategies and plans, by providing valuable insights into what worked and reasons for not achieving the desired impact. Ex-post assessment can thus contribute significantly to future planning. Box 12.1 provides a case study example on how applying the ICAT *Transformational Change Methodology* can contribute to learning and improved policy design.

BOX **12.1**

Learning from transformational impact assessment in Mexico

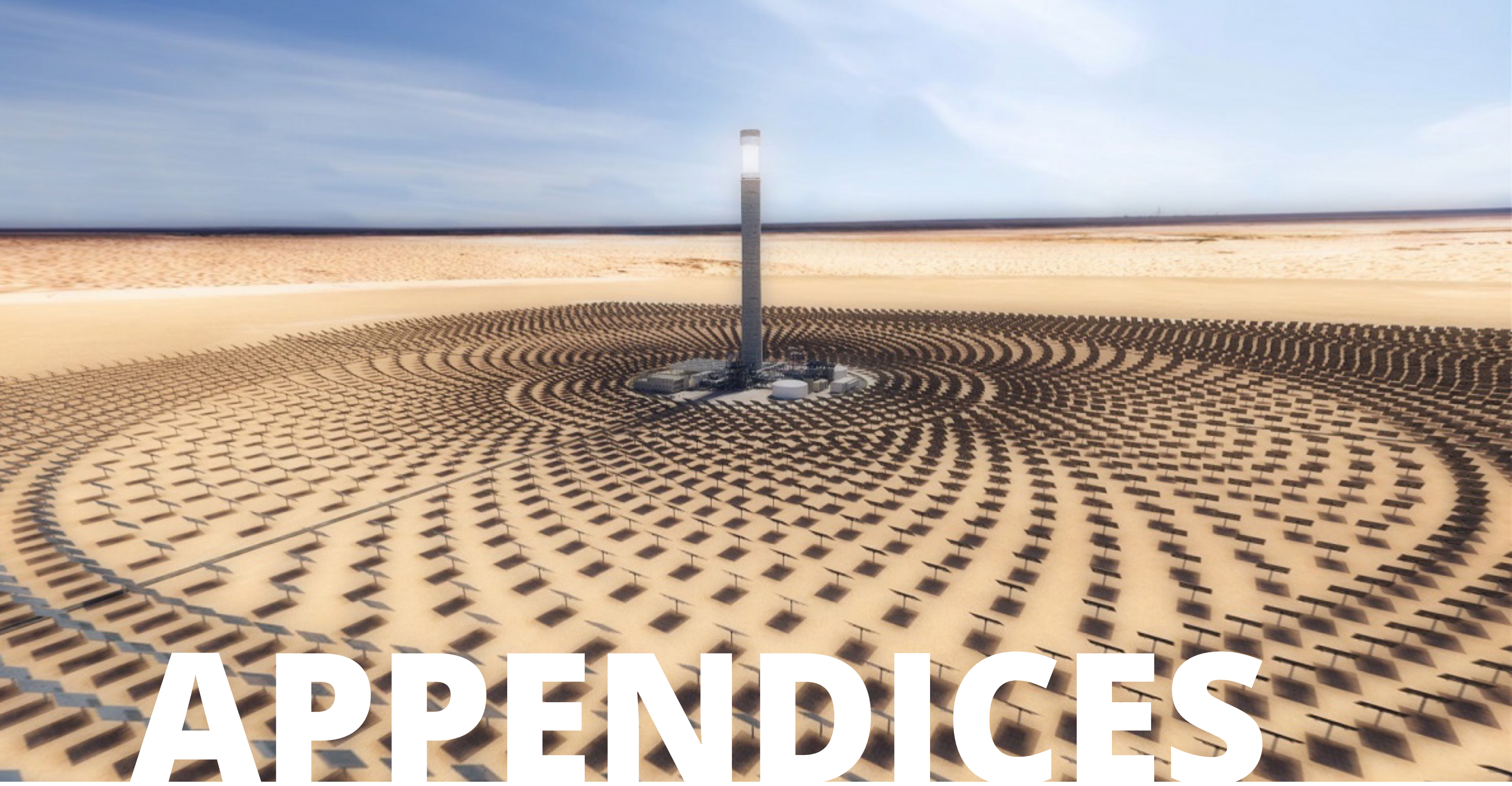
In Mexico, the Grupo Ecológico Sierra Gorda, a national NGO, is coordinating the implementation of the nationally appropriate mitigation action (NAMA) of "Subnational Mitigation Actions for the Regeneration of Landscapes". The NAMA involves state-led actions for the regeneration of forests and the implementation of planned grazing in 12 states.

