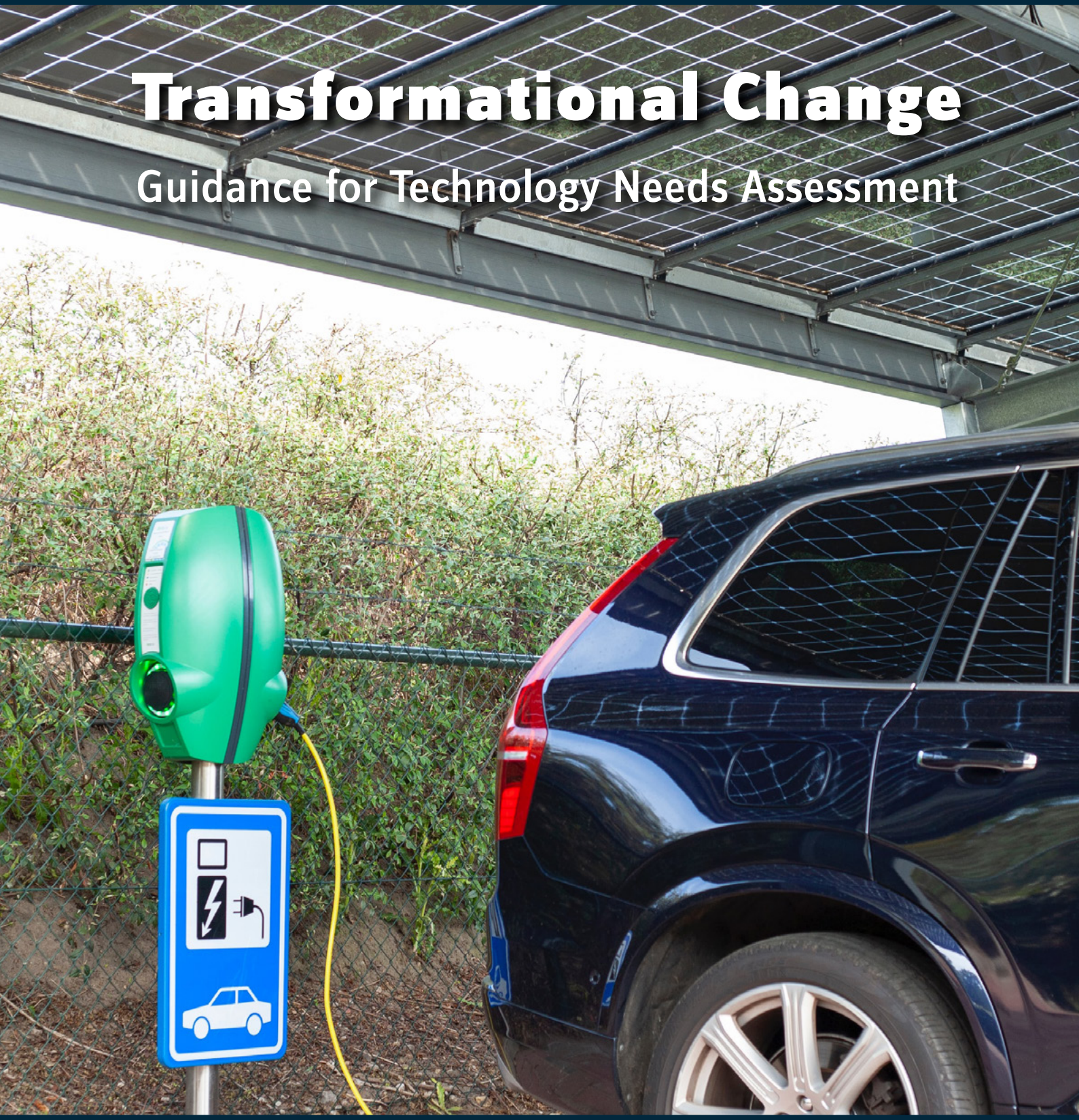
TECHNOLOGY NEEDS ASSESSMENT

Transformational Change

Guidance for Technology Needs Assessment



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CONTENTS

1. BACKGROUND

1.1 OBJECTIVES OF THE GUIDANCE NOTE

Transformational technology cooperation aims to promote systemic, multi-level change for a sustainability transition aligned with the Paris Agreement and the 2030 Agenda global goals. Support to developing countries through Technology Needs Assessments (TNAs), including Technology Action Plans (TAPs), has been provided by the UNFCCC and has played a key role in the identification of climate-related technologies that are responsive to countries' mitigation and adaptation technologies since 2010, when the Technology Mechanism of the UN Climate Convention was established. Implementation of these identified technologies paves the way towards countries' low-carbon and climate-resilient development.

Essential to this support effort has been the provision of guidance material to address key issues related to TNA. The present guidance note adds to this library of material, focussing on the consideration and incorporation of transformational change in the TNA process. This guidance therefore reflects upon and provides guidance to countries on how to promote transformational change through the TNA process, thereby contributing to the achievement of the transformational changes envisioned in the Paris Agreement through the Nationally Determined Contributions (NDCs).

Building on the notion of transformational change outlined in the Paris Agreement, the 2030 Agenda and the UNFCCC Technology Framework, the concept is defined, and its operationalisation discussed in the context of the TNA process. Two case studies from previous TNAs, in Mongolia and Moldova, illustrate how transformational characteristics, outcomes and impacts can be assessed and promoted. Finally, the guidance note presents strategic opportunities and recommendations for TNAs to promote transformational change.

1.2 TNAS AND TRANSFORMATIONAL CHANGE IN THE CONTEXT OF THE 2030 AGENDA, PARIS AGREEMENT AND TECHNOLOGY FRAMEWORK

TNAs are a set of country-driven activities that lead to the identification, prioritisation, and implementation of climate technologies to mitigate and/or adapt to the impacts of climate change. As a participatory and country-driven process, country teams develop their TNAs and Technology Action Plans (TAPs) for selected priority sectors, guiding them towards implementation of NDCs to the Paris Agreement and achievement of national Sustainable Development Goals (SDGs). Almost 100, predominantly developing countries, have carried out the TNA process through participation in the GEF-funded Global Technology Needs Assessment project, which is implemented by UNEP through the UNEP Copenhagen Climate Centre.

A TNA process is comprised of three main steps aimed at identification and prioritisation of sectors and technologies, barrier analysis and enabling framework identification, and developing TAPs. A recent addition is that countries also develop project concept notes targeting climate funding agencies and technical support institutions, with the aim to bridge the gap between the TNA results and the actual implementation of the TAPs on the ground. The TNA process thus supports countries in developing project pipelines for the financial mechanisms of the Climate Change Convention as well as potential climate donors or funders (UNEP DTU Partnership, 2019 & 2020).

The 2030 Agenda for sustainable development

A vision for transformational change is stated in 'Transforming our world: 2030 Agenda for Sustainable Development' (UN General Assembly, 2015): "On behalf of the peoples we serve, we have adopted a historic decision on a comprehensive, far-reaching and people-centred set of universal and transformative Goals and targets." The SDGs are universal, integrated, and indivisible and aim to transform the world for the better if realized. Climate change is recognized as one of the greatest challenges, threatening the survival of many societies, the bio-physical support systems of the planet and undermining the ability of countries to achieve sustainable development. For Goal 13 'Take urgent action to combat climate change and its impacts' the United Nations Framework Convention on Climate Change (UNFCCC) is acknowledged as the primary international forum for negotiating the global response to climate change.

