United Nations Climate Change
Technology Executive Committee

IMPLEMENTATION OF TECHNOLOGY NEEDS ASSESSMENTS

Linkages Between the Technology Needs Assessment Process and the Nationally Determined Contribution Process

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I EXECUTIVE SUMMARY

1. This paper elaborates on potential linkages between TNAs and NDCs. TNAs have been conducted by developing countries since 2001 as a participatory process to prioritize technologies for mitigation and adaptation within countries' national sustainable development contexts. Around 15 years after conducting the first TNA, its bottom-up paradigm was reflected in the Paris Agreement and the concept of NDCs. In their NDCs countries determine actions within their national contexts that contribute to the goal of limiting global warming to well below 2 °C and preferably below 1.5 °C.

2. There are many potential interlinkages between TNAs and NDCs, as noted in earlier papers by the TEC. For example, TEC (2018) compares possible NDC design and implementation steps with those in the TNA guidance, concluding that outputs from one process could be used as inputs for the other. Recent synthesis reports on NDCs and TNAs highlight that the processes refer to each other in several ways. Most recent TNAs use a country's NDC as a starting point for the analysis.

3. At the same time, there are reasons why the interlinkages could have been stronger than nowadays observed:

a. TNAs are often coordinated by a different organization or ministry (national designated entity and/or ministry of environment) than NDCs are. In practice, this could lead to parallel implementation of the processes with limited or ad hoc interactions;

b. TNAs and NDCs are often not conducted simultaneously, with most TNAs operating within the global TNA project, and NDCs being prepared within a five-year cycle under the Paris Agreement;

c. NDCs, as per the Paris Agreement, must have a nationwide orientation, except those prepared for LDCs and small island developing states (SIDS). TNAs, instead, often focus on a limited (given the available resources) number of strategic sectors for climate and development in a country.

4. For developing countries in general, TNAs and their technology action plans (TAPs) help to build capacity for gathering knowledge of climate technologies, assessing what is realistic and feasible within the country contexts and determining how to implement prioritized technology solutions. Aligning this capacity with NDC processes could make NDCs more robust, which can be especially beneficial for LDCs and SIDS, where most of the recent TNAs have been conducted.

5. Moreover, TNAs add 'bottom-up technology realism' to a country's NDC national planning, such as through TAPs, which help NDC planners to consider detailed implementation actions that have been checked and brokered with country stakeholders in terms of feasibility and affordability. This could lead to a vision of a holistic approach in countries that combines the formulation of NDC national targets with bottom-up assessments of technology options, including detailed implementation actions. In this case, earlier TNAs could be updated in support of NDC planning, thereby utilizing the TNA toolkit for organizing stakeholder consultation, barrier analysis and TAP preparation, for example.

6. On updating previously conducted TNAs in support of NDCs, two possible ways forward have been noted in this paper:

a. Setting up a TNA updating/refreshing infrastructure similar to the Global TNA Project, as managed by UDP, to help countries to regularly update their TNA outputs for inclusion in NDCs. This would enable continued technology-related capacity-building in developing countries and peer learning by government officials. In this option, TNA updating would coexist with NDC update processes;

b. Integrating TNA updates within developing countries' NDC cycles. This could involve utilizing tools from the TNA toolbox for updating information, for inclusion in an NDC, on priority technology options within the country context, sector-level implementation conditions, cost data and potential funding opportunities. Possible examples of good practice for this option are countries that utilize funding from the GCF Readiness and Preparatory Support Programme to update their earlier TNA results.

7. To support utilizing these potential interlinkages, the TEC could consider the following activities. If option (a) is pursued, the TEC could provide guidance and good practice insights on the design of such an infrastructure, as well as advice on funding opportunities for it. Should option (b) be preferred by Parties, then the TEC could offer advice to Parties and, for example, the NDC Partnership, on how to use the vast knowledge base of TNAs in NDC development, and how to keep this knowledge up to date for future NDCs.

8. In a survey received by 70 TNA coordinators, two thirds of the respondents have expressed a preference for option (a) (with a 22 per cent response rate). For TNA countries that are SIDS, almost two thirds of the TNA coordinators prefer integrating their TNA–NDC (updating) processes (option B). Regarding funding mechanisms for updating TNAs, answers from TNA coordinators were equally divided between GEF and GCF funding, with some of them suggesting (blended) funding from both mechanisms.

II ACRONYMS AND ABBREVIATIONS

1996 IPCC guidelines	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories
2006 IPCC guidelines	2006 IPCC Guidelines for National Greenhouse Gas Inventories
BAEF	Barrier analysis and enabling framework
BAU	Business as usual
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
COP	Conference of the Parties
CTCN	Climate Technology Centre and Network
DTU	Technical University of Denmark
GCF	Green Climate Fund
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
IGO	International governmental organizations
INDC	Intended nationally determined contributions
IPCC	Intergovernmental panel on climate change
LDC	Least developed country
NAMA	Nationally appropriate mitigation action
NAP	National adaptation plan
NAPA	National adaptation programme of action
NDC	Nationally determined contribution
NDE	National designated entity
non-Annex I Party	Party not included in Annex I to the Convention
SBI	Subsidiary Body for Implementation
SIDS	Small island developing State(s)
SWG*	Sector Working Group (technology needs assessment of Suriname)
TAP	Technology action plan (part of technology needs assessment)
TEC	Technology Executive Committee
TNA	Technology needs assessment
UDP	UNEP DTU Partnership
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

III INTRODUCTION

A Background

9 The technology framework established under Article 10, paragraph 4, of the Paris Agreement,[1] aims at promoting the alignment of TNAs with NDCs and NAPs. Through that, coherence is increased between the implementation of those national plans with national strategies to achieve climate-resilient and low-emission development.

10 The TEC, in its rolling workplan for 2019–2022,[2] includes an activity to continue work on linkages between TNAs and NDCs, including drafting a paper on a topic to be prepared in 2021. This activity further contains a policy brief and recommendations to the COP and the CMA, to be prepared in 2022.

11 In 2018, the TEC published a paper on linkages between NDCs and TNAs in which it was concluded that there are several areas where earlier and ongoing work on TNAs could be helpful in NDC processes by developing countries (TEC, 2018). Examples of such interlinkages are how to embed solutions for mitigation and adaptation in countries' national development strategies, how to engage stakeholders as co-designers and co-owners of packages for climate and development and how to transform climate planning into bankable action plans.

12 This paper builds on TEC (2018) by considering the NDCs communicated since 2018 by developing countries and analysing their content and methodological approach. These NDCs are then compared with the TNAs conducted by the same countries, in order to explore whether, how and to what extent linkages between the processes lead to stronger planning and strategies for climate and development in developing countries.