The initial decision of the Grupo Ecológico to apply the ICAT *Transformational Change Methodology* was prompted by its interest in submitting a funding proposal to an international donor that prioritizes the funding of NAMAs that catalyse transformational change towards sustainable low-emission development. With limited prior experience with the theory and literature of transformational change, the Grupo Ecológico found the process of evaluating the potential for transformational change using the ICAT guidance document to be a learning experience. It helped to improve the design of the NAMA and articulate more clearly the expected transformational impacts of the NAMA to potential supporters and donors.

Concrete examples of resulting improvements to NAMA design included:

- a specific objective was added focusing on regeneration issues in government programmes, technical support, incentives and finance mechanisms for the target sectors
- formation of a critical mass of public official decision makers, NGOs, educators, technicians and producers committed to regenerative management
- incorporation of a public awareness campaign in key cities
- a new integrated landscape management orientation for the NAMA, with greater emphasis on intersectoral coordination and the clustering of interventions geographically in high-priority landscapes.

This new orientation resulted in the current name of the NAMA.



APPENDICES

Appendix A: Examples of indicators for process and outcome characteristics

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

It mainly addresses the energy sector, but also includes some examples for other sectors.

TABLE **A.1**

Examples of outcome indicators

Category	Characteristics	Indicators
Scale of outcome – GHGs and sustainable development	Macro level	• Share of total GHG emissions reductions or removals globally, regionally, by sector or by subsector • Share of a global or national sustainable development goal, measured by an indicator • Share of zero-carbon emissions in electricity generation compared with global best practices • Average total emissions per kWh • Change in RE use (e.g. solar, wind) compared with the starting situation • Phase-out of coal – number (and level) of new investments in coal plants • Phase-out of other fossil fuels – number (and level) of new investments in fossil fuel plants, and in fossil fuel exploration and extraction • Share of RE (e.g. solar, wind) in generation mix • New investments in RE by technology • RE installed capacity (MW) and associated costs ($/MW installed) • RE net generation (kWh) • Emissions abated in the energy sector (tCO_2e) compared with business as usual • Emissions intensity in the energy sector (gCO_2e/kWh) • Energy intensity of the economy (kJ/GDP) • Emissions intensity of the economy (tCO_2e/GDP) • Cost of electricity from RE sources by technology ($/kWh) • Energy access (number of households or people with access to electricity or improved access) • Avoided energy demand megawatt (MW) • CO_2e emissions from nitric acid plants • Number of plants equipped with N_2O abatement technology

TABLE A.1, continued

Examples of outcome indicators

Category	Characteristics	Indicators
Scale of outcome – GHGs and sustainable development, continued	Medium level	• Share of a national sustainable development goal, measured by an indicator • Limiting of growth of final energy use in the sector or subsector targeted to X%, compared with 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 (and level) of investments in new coal plants • Phase-out of other fossil fuels – number (and level) of new investments in fossil fuel plants, and in fossil fuel exploration and extraction • Share of RE (e.g. solar, wind) in national generation mix • New investments in RE by technology (country or state) • RE installed capacity (MW) and associated costs ($/MW installed) • RE net generation (kWh) • Emissions abated in the energy sector (tCO_2e) compared with business as usual • Emissions intensity in the energy sector (gCO_2e/kWh) • Energy intensity of the economy (kJ/GDP) • Emissions intensity of the economy (tCO_2e/GDP) • Cost of electricity from RE sources by technology ($/kWh) • Energy access (number of households or people with access to electricity or improved access) • Avoided energy demand megawatt (MW) • GHG impacts (tCO_2e) of NAMA by sector • GHG impacts as percentages of NDC sectoral goals • Value of economic and environmental returns by sector • CO_2e emissions from nitric acid plants • Number of plants equipped with N_2O abatement technology nationally
	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 • Phase-out of coal – number of investments in new coal plants • Phase-out of other fossil fuels – number (and level) of new investments in fossil fuel plants, and in fossil fuel exploration and extraction • Number of households with solar home systems • New investments in RE by technology • Energy access (number of households or people with access to electricity or improved access) • GHG impacts (tCO_2e) of NAMA, average per state • Value of economic and environmental returns, average by state • CO_2e emissions from nitric acid plants • Number of plants equipped with N_2O abatement technology (taking into account plant capacity and abatement efficiency of the chosen catalyst)