Technology in the Paris Agreement, the UNFCCC Technology Framework, and the Technology Mechanism

The aim of the Paris Agreement (UN, 2015) described in its Article 2 is to strengthen the implementation of the UNFCCC (1992) by setting the long-term goal to hold the global average temperature increase below 2°C above the pre-industrial level and pursue efforts to limit the temperature increase to 1.5°C. In Article 10 (§4) of the Paris Agreement, a Technology Framework is established to provide overarching guidance for

the Technology Mechanism under the UNFCCC in pursuit of the long-term vision to fully realize technology development and transfer to improve the resilience to climate change and reduce greenhouse gas emissions. The Technology Mechanism consists of two complementary bodies that work together: the policy arm, Technology Executive Committee (TEC), and the implementation arm, Climate Technology Centre and Network (CTCN).

While the intrinsic relationships between climate change impacts, responses and actions, and equitable access to sustainable development and eradication of poverty are emphasized in the preamble, the Agreement does not refer to the long-term temperature goal or any other goals and visions as transformational. Neither does it refer to the 2030 Agenda for global Sustainable Development Goals (SDGs) agreed earlier in 2015 by the same Parties. Yet, through the 2030 Agenda, the Paris Agreement to the UNFCCC with its long-term temperature goal is part of the global vision for transformational change to sustainability.

Two decisions taken by the Conference of the Parties (COP) serving as the Meeting of the Parties to the Paris Agreement (CMA) at COP-24 in Katowice 2018 are relevant for understanding how transformational change is envisioned in the Technology Framework under the Paris Agreement. The first decision, 15/CMA.1 (UNFCCC, 2018), recognizes the need to operationalize the Technology Framework. The second decision, 16/CMA.1 (UNFCCC, 2018a), defines the scope of the Periodic Assessment of the Technology Mechanism.

An annex to the first decision describes the purpose, principles, and key themes to operationalize the Technology Framework:

(i) The purpose of the Technology Framework is that, by addressing the transformational changes envisaged in the Paris Agreement in a consistent way with the long-term vision for technology development and transfer, the Technology Framework can play a strategic role in improving the effectiveness and efficiency of the Technology Mechanism.

(ii) Principles of the Technology Framework include reference to taking a transformational approach to guide the Technology Mechanism in implementing the Paris Agreement.

(iii) Key themes in the technology framework that refer to transformational change are innovation and implementation. Technological innovation, including actions for its acceleration and scale-up, are important drivers of transformational change. Actions to implement the Technology Framework include 'rapidly accelerating the transformational changes towards climate resilience and low greenhouse gas development' and 'reviewing the TNA guidelines and updating them as necessary with a view to TNAs leading to plans and implementation that are aligned with the transformational changes envisioned in the Paris Agreement'.

The TNA process is thus directly acknowledged as an important element leading to technological and transformational change in reducing GHG emissions and adapting to climate change. This guidance note will thus provide information on how conducting and implementing TAPs can be instrumental in planning for transformational change.

2. DEFINITION OF TRANSFORMATIONAL CHANGE

This section explains the definition of transformational change and how steps in the methodology to assess transformational impact of policies and actions can be linked to the TNA and TAP processes to promote the transformational changes envisioned in the Paris Agreement.

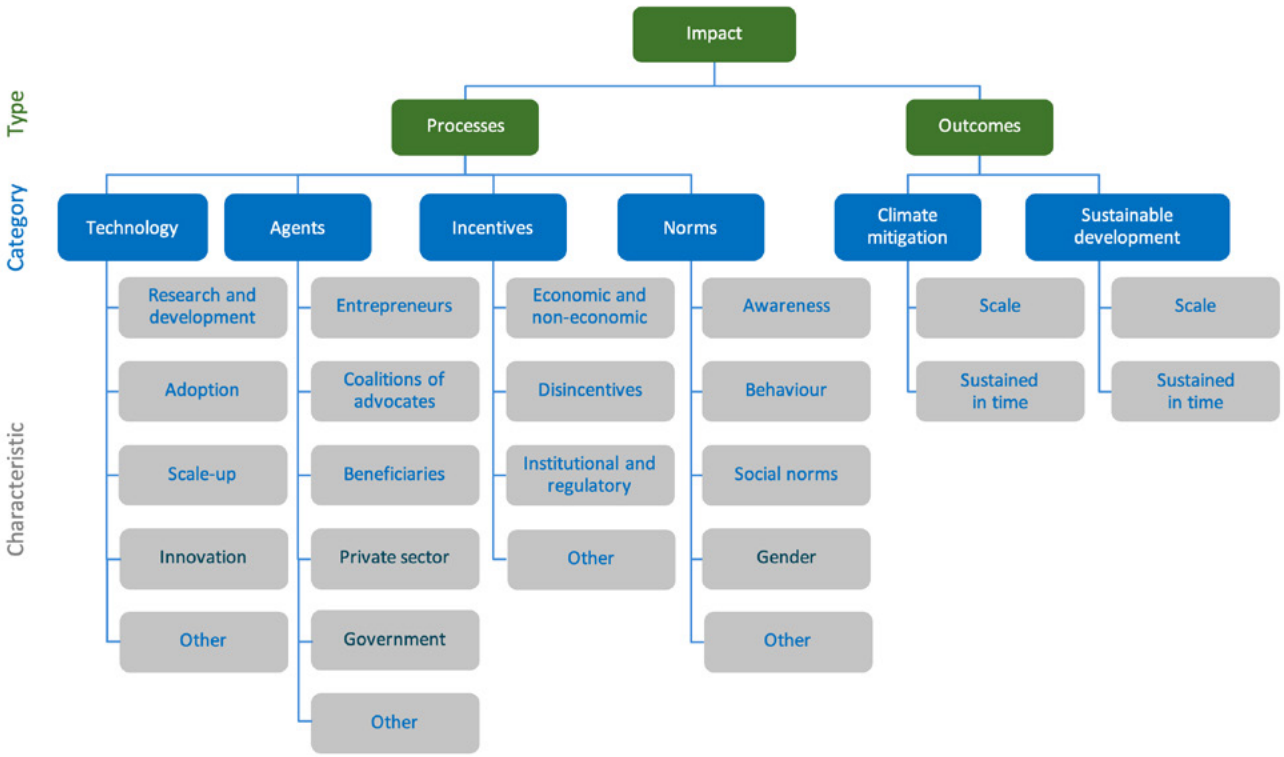
2.1 OPERATIONAL DEFINITION OF TRANSFORMATIONAL CHANGE

Based on the Initiative for Climate Action Transparency (ICAT) Transformational Change Methodology (ICAT 2020) the following operational definition of transformational change, covering both mitigation, adaptation and sustainable development outcomes and processes of change will be applied:

> *A fundamental, sustained change of a system that disrupts unsustainable, high-carbon practices and contributes to zero-carbon[1] climate resilient development in line with the Paris Agreement goal to limit global warming to 1.5–2°C and the United Nations Sustainable Development Goals.*

This transformational change definition can be broken down with regard to different kinds of impacts, distinguishing between processes and outcomes of change. Characteristics indicated in Figure 1 in dark blue have been identified in a transformational impact study (Olsen et al, 2020) as particularly relevant to technical support and capacity building for technology transfer and development. The figure is adapted from the ICAT Transformational Change Methodology (2020), where other characteristics are also described.

Figure 1 Characteristics of transformational impact



1 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.

Processes of transformation represent the main drivers that can lead to system change and transformational outcomes. These processes can be broken down into specific characteristics that represent the intermediate steps potentially addressed by an intervention, through which systemic changes can be stimulated.