13 The paper thereby takes the perspective that the stepwise guidance for TNA can be an analytical supporting instrument that is important to NDC design and implementation, especially in developing countries with capacity constraints, and thus can provide information necessary to facilitate the clarity, transparency and understanding of actions prioritized for mitigation and adaptation in NDCs.[3] This can especially be the case for LDCs and SIDS, which may lack the capacity to apply *quantitative* analytical tools for NDC design and for which the more *qualitative* approach of TNAs could be more useful.

14 This also leads to the questions whether and how the TNA process may have to be adjusted so that its outputs are more supportive of NDC processes in developing countries and its timing is better aligned with the NDC five-year cycle. Findings on this are presented as a way forward and key findings.

B Objectives

15 As explained by TEC (2018), there are several areas where TNAs and NDCs can have linkages to support each other. TNAs are a country-driven process to help developing countries identify technology needs for mitigation and adaptation. Conceptually, TNAs have had clear similarities with other processes under the Convention, such as NAMAs and NAPs. Both NAMAs and NAPs aim to identify options for mitigation and adaptation with a close connection to countries' development objectives.

16 An earlier series of papers by the TEC, such as TEC (2013) (2013b) (2014) (2016), elaborated on methodological commonalities and differences between these processes and TNAs. A core observation from these papers is that TNA outputs can be useful inputs for different stages of NAMAs and NAPs. A similar observation was found in TEC (2018) for linking TNA outputs with NDCs.

17 To analyze whether such linkages take place in practice, this paper explores to what extent developing countries that submitted NDCs between 2018 and 2021:

1 Adopted by decision 15/CMA.1, annex, para. 12(b), under Article 10, para. 4, of the Paris Agreement.
2 See https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TEC_Documents_doc/30bada866c88440cb9a5a2b80b25a9ae/f874e0f16a5643f989137362825ec3c2.pdf.
3 See decision 14/CMA.1.

a. Used outputs from earlier TNAs in their NDCs;

b. Aligned ongoing TNAs with national processes of formulating NDCs.

18 With a view to the above, the objective of the paper is to provide policy recommendations to countries and relevant stakeholders on this matter. More specifically, the paper aims to:

a. Increase coherence between the implementation of national plans with national strategies to achieve climate-resilient and low-emission development;

b. Enhance understanding on linkages between TNAs and NDCs, and on how these could be further strengthened;

c. Propose options to establish linkages between TNAs and NDCs that lead to implementation;

d. Assist the TEC in delivering relevant key messages and recommendations to Parties through the COP and the CMA.

19 By considering interlinkages between TNAs and NDCs, it is also intended to explore in this paper how TNA outputs and reporting can be useful contributions to the information necessary to facilitate clarity, transparency and understanding. In particular, the information that TNA processes compile through TAPs could be considered specific contributions to the information necessary to facilitate clarity, transparency and understanding.[4]

20 This work may assist the TEC to identify follow- up actions and provide guidance to its implementation task force on possible elements of draft key messages and recommendations to the COP and the CMA on this matter.

C Scope of the paper

21 The paper builds on work previously undertaken on analysing interlinkages between TNA and NDC processes, including:

a. Current state of play of the relevant decisions from COP;

b. TNA process and its conducted and reported TNAs and TAPs;

c. Previous TEC background paper on linkages between TNAs and other climate policymaking processes;

d. TEC brief on possible integration of the TNA process with NAMA and NAP processes;

e. TEC rolling workplan for 2019–2022 and its relevant activities, experiences and lessons learned from linking TNAs with NDCs;

f. Other relevant documents and literature.

4 See decision 4/CMA.1.

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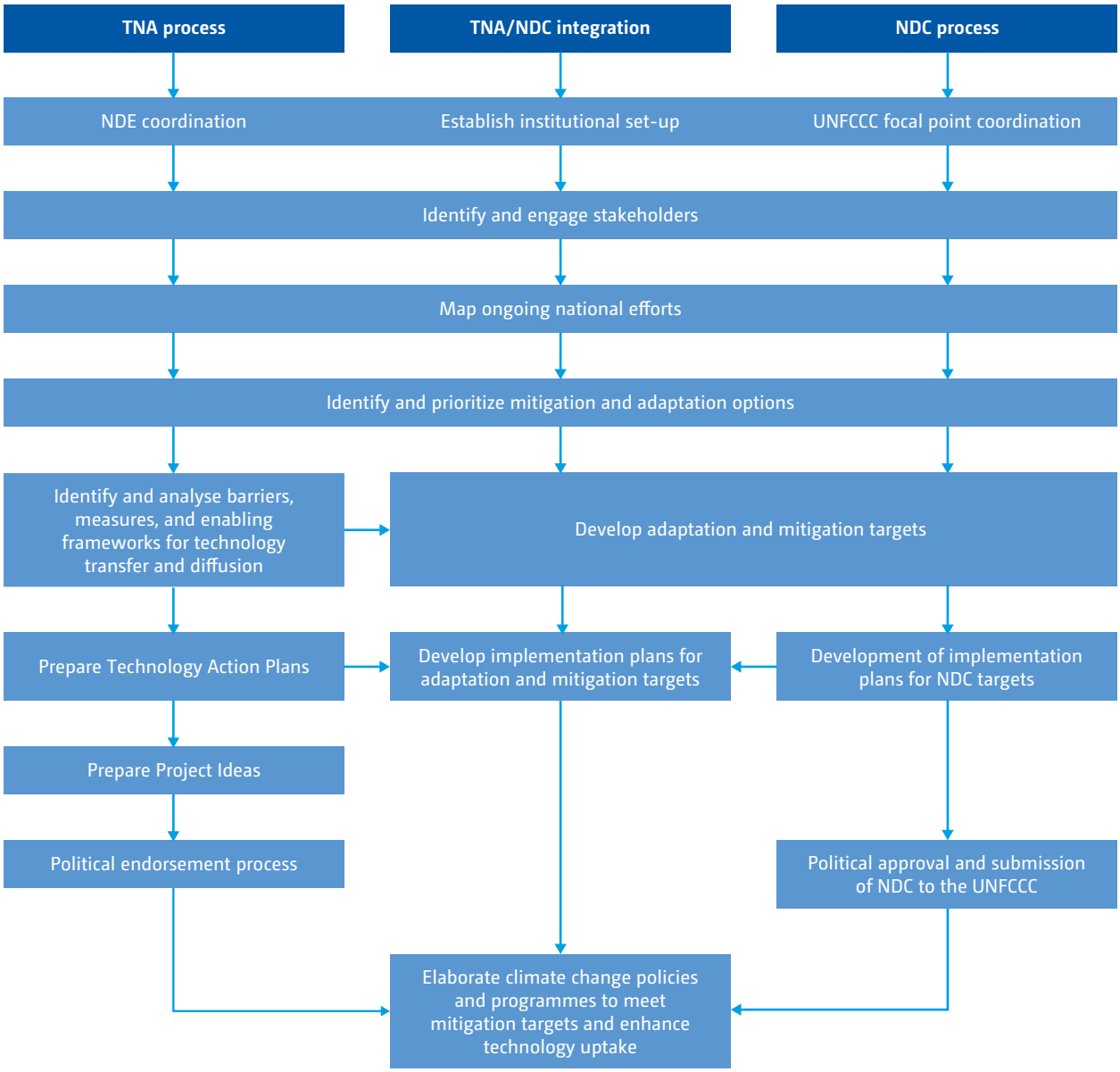
IV SYNOPSIS OF 2018 PAPER ON LINKAGES BETWEEN NDC AND TNA PROCESSES