TABLE **A.1,** continued

Examples of outcome indicators

Category	Characteristics	Indicators
Time frame over which outcome is sustained – GHG and sustainable development	Long term	• By 2100, phase-out of all fossil fuels • By 2050, phase-out of coal plants • Long-term RE goals • Sustainable development benefits by 2050 (disaggregated by sustainable development impacts) • GHG impacts (tCO_2e) over the long term (e.g. 2029–2040) • Value of economic and environmental returns over the long term (e.g. 2029–2040) • CO_2e emissions from nitric acid plants
	Medium term	• By 2030, achievement of global and national sustainable development goals • By 2030, phase-out of X% of coal plants • Limiting of growth of final energy use in the sector or subsector targeted to X% by 2030, compared with the starting situation • GHG impacts (tCO_2e) over the medium term (e.g. 2019–2028) • Value of economic and environmental returns over the medium term (e.g. 2019–2028) • Number of plants equipped with N_2O abatement technology
	Short term	• By 2020 achieve X% of the Sustainable Development Goals • By 2020 phase out of X% of coal plants • Limiting of growth of final energy use in the sector or subsector targeted to X% by 2020, compared with the starting situation • GHG impacts (tCO_2e) in the short term (e.g. 2015–2018) • Value of economic and environmental returns in the short term (e.g. 2015–2018)

Sources: Vieweg and Noble (2013); UN (2016); Westphal and Thwaites (2016); IEA(2017)

TABLE **A.2**

Examples of process indicators

Category	Characteristics	Indicators	References
Technology	Research and development (R&D)	• R&D investments/funding • Patents registered (applied for) • Number of centres, think tanks or institutes of learning • Number of trainings and rate of participation • Number of new testing/laboratory facilities • Number of new business models with an element of innovation • Number of states that integrate the technological package in subnational actions	• Bergek et al. (2008) • Laursen and Salter (2004)

TABLE A.2, continued

Examples of process indicators

Category	Characteristics	Indicators	References
Technology, continued	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 • Number of subnational actions for forest regeneration • Number of subnational actions for implementation of planned grazing	• OECD (2005) • Fageberg (2005)
	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 • Number of forest properties that implement regenerative actions as part of subnational actions • Number of ranches that implement planned grazing as part of subnational actions • Ratio of plants with abatement technology and monitoring equipment to the total number of plants (including those without such equipment) within a country	• Nygaard and Hansen (2015) • Nemet (2009) • Peters et al. (2012)
Agents of change	Entrepreneurs	• Number of new entrepreneurs and new entrants in low-carbon sectors • Provision of training in entrepreneurship • Incentives provided for new entrepreneurs (e.g. subsidies, seed funding for small and medium-sized enterprises, research support) • Number of public–private partnership projects • Volume of venture capital investments • Share of private funding and public funding • MOUs signed, projects in pipeline • New models of partnerships formed with government/firms and donors • Entrepreneurs trained for regenerative management	• Langevang, Namatovu and Dawa (2012) • Kemp, Schot and Hoogma (1998)