Based on the framework developed by the ICAT *Transformational Change Methodology,* Figure 1 identifies four main drivers (or process categories) of systemic change:

- *technology change* – processes, skills, knowhow, and practices that drive research and development, innovation, early adoption and widespread scale-up of climate technologies
- *agents of change* – governments, entrepreneurs, the private sector, and beneficiaries, 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.

Outcomes of transformational change for GHG emission reductions, climate resilience and sustainable development are characterised by:

- Large-scale outcomes or a multitude of smaller-scale changes leading to large-scale, system wide impacts
- Sustained, long-term outcomes that reinforce climate resilient responses and zero-carbon practices, while avoiding maladaptation, carbon lock-in and dependence on fossil fuels

2.2 TNA/TAP PROCESS AND CONTRIBUTION TO TRANSFORMATIONAL CHANGE

The methodological steps for transformational change assessment can be linked to the TNA steps as shown in Figure 2. Thus, it is possible to identify where and how in the TNA process the transformational changes envisioned in the Paris Agreement can be promoted and strengthened.

Figure 2 Assessing transformational change in the context of TNAs

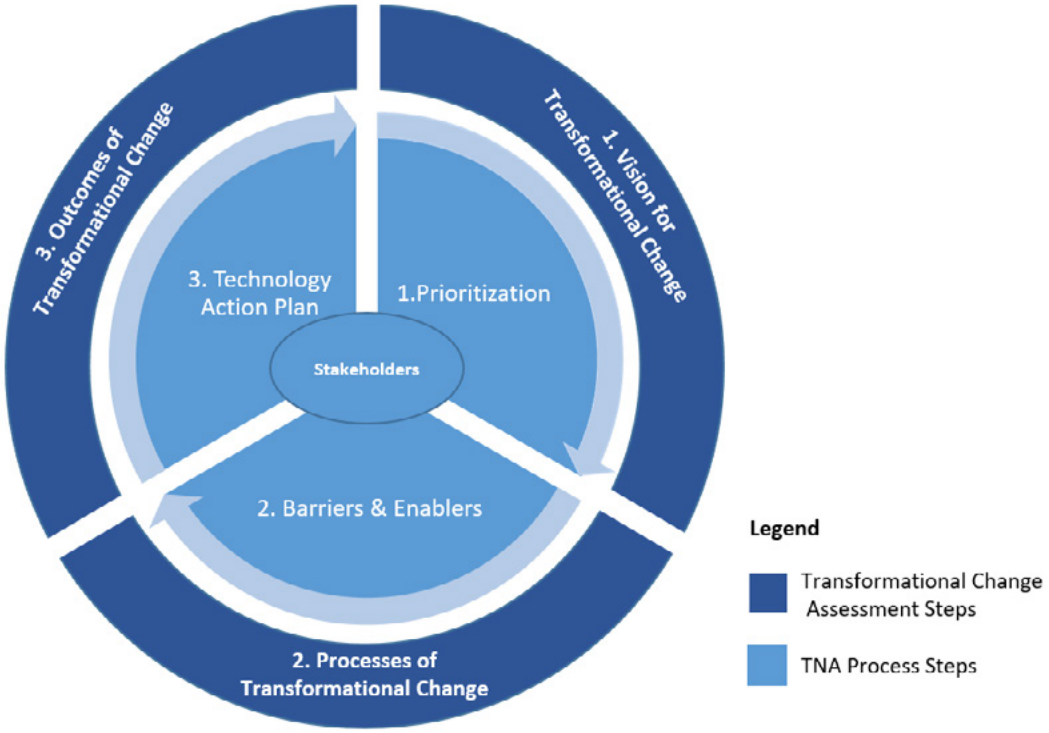


Figure 2 illustrates the steps of the ICAT Transformational Change Methodology that are most relevant to consider in the three steps of the TNA. The inner rings of Figure 2 illustrate the process of a TNA, and the outer rings indicate the transformational change assessment steps that can be relevant to apply to the TNA process. Box 1 briefly introduces the ICAT methodology and templates that are available to assist in identifying the transformational change potential within TNAs.

Prior to undergoing the TNA process steps 1-3[2], the institutional structure for the TNA needs to be set up (represented by the central "Stakeholders" ellipse in Figure 2). This involves identifying the priority sectors and detailing an institutional structure covering the responsibilities of key individuals and stakeholder groups in the rest of the process. Hereafter, the prioritization of mitigation and adaptation technologies within the selected priority sectors is the first step in the TNA process. In this analysis, the possibility for transformational change can be assessed in the context of each intervention based on the information available from the technology factsheets that should ideally indicate possible future pathways for technologies.

In the second step of the TNA, barriers that hinder deployment and diffusion of the prioritized technologies, including enabling frameworks for the said technologies, are identified and characterised. Essential to the barrier analysis is the categorisation of technologies into market and non-market goods, and the further split into consumer goods, capital goods, publicly provided goods and other non-market goods, following the TNA barrier analysis guidelines (UNEP DTU Partnership, 2015). Depending on the type of technology, different analysis tools are employed to identify the barriers and subsequently suggest measures to overcome these. It is at this stage that the possibility for identifying transformational change potential is particularly evident through the association of the barriers and corresponding measures with the characteristics of transformational impact shown in Fig. 1.

Based on inputs from the two previous steps, the third step in the TNA consists of drawing up a Technology Action Plan with an implementation ambition that contributes to the overarching transformational objective at the sector level, that can be represented in terms of the outcomes in Fig. 1 both in terms of scale and sustainability. This phase of TNA also includes budgeting the activities, developing project ideas, and potential funding schemes through a set of specific activities. One or more of these project ideas are then developed into a concept note for a selected funding entity and technical support institutions. A TAP can focus on a single technology with a larger-scale potential within a country or a portfolio of technologies to which common actions apply (UNEP DTU Partnership, 2019) with the potential to bring transformational change at sector or national levels. It is thus possible to understand the outcomes of transformational change for GHG emission reductions, climate resilience and sustainable development. Climate-change mitigation outcomes can be estimated using indicators and numbers reported in the TNA. Resilience and sustainable development outcomes can be indicated by the number of beneficiaries as well as indicators or composite indexes measuring the contribution to sustainable development goals addressed by the intervention.

Box 1. ICAT Transformational Change Methodology and Templates

To assist with the TNA assessment, templates from the ICAT Transformational Change Methodology were used and slightly adapted to fit with the objectives for TNAs. Certain steps are especially useful when identifying the potential for transformational change in TNAs. Sections 6.2 and 6.3 of the methodology are useful to describe the vision for transformational change. See section 6.5 for the transformational characteristics, and section 6.7 for the outcome characteristics. The relevant assessment tables can be found at: https://bit.ly/ICATTCResources and the ICAT Transformational Change Methodology. at: https://bit.ly/ICATTCGuide.

2 Refer to the TNA Step by Step Guidebook: https://unepccc.org/wp-content/uploads/2019/02/tna-stepbystep-guidebook-feb2019.pdf

3. ILLUSTRATIVE TNA CASE STUDIES

This section presents examples of how to describe the vision for transformational change, as well as process and outcome characteristics of transformational change using case studies of two TNAs and in the context of the NDCs for each country. The aim is to show in concrete terms how interventions to increase deployment or diffusion of specific technologies can lead to transformational change.