22 The 2018 paper on linkages between NDC and TNA processes (TEC, 2018) highlighted how TNA outputs could serve as valuable inputs for different NDC steps, and possibly the other way round. After all, both processes use national development priorities and strategies as a starting point for identifying (technology) options for mitigation and adaptation.

23 Moreover, since technology options are essential for achieving national climate targets as identified in NDCs, technology portfolios as prioritized in TNAs could potentially form an integral part of the NDC planning process. Nevertheless, the paper explains that TAPs focus primarily on scaled-up implementation of prioritized technologies, while NDC implementation plans often focus on realizing sector and national targets. In practice, these scales can align well, but their direction and focus could differ (i.e. building from individual technologies bottom up (TNA and TAP) versus identifying technology options for meeting higher-level country targets (NDC)).

Figure 1 Assessment of potential interlinkages between TNAs and NDCs in TEC (2018)



24 Based on a comparison of TNA and NDC process steps, TEC (2018) identified methodological linkages between both processes, as shown in Figure 1. It was thereby acknowledged that, in contrast with TNAs, a detailed stepwise and uniform methodology does not exist for NDCs. Therefore, TEC (2018) first identified several likely NDC design steps and then compared these with TNA steps in order to arrive at a 'TNA–NDC integration', as follows:

a. Identify the national institution(s) to enable the integration, thereby bringing together the roles of the UNFCCC national focal point and the coordinator of the NDE;

b. Consultation of stakeholders at different stages of the process(es);

c. Consideration of relevant national processes and efforts, as backdrop for the climate technology option selection and planning;

d. Development of implementation plans for actions for mitigation and adaptation.

25 Finally, TNA–NDC integration requires that the political endorsement steps for both processes need to be aligned. In the past, as explained by TEC (2015), among others, TNA reports were sometimes not considered by the country leadership as the process had been conducted by the ministry of environment, instead of, for example, the ministry of economic affairs, energy, agriculture or finance. Aligning TNAs and NDCs and thereby utilizing the potential synergies between both processes would thus require political endorsement of TNA outputs by the NDC governance structure.

26 As a way forward, TEC (2018) suggested that TNAs can be seen as a national planning tool for identifying current and future technology needs for sustainable development, in combination with achieving mitigation and adaptation benefits. As such, the TNA methodology serves as a sound basis for identifying pathways for countries to formulate and realize NDC targets.

27 Stronger alignment of TNAs with NDCs "could possibly support a post-2020 climate policy framework", whereby "the TNA process should work in sync with the NDC process by prioritization of technologies in line with NDC targets and sectors, and align targets set in technology actions to the targets set in NDCs" (TEC, 2018, pp. 19-20).

28 Further considerations for aligning NDCs and TNA were provided by TEC (2018), as follows:

a. For continuous support to NDC design, TNAs should become a process, rather than a one-time project. Regular updates would make TNAs more responsive to dynamic implementation contexts and enable implementation of TNA results as part of the NDC implementation process. TNAs could then serve as a logical starting point for countries in developing their NDC;

b. Financial support to NDC implementation and monitoring of NDC progress would also support monitoring the implementation of TAPs;

c. Aligning TNA and NDC processes would help to avoid duplication of actions (including avoiding stakeholder fatigue) and blind spots (i.e. areas not covered by TNAs or NDCs).

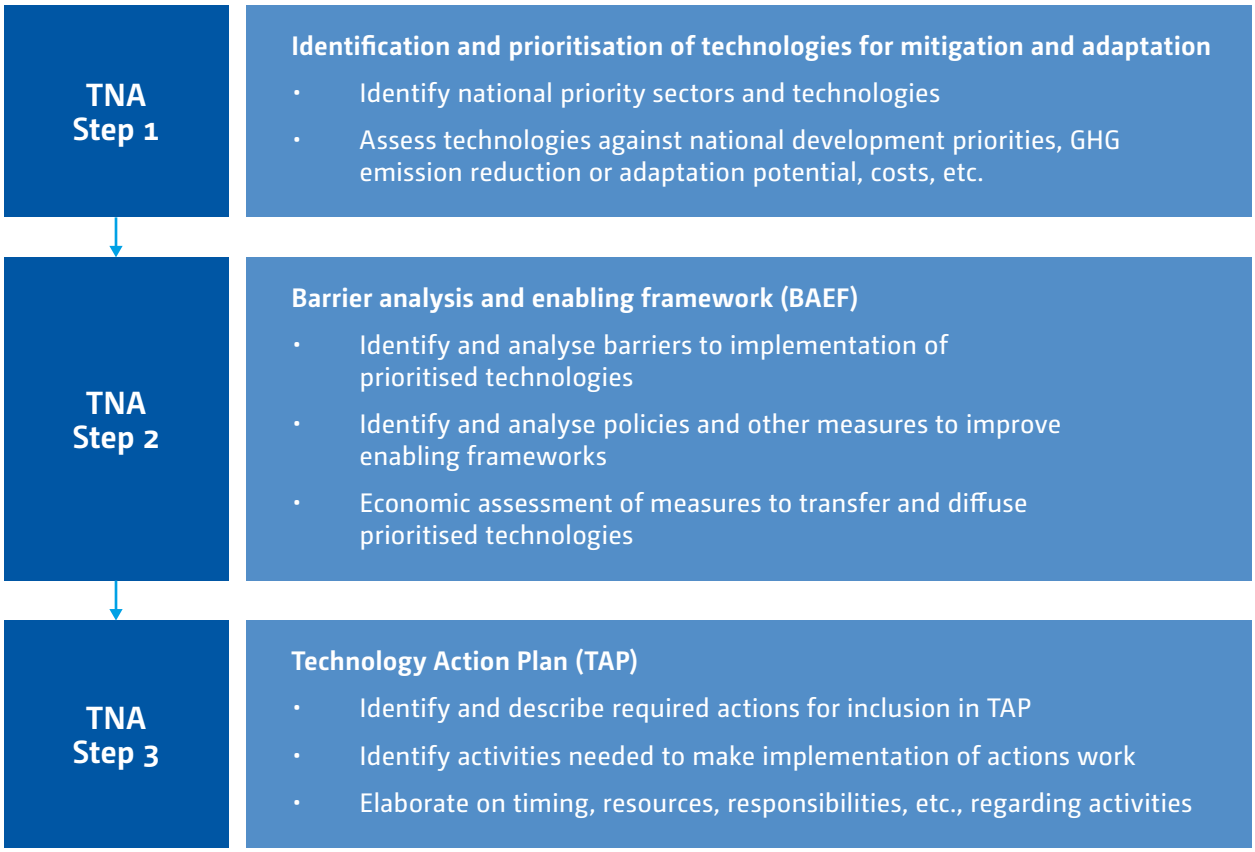
V BRIEF DISCUSSION OF TNA AND NDC DEVELOPMENTS