TABLE **A.2,** continued

Examples of process indicators

Category	Characteristics	Indicators	References
Agents of change, continued	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 (organizations or committees committed to low-carbon development that have been established or significantly strengthened, and actively lobby for changes) • Number of advocacy programmes, campaigns and initiatives • Civil society organizations denouncing unsustainable, high-carbon practices and behaviour • Community surveys/preferences denouncing the outreach of unsustainable practices • Number of leaders and authorities bringing up, promoting or demonstrating zero-carbon development practices and changed behaviour • Number of civil society organizations that collaborate with subnational actions of a NAMA • Number of exchanges or meetings between an initiative's members (e.g. Nitric Acid Climate Action Group members – governmental level or plant operators) and key actors not directly involved in the initiative, such as the World Bank carbon market programme and labelling initiatives, who could influence all developing country players to take action	• Lundvall (1992) • Hekkert et al. (2011) • Kebede, Mitsufuji and Choi (2014) • Ockwell and Byrne (2015) • Hellsmark and Jacobsson (2009) • NAMA Facility (2015)
	Beneficiaries	• Number of grassroot campaigns in favour of low-carbon practices • Number of owners and holders of forest lands and grazing lands that implement regenerative practices • Number of governments that become involved with an initiative and support its vision (e.g. signatories of a joint declaration of support) • Number of plants that become involved with an initiative and support its vision	

TABLE A.2, continued

Examples of process indicators

Category	Characteristics	Indicators	References
Incentives	Economic and non-economic	• New subsidies and tariff structures, such as renewable energy obligations, feed-in tariffs, renewable energy auctions and value-added tax (VAT) exemption • New MOUs signed • New projects in pipeline • New models of partnerships formed with government/firms and donors (i.e. models that create access to resources and services, thus incentivizing conscious behaviour towards resource use) • Number of financing mechanisms that encourage the regenerative actions of a landscape regeneration NAMA • Number of economic and non-economic incentives in place at the national level (e.g. moratorium on deforestation, ban on coal power plants)	• Johnstone, Haščič and Popp (2010) • Butler and Neuhoff (2008) • Norberg-Bohm (2000) • Westley et al. (2011) • Painuly (2001) • Gallastegui (2002) • Kiss, Manchón and Neij (2013)
	Disincentives	• Disincentives provided via carbon pricing/tax, increase in petrol/diesel prices, car registration tax etc. • Number of counterproductive subsidies eliminated • Number of national policies that create a disincentive for unabated N_2O emissions	• Wesselink et al. (2013) • Hansen and Coenen (2016)
	Institutional and regulatory	• Number of new regulations and institutions to promote low-carbon practices • Number of subnational actions for forest regeneration • Number of subnational actions for implementation of planned grazing • Number of regulations or policies in place at the national level	
Norms	Awareness	• Number of open debates, statements or publications highlighting the insufficiency of current practices • Number of leaders and organizations pushing/heading debates questioning current practices and pathways, and lobbying for behavioural change • Number of information workshops and similar platforms • Number of awareness generation programmes through private sector or business associations, etc. • Number of initiatives targeting public opinion on ethical and moral issues (e.g. agenda setting) • Number of awareness campaigns • Number of governments that understand the potential of the nitric acid sector for climate protection measured through, for example, awareness-raising activities such as communication materials or events held • Actions undertaken as a result of enhanced awareness among government officials	• Nygaard and Hansen (2015) • Wüstenhagen, Wolsink and Bürer (2007)

TABLE **A.2,** continued

Examples of process indicators

Category	Characteristics	Indicators	References
Norms, continued	Behaviour	• New government persuasion programmes, appealing to the collective conscious through the medium of advertising • New government enforcement programmes and initiatives compelling behavior change • Policies targeting change in norms and rules (e.g. dynamic pricing regulation) • Number of young leaders trained (future generation to keep momentum and sustain change) • 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 • Number of owners and trained owners	• McAdams (1997) • Shove (2003) • Lapinski and Rimal (2005) • Kinzig et al. (2013)
	Social norms	• New regulatory standards (e.g. mandatory emission levels) • New laws making previous behaviour illegal • Number of users affected • Checks and balances introduced to prevent fallbacks to previous practices and behaviour • Number of awareness campaigns	• EEA (2013) • Ambec et al. (2013) • David and Sinclair-Desgagné (2005)

Appendix B: 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. Table B.1 provides a summary of the steps in the assessment process where stakeholder participation is recommended and why it is important, noting where relevant information can be found in the ICAT *Stakeholder Participation Guide*.