The cases of Mongolia and the Republic of Moldova are selected as illustrative cases of how the TNA process has contributed to transformational impacts. Both TNA were conducted between the years 2010-2013. Although these TNAs predate the (I)NDC, their finalized TNAs and their TAPs have several sustainable development benefits that are both directly linked to their NDCs. In the case of Mongolia, the TNA has contributed to the development of several successful GCF proposals. For Moldova the TNA consultants have produced concept notes on Conservation Agriculture (CA), also producing NAMAs on agriculture (along with forestry and energy) and it is part of the country programme for engagement with GCF. The case studies are not a representative sample of all the TNAs completed within the project but are intended to be illustrative examples for inspiration of future TNAs.

An assessment template from the ICAT Transformational Change Methodology was applied in both case studies and adapted to the assessment of the TNA reports. Key findings of the analyses are presented in sections 3.1 and 3.2.

3.1 MONGOLIA CASE OF TRANSFORMATIONAL CHARACTERISTICS FOR MITIGATION

The following case delves into the transformational characteristics present in Mongolia's TNA reports for mitigation of greenhouse gas emissions in the energy sector and how these have led to the development of two GCF proposals. Specifically, the assessment focuses on technology transfer for improved insulation of pre-cast panel apartment buildings prioritized for energy efficiency (EE) within the residential and commercial subsectors. Panel buildings are high-rise apartments built of pre-cast concrete blocks. In Ulaanbaatar, these buildings tend to have no added external wall insulation, poorly insulated external doors, and roofs, as well as no heat output controls on radiators. The TAP had the goal of additional insulation for 300 existing apartment buildings in Ulaanbaatar to ensure thermal comfort of residents in these old buildings. GHG emissions were expected to be reduced by 842,600 tCO_2/year. One GCF proposal sought to offer concessional loans to consumers purchasing efficient heating appliances and housing insulation retrofits. The other, was to create a joint public-private sector effort to create a national financing vehicle (NFV) to directly support the provision of affordable financing for various EE measures in housing. More background on the Mongolia TNA can be found in Appendix 2.

Transformational change vision and alignment with NDC and the 2030 agenda

Mongolia completed its TNA in 2013. The TNA was thus designed before the NDC framework and 2030 agenda were developed, so it is difficult to point conclusively towards a vision for Transformational Change in the TNA. Nevertheless, certain elements of this TNA can make the case for strengthening the potential for transformational change through alignment with these processes, as current TNAs already take point of departure in. One of the components of the TAP was for the residential and commercial subsector within the energy sector. At the time, it was the fourth largest GHG emitting subsector contributing 8.1% of total GHG emissions (excluding LUCF). Furthermore, the emission contribution was expected to increase by a factor of 2.9 by 2020 from 2006 levels (MEGD, 2013: 17) and had the potential to contribute to national development priorities.

The urban population of Mongolia is 1.6 million, which represents about 60% of the national total. In Mongolia's updated NDC of 2020 (1st version submitted in 2015) it sets a new target of reducing its GHG emissions by 22.7% by 2030 compared to the business-as-usual scenario. To achieve these goals, the intention is to increase the use of renewable energy sources and improve energy efficiency. Specifically, for energy efficiency the goal is to reduce building heat loss by 40% by 2030 compared to 2010 levels. Financial needs for the NDC's mitigation implementation are around 6.3 USD billion (IISD, 2020), of which 90 USD million is for improving insulation in existing panel apartment buildings of 18,184 households in Ulaanbaatar (Mongolia's updated NDC). These actions stem from Mongolia's TAP and the linkage between the TNA project and the NDC policies and actions is strong. The vision in the NDC is directly based on the TNA finalized in 2013. Although the NDC does not specify direct links to the SDGs, it does indicate that it is aligned with Mongolia's sustainable development vision 2030.

At the time of the TNA for Mongolia, the SDGs were not in existence. Yet, based on a qualitative judgement of the TAP for energy efficiency, the actions envisioned in TAP would contribute to SDG goals at the national level under SDG 7 (Affordable and clean energy), 11 (Sustainable cities and communities) and 13 (Climate action). Other co-benefits from the GCF project include lowering air pollution, creation of jobs, increase living standards and stimulation of investment in the building sector. The two successful project proposals to the GCF related to residential buildings both inform that they will reflect principles outlined in the SDGs, e.g. on gender equality. Monitoring and accounting of the sustainable development benefits remain to be seen, as implementation is either underway or yet to begin.

In the short term and at the city level, the National Action Programme on Climate Change (2010-2021) set goals for energy efficiency. In the first phase (2011-2016), the aim for building standards is to install insulation in buildings with high thermal loss in Ulaanbaatar and to take other measures to reduce the heat-transfer rate. The city vision of the TAP echoes and aligns with these goals, looking to undertake a multifaceted number of measures to support achievement of the goals. Concretely, the suggestion in the TAP and the project idea is to insulate 300 apartment buildings by 2020, reducing 842,600 tCO_2/year.

Process characteristics of transformational change

To implement the insulation technology in buildings, the TNA identified the following barriers as the most important: High cost of capital and low fixed tariff not depending on actual heat consumption, low awareness, weak market conditions and the legal, policy and regulatory frameworks required to support the market and inter-ministerial cooperation. Although the economic and financial challenges were listed as priority barriers to be addressed first, they are not the only challenges listed. This shows that systemic and multifaceted actions are needed to promote transformative elements and succeed with technology transfer. The analysis below delves deeper into the transformational process characteristics shown in Figure 1, which are identified and described for the TNA based on the barrier analysis and what measures and actions are needed to overcome the barriers. Although the output of the TNA is the development of planning documents, the overall number of transformational characteristics addressed by the intervention itself are limited. Upon its implementation, the TNA via implementation of the proposed TAP, have both laid the groundwork for several actions for transformational changes relevant to the prioritised EE technology.

Agents

The TAP for Mongolia identified government ministries and other authorities as the main stakeholders responsible for leading on the identified actions. This highlights the major role governments play in creating the enabling environments to address the challenges to technology development. As governments establish and enforce the appropriate regulatory and institutional framework, inter-ministerial coordination is key. At the time of the TNA, such coordination was not strong regarding energy efficiency in buildings. As a proxy, we can turn to successful project concept notes submitted to the GCF with XacBank as accredited entity.

Although several policies and regulations were established in the years after the TNA, such as the 2014 Green Development policy, the first NDC in 2016, the 2015 Law on energy and the Law on renewable energy. By 2016 "Heat innovation of panel apartment buildings in cities of central region technical project" was established with the purpose to reduce heat loss and consumption. But due to a lack of secure funding, the implementation stagnated. The private sector was present in workshops to ensure stakeholder engagement and raise awareness. Despite this, both the Government of Mongolia and the domestic financial sector were unable to deliver finance at scale to support a transition to low-emission technologies. They thus joined in a public-private sector effort to create a national financing vehicle to overcome constraints. The results of the TNA form part of the basis for the GCF project's Theory of Change. The domestic private-sector partner is Mongolia's first Accredited Entity to the GCF, XacBank. The project also aims to strengthen the coordination mechanisms towards implementing the country's NDC. Together, these measures could potentially induce a paradigm shift towards low carbon technologies, targeting EE of households.

Incentives

Inappropriate financial incentives, high costs of capital and lack of adequate access to financial resources were identified as major constraints to the uptake of the insulation technology. Residents have limited interest in paying money to insulate their buildings when the heating bill is not calculated based on actual consumption but per square metre. To create economic incentives for EE, the TAP promotes a series of actions that are designed to create an enabling environment. The suggested economic incentives are to set up a fund to improve insulation, set up a new pricing system and develop guidelines to provide financial incentives to residents who successfully improve building insulation. Other incentives are within the regulatory and institutional domain, such as an action to develop and adopt a law on energy savings and support decision making of the city mayor. If these activities are undertaken,

there is an institutional and regulatory incentive for the actions to lead to changes in the underlying conditions and circumstances for the insulation technology to scale up.