A Development of the TNA process and its results

29 Following the Poznan Strategic Programme on Technology Transfer, the Global TNA Project started in 2009, with support from the GEF and managed by UNEP in collaboration with UDP.[5] TNAs originated from a decision at COP 7 that encouraged developing country Parties to undertake assessments of country-specific technology needs.[6]

30 The Global TNA Project offers non-Annex I Parties a stepwise decision-making procedure for the TNA process, which consists of three main stages, as shown in Figure 2: prioritization of technologies for meeting countries' climate and development goals, identifying barriers and enablers for scaled-up and accelerated implementation of these technologies, and formulating TAPs.

Figure 2 Key steps and components of the TNA process



5 References to dissemination of technology and transfer of, or access to, technology are to voluntary technology transfer on mutually agreed terms.
6 Decision 4/CP.7, annex, para. 5.

31 Through the years, the focus of TNA work has increasingly moved towards implementation. Following the publication of the renewed guidance for the Global TNA Project in 2010 (UNDP, 2010), countries delivered well-elaborated and detailed technology portfolios that had been put together with the active engagement of country stakeholders (TEC, 2015).

32 However, the success of the implementation of TNA results was often less clear. TEC (2015b) concluded that many TAPs were insufficiently bankable, and the eventual success was difficult to monitor (also because monitoring TNA results is beyond the TNA process). This led to improved guidance on technology implementation, to lead to more detailed TAPs (TEC & UDP, 2017).

33 TEC (2019, p. 3) concluded that the "updated TAP guidance has significantly improved the quality of the TAP reports, with clear and consistent information on for example stakeholder roles and responsibilities, timelines, budgets and potential funding sources. Many of the countries in Phase II have followed the new guidance meticulously, and the TAPs are seen by stakeholders as useful documents to get TNA results towards implementation."

34 Since 2001, 90 non-Annex I Parties have conducted TNAs (some of these countries have renewed earlier TNAs). The results of earlier TNAs have been synthesized as follows:

a. 2001–2007 – first TNA synthesis report;

b. Global TNA Project Phase I – second TNA synthesis report (2014): 31 countries;

c. Global TNA Project Phase II – third TNA synthesis report (2017): 22 countries;

d. Global TNA Project Phase I and II – fourth TNA synthesis report (2020): 53 countries (51 on mitigation and 52 on adaptation).[7]

35 From its latest synthesis in document FCCC/SBI/2020/INF.1, the SBI derived the following overarching, generic conclusions:

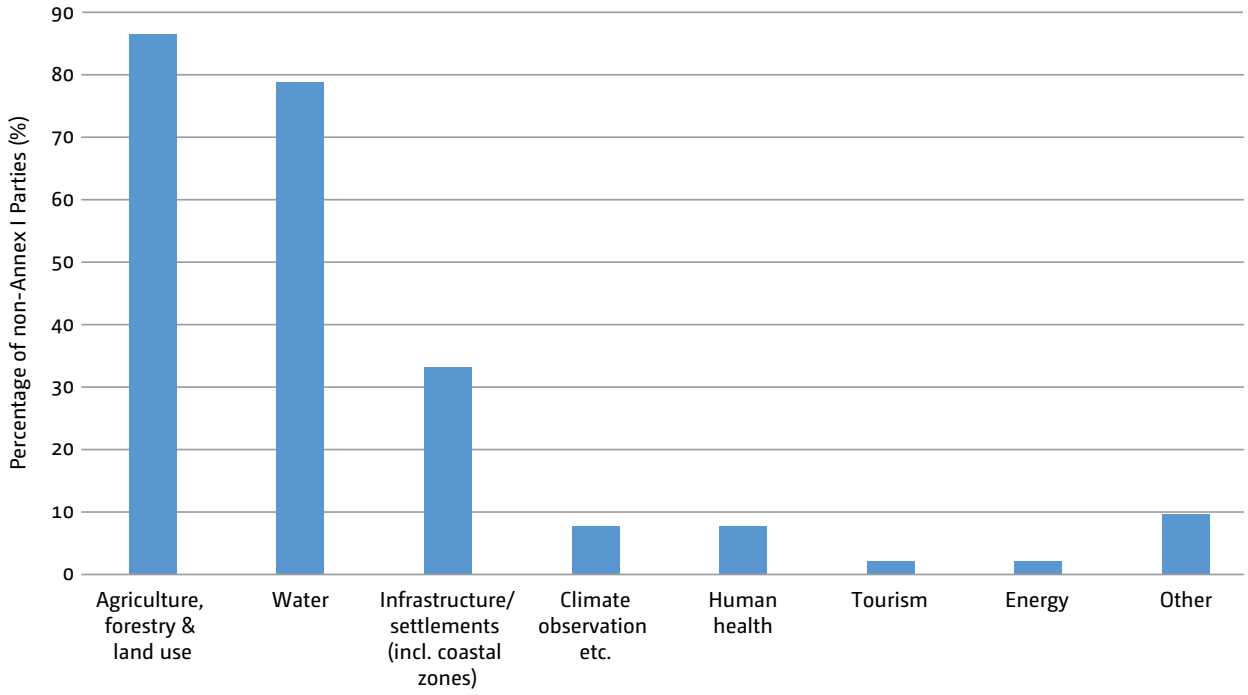
a. The majority of TNAs are coordinated by governments (through a ministry or agency), with ministries of environment being in the lead in most cases. TNAs are generally strongly participatory, with the engagement of stakeholders from national government bodies, ministries, academia, the private sector, nongovernmental organizations, independent consultants and intergovernmental organizations;

b. Most TNAs use national development priorities and GHG emissions and/or climate vulnerability as a starting point for their assessment, which enables the identification of technologies for realizing national development goals with low emissions and strengthened climate resilience;

c. Energy is most frequently identified in TNAs as a strategic sector for mitigation (in 94 per cent of the countries), with a particular focus on energy industries and transport. Agriculture (87 per cent) and water (79 per cent) are key sectors for adaptation in the TNAs (see Figure 3);