TABLE **B.1**

Steps where stakeholder participation is recommended in transformational change impact assessment

Chapter/section in this document	Why stakeholder participation is important at this step	Relevant chapters in *Stakeholder Participation Guide*
Chapter 2 – Objectives of assessing transformational change	• Ensure that the objectives of the assessment respond to the needs and interests of stakeholders	Chapter 5 – Identifying and understanding stakeholders
Chapter 4 – Steps and assessment principles • Section 4.2 – Planning the assessment	• Build understanding, participation and support for the policy 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 • 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 6 - Choosing which transformational change characteristics to assess • Section 6.3 – Describe the vision for transformational change of the policy • Section 6.4 – Identify barriers to transformational change • Section 6.5 – Choose transformational change characteristics to be assessed	• Reflect diverse stakeholder interests and concerns in the vision for transformational change • Enhance completeness of identification of transformational change characteristics with stakeholder insights • Ensure that indicators and frequency of monitoring reflect stakeholder interests and information needs • Improve identification of barriers to transformational change with stakeholder insights	Chapter 8 – Designing and conducting consultations

TABLE **B.1,** continued

Steps where stakeholder participation is recommended in transformational change impact assessment

Chapter/section in this document	Why stakeholder participation is important at this step	Relevant chapters in *Stakeholder Participation Guide*
Chapter 8 – Estimating transformational impacts ex-ante • Section 8.1 – Assess characteristics	• Minimize 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 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 that 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 to stakeholders

Abbreviations and acronyms

CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
GDP	gross domestic product
GHG	greenhouse gas
Gt	gigatonne
GW	gigawatt
ICAT	Initiative for Climate Action Transparency
IPCC	Intergovernmental Panel on Climate Change
kJ	kilojoule
kW	kilowatt
kWh	kilowatt-hour
MOU	memorandum of understanding
NDC	nationally determined contribution
NGO	non-governmental organization
N_2O	nitrous oxide
PV	photovoltaic
SDG	Sustainable Development Goal
TWG	Technical Working Group

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 a policy are assessed. The assessment period can differ from the policy implementation period (the time period over which the policy 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 transformational impacts of a policy
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 a policy for each facility, project or entity affected by the policy, then aggregate across all facilities, projects or entities to determine the total impact of the policy
Category of transformational change	A group of transformational characteristics that describe processes of change (technology, agents of change, 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 can result in changes of characteristics describing a system that lead to processes of change and outcomes of change.
Ex-ante assessment	The process of assessing expected future transformational change impacts of a policy (i.e. a forward-looking assessment)
Ex-post assessment	The process of assessing historical transformational change impacts of a policy (i.e. a backward-looking assessment)
Expert judgment	A carefully considered, well-documented qualitative or quantitative judgment made in the absence of unequivocal observational evidence by a person or persons who have a demonstrable expertise in the given field[21]
Impact assessment	The qualitative or quantitative assessment of transformational impacts resulting from a policy, either ex-ante or ex-post
Impact type	A result of transformational change that describes 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 following: (1) relevant legislation or regulation is in force, (2) one or more voluntary agreements have been established and are in force, (3) financial resources have been allocated, (4) human resources have been mobilized

[21] IPCC (2006).

Indicator of transformational change	For qualitative assessment, a variable that can be assessed to indicate the impact of a policy 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 on a characteristic of transformational change.
Monitoring period	The time over which a policy is monitored, which may include pre-policy monitoring and post-policy monitoring in addition to the policy implementation period
Outcome of transformational change	The change in GHG emissions reductions and sustainable development impacts at scale and sustained over time resulting from a policy
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 stabilization or relapse.
Planned policies	Policy options that are under discussion and have a realistic chance of being adopted and implemented in the future, but 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
Policy implementation period	The time period during which a policy 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 of change, incentives and norms.
Stakeholders	People, organizations, communities or individuals who are affected, by and/or who have influence or power over, a policy
Starting situation	The current situation of a selected historical year before implementation of a policy that describes the phase of transition and the status of selected indicators as a benchmark for tracking performance
Sustainable development impacts	Changes in environmental, social or economic conditions that result from a policy, such as changes in economic activity, employment, public health, air quality, 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 United Nations SDGs