Technology

In terms of adoption and scale-up, the untapped potential can be identified in the EE sector for residential buildings. Several barriers exist to massive deployment such as no reliable product quality standards for EE equipment, weak legal environment for government to proceed with additional legislation (at the time of the TNA, barely any existed specific to EE), high capital cost and inappropriate financial incentives. If the actions presented to establish an enabling environment for the insulation technology are implemented, this should lead to deployment of insulation as a new business model. Thus, financial incentives emerge to capitalize on policy incentives and the new pricing system.

Norms

Implementing an awareness campaign on EE and the technologies identified as measures in the TAP, can help with both adoption, scale-up as well as norms surrounding the technologies. The government was identified as the lead institution to promote energy efficiency. Awareness-raising through organisation of a knowledge base on energy efficiency projects coupled with workshops, training and campaigns targeting the economic and environmental benefits of the technology are the key means to change social norms to promote EE. It is likely that the TAP measures will have a positive impact on the residents' behaviour through the awareness-raising campaigns leading to a change of behaviour to pay for actual heat use. Thereafter, residents may start turning off lights not in use, turning heating off, when not used, and adjusting thermowwstats.

Outcome characteristics for transformational change

Following the finalization of the TNA, we would anticipate that the TAP lays the foundations for an application to the GCF or other funding institutions to support a programme or project aligned with the measures identified. This could be in the form of developing the energy efficiency policies envisioned or setting up a credit system that makes it more available to private sector actors to implement the targeted insulation technology. As neither the GCF nor NDC structures were in place at the time of the TNA, it is notable that the TNA findings from Mongolia have been utilized to support four successful funding proposals to the GCF. This demonstrates that it has outcomes that can be considered at the medium scale of transformational change. In its first stage, the national financing vehicle in one GCF proposal targets households in peri-urban areas of Ulaanbaatar as well as rural areas in Mongolia to transition to energy efficient practices. These are further demonstrated by being present as direct measures for the NDC commitments for consumption in the energy sector. If we return to the actions planned in the TAP, the scale is micro, only focusing on insulation of 300 apartment buildings in Ulaanbaatar. Yet, the actions improve residents' livings conditions, increase the financial income of people, reduce heat energy costs, air pollution and coal consumption in power and heat plants. In terms of emissions, according to the TAP, it is estimated that the actions can reduce GHG emissions amounting to 842,600 tCO_2/year. Heat consumption reductions can also be measured once heat meters are installed in the apartment buildings and reflected in the heat balance distributed from the Ulaanbaatar District heating company.

3.2 MOLDOVA CASE OF TRANSFORMATIONAL CHARACTERISTICS FOR ADAPTATION AND MITIGATION

The Moldova case describes both adaptation and mitigation aspects that were presented in Moldova's TNA reports. Specifically, the case is about conservation agriculture, both as an adaptation measure and as a NAMA at sector level. The assessment focuses on the actions highlighted for the agriculture sector in the adaptation component of the TNA reports, although conservation technologies were prioritized in both the mitigation and adaptation components of the TNA with cross-cutting benefits. The technologies and practices prioritized for the adaptation component are:

1) Conservation system of soil tillage without herbicides for winter wheat
2) Applying 50 t/ha of manure with bedding to agricultural soils once per five years
3) Vetch field as green fertilizer into a 5-year crop rotation

More background on the Moldova TNA can be found in Appendix 2.

Transformational change vision and alignment with Moldova's NDC and 2030 agenda

The vision of transformational change to contribute to GHG emission reduction and effectively respond to climate change impact is an evolving concept of the Republic of Moldova's policy framework. The TNA was conducted in key priority sectors of Moldova's economy (agriculture, energy, health, and transport) against a background of a wide stakeholder consultation process of Climate Change Adaptation Strategy (2014-2020). This policy document presented a vision of

a sectoral approach to climate adaptation, aligned to that of mitigation based on LEDS until 2020, and with the agriculture sector identified as a priority sector.

The vision was further elaborated in the INDC (2015), with significant contributions from the agriculture sector, both to the clearly set mitigation targets and to the first version of the adaptation component. The updated NDC (2020), contained ambitious mitigation targets (unconditional target: to reduce GHG emissions by 70 per cent below the 1990 level in 2030; conditional target: up to 88 per cent below 1990 level), while the adaptation component covered a broad range of sector-specific and cross-sectorial priorities targeting transformational change. The adaptation component of the NDC references the TNA several times and the TNA's prioritized measures and actions were proposed to support the implementation of the NDC policies.

Following a coherent approach to promote climate technology transfer in the TNA, the NDC takes a cross-cutting approach that emphasizes several issues. The activities and actions specifically linked to the TNA involve harnessing Science, Technology, and Innovation (STI) with a focus on resilient transformation for sustainable development and increasing the uptake and scale of identified technologies in the agriculture sector. The plan is to develop a portfolio of projects, based on results of the TNA and considering lessons learned. The portfolio would be supported through different funding sources to realise the implementation of climate and environmentally sound technologies. Concretely, sustainable soil management through conservation agriculture is presented as one of the modern agronomic technologies and practices to be undertaken in support of these adaptation priorities. Several broader agricultural priorities are also highlighted.

The technologies and priorities in the TAP can be understood to have increased the likelihood that conservation agriculture (as an umbrella concept for the three prioritized technologies in the TAP) is part of the NDC. Through this firm alignment with the NDC and international commitments, political support for investing in technologies and practices within conservation agriculture have become deeper. This commitment is strengthened by the Sectoral Agriculture Planning process (Ag. SAP GCF Project) now under implementation, and the updated Agriculture Sector Development Strategy for 2022-2030 (draft). This strategy promotes conservation agriculture (CA) practices as top prioritised adaptation measures, with the ambition to be upscaled and widely adopted by most large agro enterprises and, in conjunction with precision agriculture, by medium and small agro farms, bringing transformational changes at sector level. This approach is broadened by the overarching vision of the programmatic mode of climate change adaptation to achieve large-scale impact by 2030.

The actions envisioned would contribute to SDG goals at the national level under SDG 12 (Responsible consumption and production), 13 (Climate Action) and 15 (Life on land). As noted in the TAP itself, the goal according to the Minister of Environment of the Republic of Moldova at the time of the TNA, "Above all, the TAPs offer practical solutions for the sustainable development of the country's agricultural sector, upon which we depend heavily for our income and livelihoods." (p. 7, MEGD, 2013). Overall, there are many environmental benefits through: reduction of soil erosion, reduction of groundwater pollution with nitrates, and reduction of GHG emissions because of lower amount of fuel combustion. Also, it should create conditions for the development of small and medium size enterprises and thus also jobs.

Process characteristics of transformational change

The TNA barrier analysis, identified the following barriers as the highest priority to overcome:

- high up-front costs of investments and interest rates on loans for agricultural entrepreneurs
- insufficient legal and regulatory enforcement
- weak research and innovation development in sustainable agriculture
- lack of skilled personnel, and poor market infrastructure.

The financial, legal, and regulatory barriers were presented as the most common barriers across the three technologies comprising the CA concept in Moldova's TNA, but a portfolio of measures was proposed to overcome all the general barriers to technology transfer in the agriculture sector. To achieve transformational changes, conservation agriculture is to be implemented holistically, as an integrated agricultural system of soil management, the approach proposed in the TNA. In the next section we will describe how the measures prioritized in the TNA addressed various process characteristics of transformational change. Additional background information can be found in Appendix 2.