7 FCCC/SBI/2020/INF.1.

Figure 3 Prioritized sectors for adaptation reported in Parties' TNAs between 2009 and 2017



d. Within the energy sector, the technology options solar photovoltaic, hydroelectricity and biomass or biogas electricity generation technologies are the most prioritized technologies, followed by wind turbines, efficient lighting and improved cookstoves. Within agriculture, prioritized options for stronger climate resilience are sprinkler and drip irrigation, followed by biotechnologies for crop improvements;

e. In terms of barriers to implementation of prioritized technologies, most TNAs refer to obstacles of an economic, financial or technical nature. Frequently mentioned examples of these are inadequate access to financial resources and high capital costs. In the TNAs for adaptation policy, legal and regulatory, institutional and lack of human skills have been identified as barriers to implementing prioritized solutions. As enabling actions for promoting technologies, TNAs mostly contain suggestions to increase the availability of financial resources, including subsidies, new financial mechanisms and a larger allocation of government budgets for prioritized technologies;

f. Based on the budget information provided in TAPs, Parties request a cumulative budget of USD 20.1 billion for technologies for mitigation, which is more than four times as much as the estimated budget of USD 4.4 billion for prioritized technologies for adaptation.

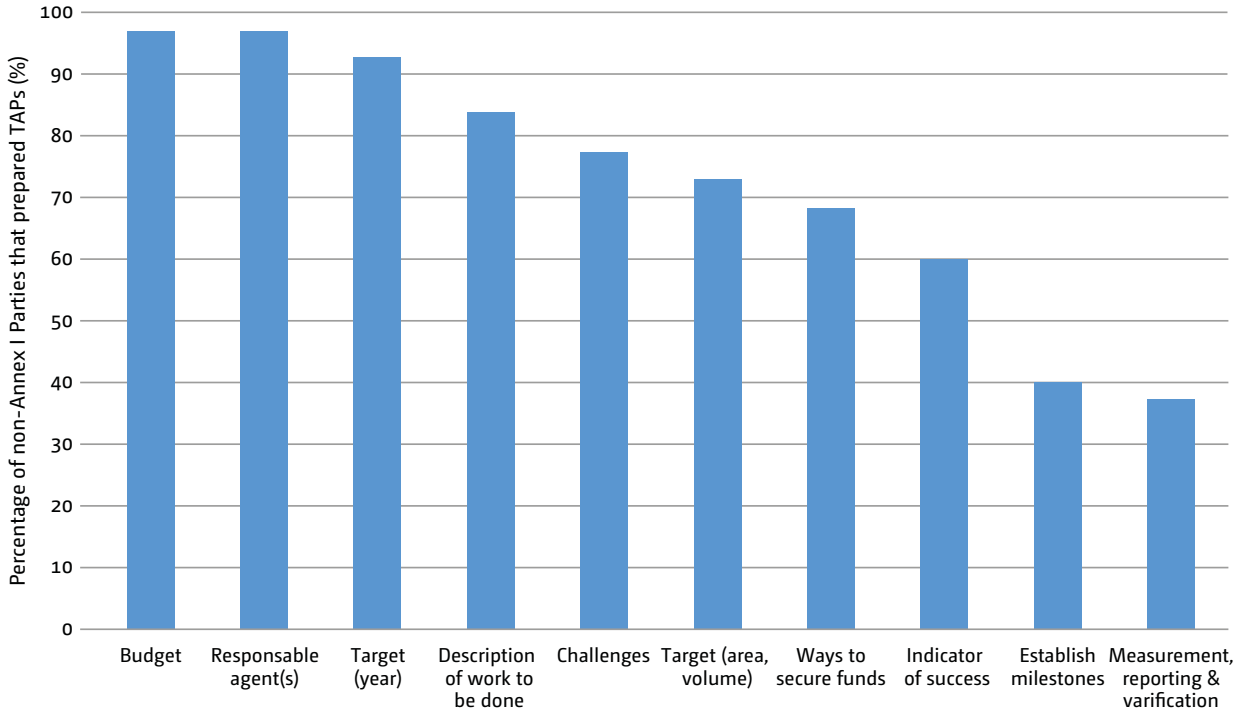
36 The fourth synthesis report also compares TNAs in Phases I and II of the Global TNA Project, which leads to the following key insights:

a. TNAs have remained highly participatory across the two phases, with active engagement by stakeholders from the sectors identified as strategically important for mitigation and adaptation. At the same time, more cross-sectoral stakeholders, such as the finance community, household representatives and trade unions, are generally underrepresented in TNAs. Despite the call in the improved TAP guidance (TEC & UDP, 2017) for stronger involvement of these types of stakeholders, little progress could be seen from Phase I to Phase II;

b. TNA countries have become increasingly aware of their climate vulnerability, given that more attention is paid to climate change impacts in Phase II TNAs;

c. The quality of TAPs has significantly improved in Phase II TNAs, in comparison with in Phase I TNAs, in terms of completeness and level of detail (see Figure 4). Phase II countries were assisted in their TAP development using the updated TAP guidance (TEC & UDP, 2017).

Figure 4 Information elements included in TAPs in Phase II TNAs



37 In a review of implementation performance of TAPs, TEC (2019) highlights several examples of successful actions to advance implementation of TNA results, such as pilot projects carried out on the basis of prioritized TNA technologies, with support from, for example, UNDP and with funding provided by the GEF and the GCF, a governmental feed-in tariff system for renewable energy technologies prioritized by the TNA, and blending of commercial bank loans with GCF funding to fund technology implementation programmes.