Transformational impact — Changes in system characteristics resulting from a policy, described by processes and outcomes of transformational change with regard to GHG and sustainable development impacts at scale and sustained over time

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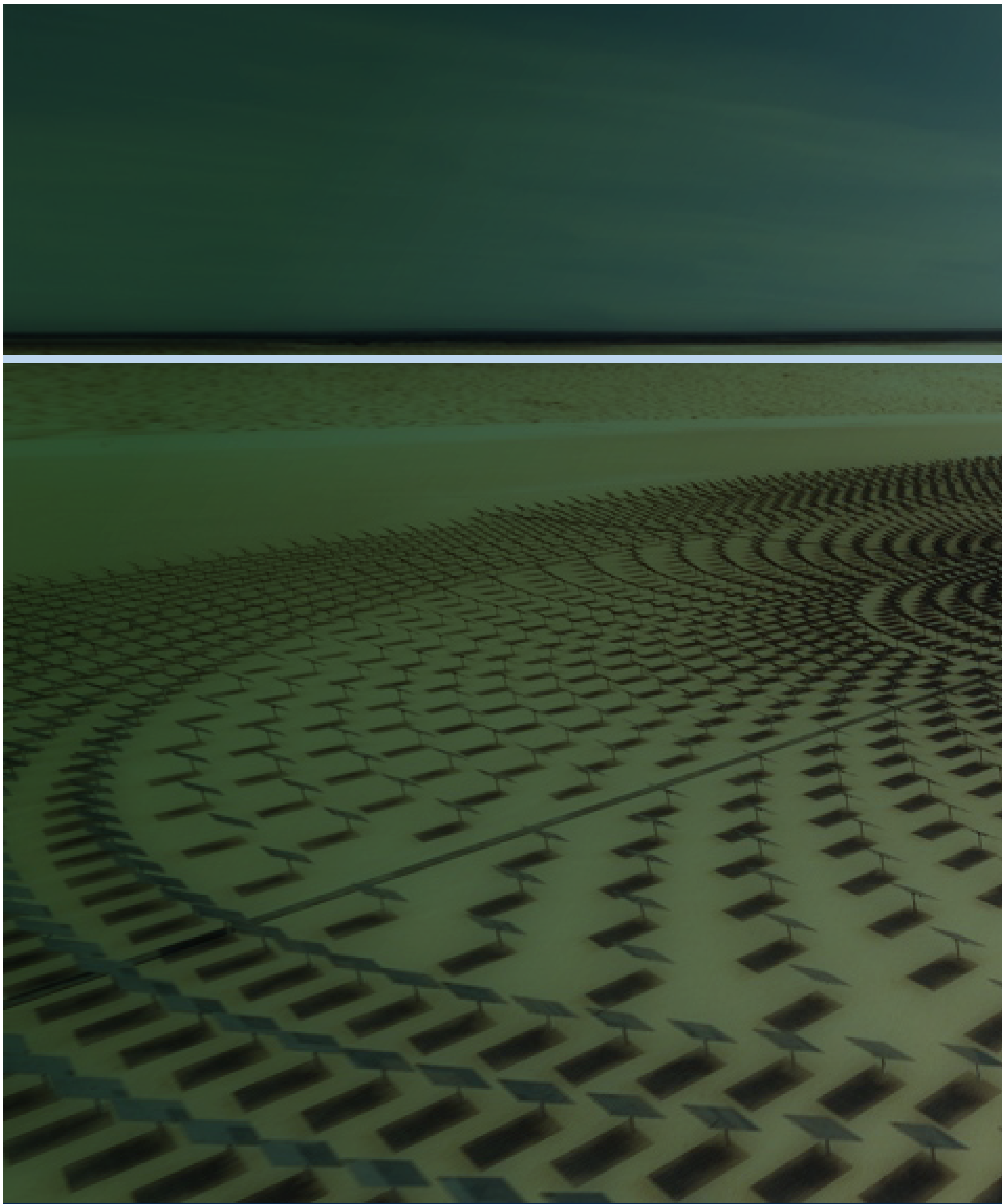

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