Agents

The measures proposed in the TAP require cooperation between several actors. Government is involved in each measure at some level, as an agent to accelerate the uptake of the technology. Banks are integral and crucial for rural entrepreneurs accessing resources. Affordable finance is essential for achieving conservation agriculture at scale. Therefore, unlocking access

to finance for all farmers practising CA is an issue that has to be addressed by the Ministry of Finance and local financing institutions. Commercial banks have already developed a strong climate-related portfolio, specifically for rural entrepreneurs implementing conservation practices, yet not sufficiently attractive for small and medium-sized enterprises. As representatives of the private sector, farmers are equally vital, as they must change their equipment and employ new farming practices. Researchers help adapt CA to the conditions in Moldova. Rural entrepreneurs help develop and follow the laws for good agricultural practice, providing guidelines and producing publications for practitioners, establishing an online community of practice with open discussions and knowledge sharing of issues and solutions among practitioners of CA.

Government is a vital agent of change making certain practices binding by law, such as the use of soil-protecting agricultural technology. The partnership between Government can support farmers in changing to CA. Development partners (WB, IFAD, FAO, USAID) through implemented CA projects have been critical for boosting local-level capacity with dedicated training and demonstration plots that illustrate the advantages and overcome implementation barriers to new conservation technologies.

Norms

The concept of CA has only begun to gain momentum in Moldova during the TNA. Acceptance of the practice was challenged by the difficulty of gaining popularity and raising awareness of the approach. Stakeholders engaged during the TNA found that the lack of information and knowledge of the benefits of CA technologies presented a serious barrier that was evident in many ways. For example, CA is not only involve replacing the tangible machinery of a technology. Reaping the benefits of CA practices involve the implementation of an integrated system of soil management, which is not always followed by stakeholders during the implementation phases. Knowledge transfer from those working closely with farmers (researchers, agricultural business, etc.) to the farm community was a main delaying factor to technology transfer. Measures to drive changing norms were described in the TAP, such as awareness-raising activities through the creation of rural consultancy centres. The TAP set only a start date was set for this measure, but it has been shown that more time is needed than has elapsed so far (~10 years). CA practices need to be better adapted to the country context, soil conditions, climate impact, and other influencing factors. Several information sources are now available. Efforts in other CA projects have since been more oriented towards boosting the level of farmers' awareness, knowledge and skills concerning CA practices.

Incentives

Local farmers (especially rural entrepreneurs) have difficulty overcoming the up-front costs, since adopting sustainable technologies also requires a change in equipment or disposal of it. Another common financial barrier experienced is high interest rates on loans provided to agricultural entrepreneurs for operations. According to informants, this issue still exists, but the Government, particularly the Ministries of Finance, Agriculture, Regional Development, and Environment, in collaboration with locally operating banks, microcredit organisations and development partners have been working since the TNA on identifying effective financial instruments for these types of technologies, which will be needed to achieve CA at scale.

The Government has produced regulatory incentives in support of farmers applying CA. Article 2.4 of GDs nr. 352 of 10.06.2015 stimulates investments in the procurement of the equipment for no-till, min-till and strip-till practices, up to 400,000 mdl (approx. USD 20,000) per beneficiary, while Article 1.7 facilitates farmers' access to capital markets, including farmers lending by commercial banks and non-bank financial institutions. Through the Fund for subsidising agricultural producers (Government Decree no 352 from June 2015), the Government annually allocates financial resources to motivate investment in the consolidation of agricultural lands and the acquisition of no-till and min-till equipment. The subsidy system for applying conservation technologies comes from a government agency that offers financial support for applied agriculture measures following EU rules. These supporting enabling actions had to be in place, so that the capacity to tackle these barriers is in part enabled by selecting complementary technologies, which creates multiple avenues to address a wider scope of barriers and offer measures to address them within a span of timeframes, and potentially creating more certainty across the market.

Technology

The TAP includes measures for data collection and capacity building elements, to set up monitoring systems on levels of farm sustainability and awareness raising activities. Several measures facilitate a closer partnership between various government entities and stakeholders to secure an enabling environment. These conditions are all important pre-conditions to adoption, scale up and secure R&D for the technology. In addition, the three technologies are long-term and large-scale, addressing soil management and soil improvement. Applying these under the umbrella of CA, the practices will improve soils with long-term effects.

Transformational outcome characteristics

The CA was prioritised as a technology in both the mitigation and adaptation components of the TNA with cross-cutting benefits. Around 2.55 million tonnes of GHG emissions were produced annually from all the tilled soils of Moldova. The agriculture sector is one of the most exposed to the effects of climate change, with high vulnerabilities. At the same time, it is a sector with a large (31.3% - 11.9% during 1993-2010) contribution to the gross domestic product (GDP), employing one-third of the country's population, and thus the dependence of the rural population for their livelihood on the agricultural sector is very high (~70%). The TAP's overall target assumes long-term implementation (5-30 years) and significant coverage of arable land area (200,000 ha, with a potential for 900,000 ha). By increasing the scale of CA, more jobs will be created and there will be sustainable benefits to soil conditions, preventing further degradation and erosion and increased resilience to a changing climate.

CA identified during the TNA and later promoted as an alternative modality to conventional agriculture, has already gained recognition as a leading way to cope with the impact of climate change. It is a sustainable modality of agricultural production responsive to farmers needs under the aggravating conditions and is also based on social and moral considerations, which makes it an effective adaptation measure.

In this assessment, the focus has been on the CA approach through an adaptation lens. However further outcomes will occur if the mitigation technologies and actions envisioned for CA are also implemented. These cross-cutting measures, if implemented at the time of the TNA, were expected to assure a significantly higher CO_2 reduction than originally envisaged in the Second National Communication (2009).

3.3 COMPARISON OF TRANSFORMATIONAL PROCESS AND OUTCOME CHARACTERISTICS

This section provides an overview of the results of the TNA case studies. Table 3 shows a summary of the findings for the process characteristics of transformational change. It also indicates whether a transformational characteristic has been assessed as relevant within the scope of the TNA.

Table 1 Overview of transformational process characteristics in the TNA case studies

TNA	Technology				Agents					Incentives			Norms		
Country	Research and development	Innovation	Adoption	Scale-up	Entrepreneurs	Beneficiaries	Coalition of Advocates	Private sector	Government	Economic and non-economic	Disincentives	Institutional and regulatory	Awareness	Behaviour	Social Norms
Mongolia	■		■	■			■	■	■	■		■	■	■	
Moldova	■	■	■	■	■	■	■	■	■	■		■	■		
Total addressed	**2**	**1**	**1(1)**	**(2)**	**(1)**	**(1)**	**1(1)**	**(2)**	**2**	**2**	**0**	**2**	**2**	**(1)**	**0**

□ *[blank] Characteristic is not deemed to be relevant to the intervention achieving its intended outcomes.*
■ *Characteristic is deemed to be relevant to the intervention and has been addressed within the scope of the TNA*
■ *Characteristics is deemed to be relevant but has not been addressed within the scope of the TNA*

In terms of technology characteristics, R&D coupled with adoption lays the foundation for the scale-up of green technologies and replication. Both case studies, although illustrative, have components of R&D for the specific technologies which then form the basis for these processes as part of the enabling environment. In both cases, a solid barrier analysis and market mapping is a source of information that can be used to remove some of the identified barriers for development of capacity, policy, regulation, technology transfer and diffusion. Furthermore, the analysis provides a coherent diagnosis of the barriers to transformation and a unified strategy to overcome them.