38 These successes can, to a large extent, be ascribed to collaboration between different stakeholders around a prioritized technology and its TAP. As TEC (2019) shows, preparing for implementation is not just a matter of writing a business plan. In fact, implementation is strongly supported by effective and efficient interlinkages between, for example:

a. National ministries and multilateral development organizations to prepare guidelines for implementation (e.g. replicating rainwater harvesting projects in Lebanon);

b. Multiple stakeholders who first collaborate within the context of a TNA and then form an informal sector stakeholder group to lobby for incentives for technology implementation after completing the TNA;

c. National government agencies and the CTCN in support of proposal preparation for funding applications at the GCF or other international funding providers;

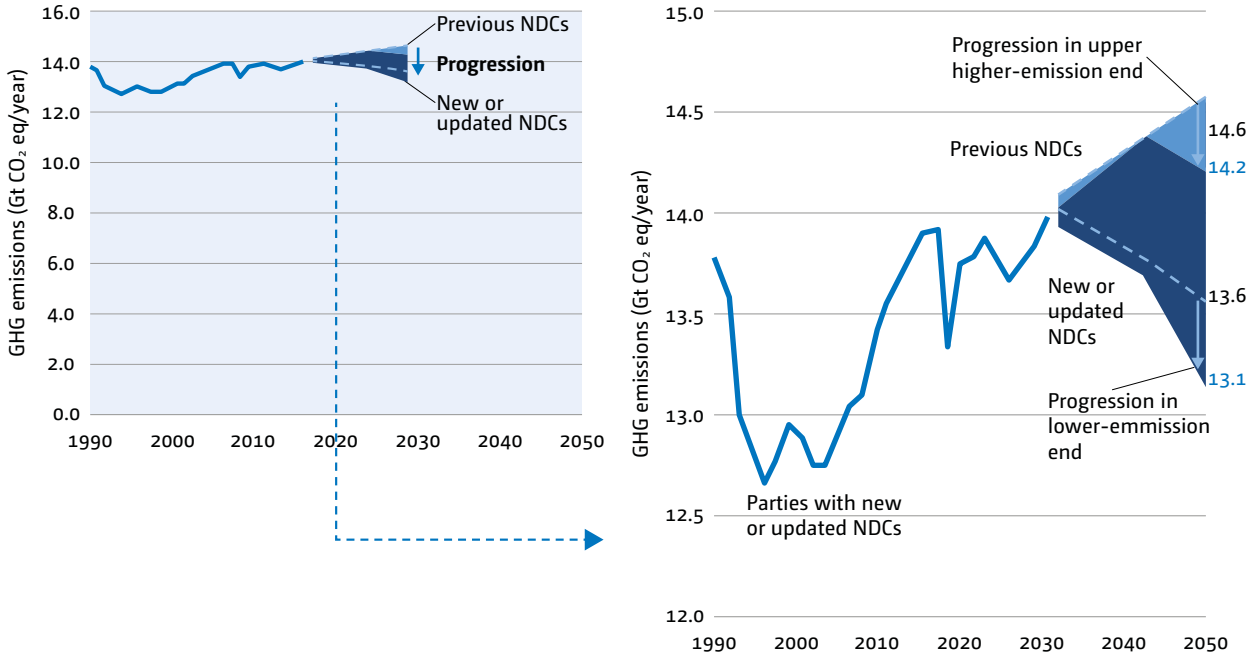
d. Ministries within the same country to jointly work on technology solutions for adaptation or mitigation when these cut across different policy areas.

B Development of the NDC process and its results

39 In preparation for COP 26, the secretariat prepared an initial version of the NDC synthesis report, containing information from 48 new or updated NDCs and representing 75 countries (submitted by 31 December 2020) (UNFCCC, 2021). The synthesis report covers almost 30 per cent of the global GHG emissions in 2017. By July 2021, the NDC registry showed 192 Parties had submitted their first NDCs, of which nine had also submitted a second NDC.[8] These reports are, however, not covered by the NDC synthesis or in this section.

40 All analysed NDCs start from a national target for climate change mitigation, ranging from economy-wide absolute emission reduction targets to emission reductions below a reference scenario, such as 'business as usual', or targets in the form of policies and measures or relative targets (e.g. GHG emissions per unit of GDP). In comparison with previous NDCs, new or updated NDCs increasingly opt for absolute targets. Figure 5 shows the projected range of GHG emission levels in accordance with the NDCs analysed with midterm values (averages) of around 14.04 Gt carbon dioxide equivalent in 2025 and 13.67 Gt carbon dioxide equivalent in 2030.[9]

Figure 5 Projected range of greenhouse gas emission levels according to nationally determined contributions (UNFCCC, 2021, p. 12)



Note: The projected ranges coer the higher-emission end for unconditional elements of NDCs to the lower-emission end when also taking conditional elements of NDCs into account.

8 https://www4.unfccc.int/sites/ndcstaging/Pages/Home.aspx.
9 These are the midpoint values of minimum and maximum values ('progression in lower-emission end' and 'progression in higher-emission end' in Figure 5), after aggregating NDCs.

41 Contrary to many TNAs, the coverage of sectors and GHGs in the new or updated NDCs is almost countrywide (i.e. 99.2 per cent coverage of Parties' total economy-wide emissions in 2017 (the latest year for which the analysis was carried out)). All analysed NDCs cover the energy sector, whereas land use, land-use change and forestry are covered in 92 per cent of the NDCs, followed by waste (89 per cent) and industrial processes and product use, and agriculture (both 86 per cent).

42 In terms of time frames for achieving targets, NDCs take a longer-term perspective, including net-zero emissions by 2050, with intermediate targets for 2025 or 2030, for example. These time frames align with the longer-term country and sector visions included in most of the NDCs.

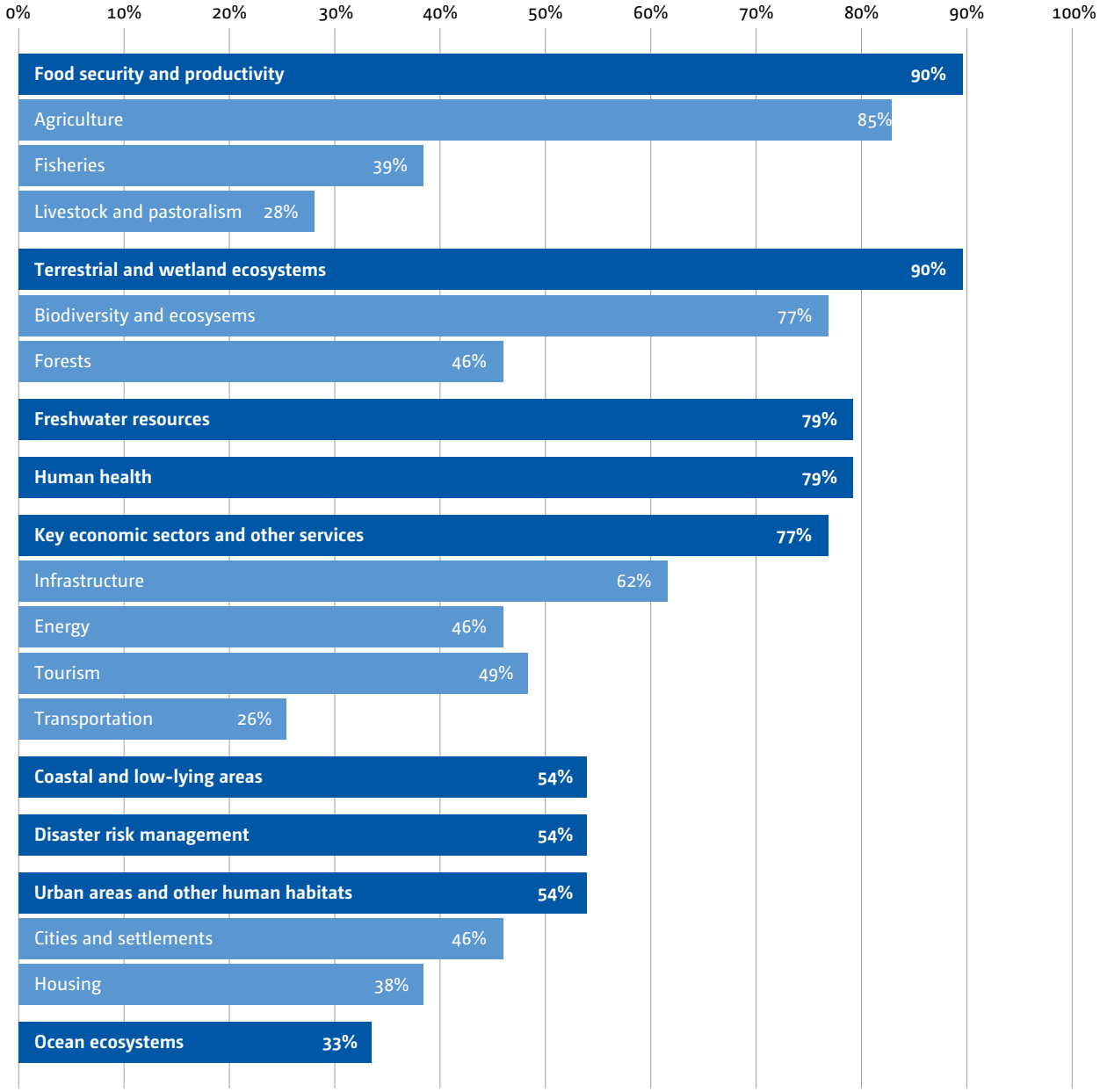
43 In line with the development of longer-term visions and economy-wide emission projections, countries describe in their NDCs how they have used scenario development, using data on key parameters and variables such as GDP and population (growth), in combination with a cost–benefit analysis for comparing different options for inclusion in the NDC. Among the tools used are modelling tools for estimating emissions in different scenarios.[10]

44 According to the synthesis analysis, most NDC processes are accompanied by inclusive and participatory consultation processes with stakeholders representing a wide range of interest groups. The report does not specify what methods for such consultation have been used and at what stages of NDC preparation stakeholders have been consulted (e.g. for co-creation of NDC scenarios or validation of (modelled) scenario outcomes).

45 The synthesis report concludes that analysed NDCs contain more assessments on adaptation than earlier NDCs did, thereby often building further on NAPs (see Figure 6). Frameworks for adaptation are also more integrated and are national level rather than project level, as in earlier NDCs. Some NDCs also establish interlinkages between mitigation and adaptation, especially in terms of emission reduction co-benefits of solutions for adaptation.

10 For example, the synthesis report mentions the Integrated Market Allocation-Energy Flow Optimization Model System, Long-range Energy Alternatives Planning, the Greenhouse Gas Abatement Cost Model, Green Economy Modelling, the PROSPECTS+ emissions scenario tool and the Ex-Ante Carbon-balance Tool.

Figure 6 Share of adaptation components of NDCs referring to specific adaptation priority areas and sectors



46 Regarding implementation, analysed NDCs show a divergent picture, with some countries preparing dedicated sections on means of implementation, including separate sections on finance, and others referring to implementation aspects across the NDC report. For example, half of the NDCs have a dedicated section on finance, whereas the others address financial aspects in other sections of the NDC. Only 20 per cent of the countries have included a dedicated section on capacity-building in their NDC.

47 Finally, in terms of coverage of technology needs for mitigation and adaptation, many NDCs contain information on specific technology options as identified for several areas (mostly energy-efficient appliances and processes, renewable energy technologies, low- or zero-emission vehicles and hydrogen technologies), including (policy) measures to support their implementation.

48 Some countries have also included in their NDCs aspects for stimulating technology innovation, such as research and development funding and business model development. In comparison to the above TNA synthesis, the identification of technology needs in NDCs seems more top-down oriented – working from a national target towards options to reach it – than the bottom-up orientation of TNAs, to identify technology options and analyse what to do to upscale them (see elsewhere in this paper for an elaboration on this observation).

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VI INTERLINKAGES BETWEEN TNAS AND NDCS AS IDENTIFIED IN THE SYNTHESIS REPORTS

A Fourth TNA synthesis report

49 The main conclusions in the fourth TNA synthesis report are discussed elsewhere in this paper. Among the topics explored in the synthesis report are linkages between TNAs and other processes under the Convention. The report concludes the following:

a. Most countries do not consider TNAs a stand-alone process. Instead, countries see TNAs as being complementary to national policies and plans for mitigation and adaptation, such as NDCs and NAPs;

b. Over half the TNA reports analysed contain elaborations on possible interlinkages, such as TNAs being based on earlier completed NAMAs and NAPAs;

c. Countries identify the outputs of TNAs as inputs to work on their national communications, NDCs and NAPs.