In terms of Agents, the key stakeholders are government actors in both case studies. This reflects the TNA process being anchored nationally with the relevant government counterpart. It also highlights how the value of the TNA is a country-driven process. If policy recommendations resulting from the TAP are vetted and secured through government buy-in, this will help ensure sustainability of actions after the TNA project support comes to an end. One source of untapped transformational potential within the TNA is to address the private sector and secure a coalition of advocates. While the TNA process itself consults a wide spectrum of stakeholders, the key role of the private sector was not clearly identified in the case of Mongolia. Later, the private sector turned out to be a key driver through XacBank. Government was able to partner up for a private-sector actor to become an Accredited Entity with the GCF, showing the strength of coalition building with influential agents of change.

The establishment of Incentives is seen to be important across the case studies, ranging from economic and non-financial as well as institutional and regulatory. Both case studies show technologies that at the time of the TNA had no or very weak regulatory frameworks in force. At the time, high-up front costs of investments were another common economic barrier. The incentives range from building capacities of government to developing recommendations and putting in place regulatory frameworks, laws and new financial incentives and instruments.

Regarding Norms, the assessment of the case studies shows that both incorporate awareness-raising and knowledge-sharing activities, and one also includes behavioural change among its targets. On the other hand, none of the TNAs target social norms.

Table 2 provides an overview of the outcomes targeted by each TNA, highlighting which SDGs are addressed, the sustained nature of the outcomes and the scale at which they are taking place. The results indicate that the outcomes of a TNA have a sustained nature and opportunities at scale. Both TNAs have managed to become embedded in other national processes past their timeline. This illustrates that they have had an indirect impact at a larger scale, although their direct impact is more at micro- or medium scale.

Table 2 Overview of the anticipated outcomes and their transformational characteristics in select TNAs

Country	Anticipated mitigation, resilience, and sustainable development outcomes	Sustained nature	Geographic scale and sectoral relevance	SDGs addressed
Mongolia	Mitigation: GHG emissions are expected to be reduced by 842,600 tCO_2/year. Resilience & SD: in terms of SD, it will ensure thermal comfort of those who live in these old residential buildings, decrease air pollution in the city and increase quality of life.	Targets set for 2020 in TNA, and for 2030 in NDC	City level (Ulaanbaatar) Energy Efficiency Micro-scale	
Republic of Moldova	Mitigation: Some reductions expected, but baseline issues. Resilience & SD: 200,000 ha of arable land, job creation, increase in soil & ground water quality	Target year for NDC is 2030, and in the TAP between 5-30 years dependent on the measure	Agriculture sector Medium scale	

4. STRATEGIC OPPORTUNITIES FOR TNAS TO PROMOTE TRANSFORMATIONAL CHANGE

TC Assessment Steps	Guiding questions for the TNA process
Vision for Transformational Change	**1. Identification and Prioritization of Sectors and Technologies** Once the priority sectors or subsectors have been chosen, define the national and sectoral vision for transformational change in which the technologies are planned or implemented. This, vision combined with the existing national development plans and international climate help to set the scene for the desired changes at the sectoral or national level (through consultation with key stakeholders). Guiding questions: • What is the long-term (≥15 years) vision for social, environmental, and technological change? • What structures, institutions, behaviour, and values need to change over a mid-term period (≥5 years and <15 years) to achieve the overall vision? • Which actions and projects within the short term (<5 years) enable the desired change? TNA teams can consider including a criterion that reflects transformational change in the prioritization of technologies. For example, a criterion on the potential for transformational change under technology-related benefits in the MCA. Indicators for this could be: • the potential scale for utilization (emission reductions, SDG impacts) • maturity of the technology, • relevance to national plans.
Processes of Transformational Change	**2. Barrier Analysis and Enabling Framework** Consider including actions that have the most transformational impact sustained over time. The enabling environment should incorporate measures that address key characteristics of transformational change. Guiding questions are: • Does the measure create new markets and business activities at the local, national, or international levels? • To what degree do the proposed measures help to overcome systemic barriers to the deployment of low-carbon and resilient solutions? • Do the proposed measures lead to behavioural change or change in awareness of society? • To what degree will the proposed measures change incentives for market participants? • Are the right stakeholders and agents of change included to help push the transformational change? The barrier analysis and enabling framework of the TNA can be used to further identify and describe which of the transformational characteristics are affected. A single characteristic may be affected by several barriers, and one measure could address multiple barriers or characteristics of transformation.
Outcome of Transformational Change	**3. Technology Action Plan** The ambition level for the TAP should be anchored on the expected outcomes within a vision for transformational change. Transformational change means system change, which cannot be entirely steered or controlled. Yet, design of activities for transformational impact can be planned and informed by strategic (long-term), tactical (mid-term) and operational (short-term) governance as well as reflexive, ongoing governance focused on outcomes at scale and sustained over time resulting from TAPs focused on one or more prioritized technologies: 1) What is the scale of the outcome in terms of GHG or sustainable development at the macro (international/global), medium (national/sectoral), and/or micro (subnational, subsector, city or local) level? 2) What is the outcome sustained over time in terms of GHG reduction or sustainable development in the long term (≥15 years from the starting situation), medium term (≥5 years and <15 years from the starting situation) and/or short term (<5 years from the starting situation)?

5. RECOMMENDATIONS AND CONCLUSION

In this section, the key recommendations and conclusion are presented in response to the objective of how transformational change can be incorporated into the TNA process.

5.1 RECOMMENDATIONS

TNA project developers and the wider community can foster transformational change in two ways:

1) **Develop a transformational vision in the TAP to clearly indicate how the prioritized technology has the potential to promote transformational impact.** The transformational vision of the TNA is strongly embedded in national policy processes. Information describing transformational changes in TNAs can often be relatively high-level, and the way to achieve systemic change should be strong. The aspirational vision for transformation can be used to back-cast and plan how to tackle the most important drivers and barriers for low-carbon or climate resilient development.

2) **Enhance coordination with private sector and link to market approaches.**
One of the strengths of the TNA is the country-driven process with strong stakeholder engagement. Anchoring of the process within a relevant Ministry facilitates the role as a national champion, which can garner further political support. For example, public-private partnership models can be used as leverage for the TNA process leading to the development of successful proposals to the Green Climate Fund for scaled-up financial support.

5.2 CONCLUSION

With the objective to contribute to the transformational changes envisioned in the Paris Agreement, the guidance note has provided a definition of transformational change and demonstrated through two illustrative case studies, how transformational technological cooperation can be incorporated in the context of the TNA/TAP process. Practical guidance, strategic opportunities and recommendations are provided to countries and TNA developers on how to make use of the ICAT Transformational Change Methodology and templates to promote the transformational impact of TNA/TAPs.

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APPENDIX 2: CASE STUDY BACKGROUND

1. Mongolia case study

Information	Assessment information
Title of the Technology Action Plan	Improved insulation of panel apartments - energy-efficiency in buildings project.
Type of policy or action	Technology Action Plan and Project idea for improved insulation of panel apartments – buildings project.
Description of specific interventions	In 2013, the residential and commercial sector in Mongolia used mainly coal, some fuel wood and dung for its energy needs. Heating has traditionally been subsidized by the government, either through cheap coal or cheap district heating. Thermal energy was used for heating of buildings, production of goods and services and preparation of hot water for households. Due to this, energy conservation and building insulation remained low priorities for consumers, and the overall energy efficiency of the residential and commercial subsector was low. In addition, most apartment buildings in Ulaanbaatar were constructed in the 70s-90s. They were in a poor state and the heat consumption of the buildings was about five times higher than comparable modern systems in Europe. The cold climate is a contributing factor, but mainly it is due to poor technology and a lack of incentives to save energy. In response to this, improved insulation of panel apartment buildings was selected as one of two technologies under the TNA process. A barrier analysis, enabling framework and TAP incl. project idea was developed for carrying out additional insulation to 300 existing apartment buildings in Ulaanbaatar. This would ensure thermal comfort for residents and reduce coal consumption for heat supply in power plants. Specific activities in the TAP include: • EPS (Expanded Polystyrene) wall insulation fitted to the outside of the external precast concrete walls, roofs, and windows changed. Uncontrolled ventilation reduced. • The heating pipeline to the radiators changed. • Balancing valves installed for all heating risers. • A thermostat valve is installed to each radiator. • Heat meters installed for each apartment heat meters. • Apartment space heat billing changed from a square-metre based heat tariff to a measured actual heat-supply based heating tariff. In addition, the TAP for the improved insulation technology, suggests to: • Establish legislation through development and adoption of the law on energy saving • Set up a fund to improve building insulation • Increase awareness of residents on building insulation through campaigns and trainings • Develop a new pricing/tariffing system for rates of prices for heating building • Develop guidelines for financial incentives to residents who improve insulation
Status of the policy or action	At the time of the TNA all the measures were planned. Since 2013 several developments have been made which are directly linked to the TNA: 1. The actions identified in the TNA have been adopted as direct measures to be taken for energy efficiency in the 2020 updated NDC for Mongolia. 2. With XacBank, two funding proposals have been accepted with GCF support related to the technology. • One proposal is the EE Consumption Loan Programme focusing on the ger areas, which is a form of residential district mostly consisting of traditional tents. The USD 21.5 million programme will support household EE lending. The programme is comprised of a USD 18 million facility with concessional loans to consumers purchasing EE heating appliances. It also includes (USD 3 million of the facility) and EE housing solutions (USD 15 million of the facility) which includes EE housing insulation retrofits and EE housing construction. • The other GCF proposal for the Mongolia Green Finance Corporation (MGFC) is a joint public-private sector effort to create a national financing vehicle (NFV) to overcome the existing challenges and constraints of climate change mitigation. The MGFC will directly support the NDC target to implement advanced technology in energy production through the provision of affordable financing for: (i) thermos-retrofitting solutions of existing houses; (ii) energy efficiency measures of energy intensive users; and (iii) green mortgages for EE housing.

Table continues at next page

Information	Assessment information
Implementing entity or entities	Multi-stakeholder (Ministerial and Municipal level)
Objectives and intended impacts or benefits	To offer additional insulation for 300 existing apartment buildings in Ulaanbaatar to ensure thermal comfort of residents, who live in these residential old buildings. GHG emissions were expected to be reduced by 842,600 tCO_2/year.
Date of implementation & completion	The TNA was developed from 2010-2013. The goals to insulate apartment buildings were broadly projected to be completed by 2020. The updated NDC in 2020 aims to implement measures identified in the TNA by 2030.
Geographic coverage	The insulation of residential buildings is envisaged within the capital region of Ulaanbaatar.
Other related policies or actions	Updated NDC (2020) NDC (2015) Law on Energy (approved 2001, updated 2015) Law on Energy Saving (2015) Green Development Policy (2014) State policy on energy Sustainable Development Vision 2030
References	Full TNA Report (TNA, BAEF and TAP reports) GCF Proposal – Energy efficient consumption loan GCF Proposal – Mongolian Green Finance Corporation

2. Moldova case study

Information	Assessment information
Title of the technology	Conservation Agriculture (CA) for the Agriculture Sector
Type of policy or action	Technology package with multiple parts under the umbrella of Conservation Agriculture as a system and modality of tackling the impact of climate change in the agriculture sector
Description of specific interventions	Three prioritized agricultural technology practices were included in the TNA's mitigation and adaptation component as part of a Conservation Agriculture concept for the Agriculture Sector. In this assessment the focus is on technologies and practices prioritized for the adaptation component, which are: • Conservation system of soil tillage without herbicides for winter wheat • Applying 50 t/ha of manure with bedding to agricultural soils once per five years • Vetch field as green fertilizer into a 5-year crop rotation These are considered large scale technologies, addressing soil management and improvement issues. The application of Conservation Agriculture technologies for agricultural practices aiming at soil improvement, while reducing GHG emissions and building resilience for sustainable production under changing conditions of climate, will have long term local and regional benefits as well as significant geographic coverage of 200,000 hectares (with potential to expand) arable land area. Their overall targets aim at solving basic sector issues such as weakly developed or outdated local services as well as land fragmentation in terms of property ownership, at the same time following country's mitigation and adaptation objectives
Status of the policy or action	Planned – the prioritized technologies are long-term large-scale technologies aimed at being implemented over 5-30 years from the time of the TNA (2010-2013)
Implementing entity or entities	Multiple stakeholders from government, private sector, academia, and beneficiary groups.
Objectives and intended impacts or benefits of the policy or action	If implemented, the planned measures will see more decrease soil degradation by erosion and improve the soil and water quality. There will be reduced use of pesticides as more farmers are practicing climate technologies, thus also increasing the resilience of soil to climate risks. GHG emission reductions expected if the actions were implemented 28 tCO_2 by 2015 and 540 tCO_2 by 2020 (with extended area).
Level of the policy or action	Sector and national level
Geographic coverage	The coverage envisioned is at the sectoral level within the geographical boundaries of Moldova.
Other related policies or actions	Moldova Updated NDC 2020 Moldova 2020: National Development Strategy: 7 Solutions for Economic Growth and Poverty Reduction National Development Strategy "Moldova 2030" National Strategy for Sustainable Development of the Agro-Industrial Complex for 2008-2015 National Strategy of Agriculture and Rural development for 2014-2020 Republic of Moldova Climate Change Adaptation Strategy for 2014-2020 Low Emission Reduction Development Strategy of The Republic of Moldova to 2020. Programme for Soil Fertility Conservation and Enhancement 2011-2020 (Fertility 2011) Strategic priorities for the activities of the MAFI of the Republic of Moldova in the years 2011 – 2015 Soil protection measures in the frame of Agriculture practices. GD no 1157 from 13.10.2008. The Law no. 115 of 09.06.2005 organic agro-food production Government Decision no. 149 of 10.02.2006 regarding the implementation of the Law on ecological food production. The Law for accession of the Republic of Moldova to the Kyoto Protocol the Framework Convention of the United Nations with regard to climate change. (no. 29-XV of 13.02.2003)
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TNA TECHNOLOGY NEEDS ASSESSMENT

This guidebook is produced as part of the GEF-Funded Global Technology Needs Assessment (TNA) Project, implemented by the United Nations Environment Programme (UNEP) through the UNEP Copenhagen Climate Centre. The guidebook will be used by national TNA teams, comprising stakeholders from government, non-governmental organisations, private sector and others.

The guidebook familiarizes the reader with the concept of transformational change in the context of the Paris Agreement, the 2030 Agenda and the UNFCCC Technology Framework. Transformational change is defined, and its operationalisation is discussed as an integral part in all steps of the TNA process. Two case studies from previous TNAs, in Mongolia and Moldova, illustrate how transformational characteristics, outcomes and impacts can be assessed and promoted. Finally, the guidance note presents strategic opportunities and recommendations for TNAs to promote transformational change.

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