50 Moreover, countries indicate that the updated guidance for better quality TAPs (TEC & UDP, 2017) has provided them with enhanced processes for addressing and overcoming gaps in enabling frameworks and capacities for technology implementation. In addition to supporting scaled-up implementation of prioritized climate technology options, TNA reports reveal that this provides a technology-responsive element of overall climate change strategies and plans, such as NDCs and NAPs.[11]

51 In their TNAs, countries refer to existing or ongoing national processes from which data or other insights were gathered as inputs for the TNAs. A total of 65 per cent of the countries refer to national communications as a source of information, and 31 per cent mention NAPAs and NAPs as background information for assessments of technology options for adaptation. In addition, 23 per cent of the TNA reports referred to or extracted information from INDCs and NDCs (e.g. as a backdrop for describing national climate policies and measures (e.g. Armenia, Guyana, and United Republic of Tanzania)).[12]

B TNA regional technology briefs

52 The TEC has published a series of TNA regional briefs that highlight technology choices for prioritized sectors for climate and development in Latin America and the Caribbean, Asia and the Pacific, and Africa (TEC, 2020a) (2020b) (2020c). The briefs conclude that TNAs are a practical tool that provides developing countries with an effective and solid foundation for scaled-up implementation of climate technologies. This assists countries in pursuing both targets agreed under the Paris Agreement and nationally determined sustainable development goals.

11 FCCC/SBI/2020/INF.1, para. 23.
12 FCCC/SBI/2020/INF.1, box 10, p. 35.

53 On linkages with NDCs, the briefs contain the following examples:

a. The TNA of Suriname highlights the development of climate-resilient crop varieties in order to ensure the country's food and nutritional security, which "goes hand in hand with Suriname's NDCs, which stress the goal of increasing the contribution of the agricultural sector to the national economy" (TEC, 2020a);

b. There is a strong similarity between the top technologies prioritized by many African countries for the energy sector (i.e., solar energy, hydropower, bioenergy, energy-efficient cookstoves and efficient lighting systems) in the NDCs and the results of these countries' TNAs (TEC, 2020c).

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VII COMPARATIVE ANALYSIS OF THE MOST RECENT TNAS AND NDCS

54 The picture that has arisen from the above discussion of the latest NDC and TNA developments and their assessment reports is that developing countries in practice frequently connect both processes, albeit to different degrees. From the TNA reports and interviews with TNA and NDC practitioners, it has become clear that for most of the latest TNA countries NDCs are the starting point for analysing technology needs.

55 For instance, the selection of sectors for a country's TNA is based on the sectoral scope of the country's NDC. Similarly, TNAs are often considered a tool for contributing knowledge to move forward on NDC implementation. In many countries, consultants and working groups are the same for both TNA and NDC processes. Interviewed practitioners indicate that TNA work has helped to build capacity, which also supports NDCs. For example, in Eswatini the Centre for Sustainable Energy Research was established as a result of the country's TNA work, and the centre is currently involved in revising Eswatini's NDC.

56 For this paper, a specific sample of countries has been taken to compare their NDCs and TNAs. The sample contains developing countries that completed their TNA reports after 2017 and that recently communicated the first or second NDC. The goal of the comparison is to see whether and to what extent the countries have used their TNA results as inputs for their NDCs.

57 The sample of developing countries meeting the above criteria contains Fiji, Grenada, Honduras, Jamaica, Panama and Suriname. As per the focus of the TNA phase that they participated in, each of these countries is an LDC or SIDS. Their NDC and TNA (including their TAP) reports have been compared using the following parameters:

a. National development and climate targets and priorities;

b. Sector coverage;

c. Identified solutions, including technologies, for mitigation and adaptation;

d. Identified barriers and enablers;

e. Action plans for scaled-up implementation of the solutions.

58 Box 1 contains a description of, and linkages between, the NDCs and TNAs for two of the sample countries, Suriname and Honduras. The examples illustrate how TNA and NDC results are comparable and how NDCs refer to the work on TNAs done in these countries.

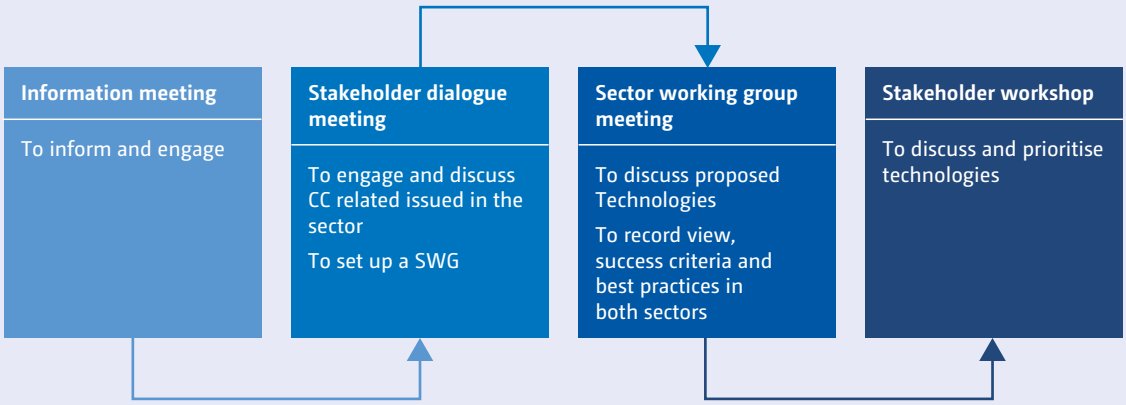
Good practice examples of linkages between NDCs and TNAs

Suriname

Suriname's TNA includes an emphasis on adaptation, as most of its population is located near the coast in a low-lying area and the region is subject to climate disasters and droughts. Therefore, most of the actions identified for implementing prioritized technologies for adaptation in the TAP refer to water management and agriculture to ensure food security and people's safety. The proposed mitigation plans can be effectively integrated with the adaptation actions, as they refer to enhanced farming systems and passive savings through integrated design options for improved efficiency in households and buildings. The sectors to be addressed in the TNA have been determined through public stakeholder participation, and the specific technical solutions were provided by local experts during collaborative workshops.

Suriname's NDC addresses the sectors included in its TNA, and also uses public stakeholder participation as the method to decide on policies and means of implementation (see also Figure 7). Regarding implementation plans, the NDC document explicitly refers to the technology actions defined in the TAP, although these are not yet included in the NDC's project portfolio.

Figure 7 Suriname's stakeholder engagement process



Honduras

Honduras's TNA also stresses addressing adaptation actions, with a focus on natural catastrophes, as, owing to its geographical characteristics, the country has experienced several climate-related disasters. The topics addressed in the TNA and the TAP were determined by consultation with local sector stakeholders. Many of the technologies prioritized for mitigation can be easily integrated with solutions identified for adaptation, such as improved agriculture systems and enhanced water management. Honduras's mitigation TAP also includes ongoing initiatives, such as increasing the share of renewable energies for electricity generation and obtaining energy from waste management.

The elaboration of the NDC included all sectors of the population, and the GHG emission reduction per sector was partially decided using modelling. Most of the technologies included in the TAP are also included in the NDC's road map, although there is not an explicit mention of it or a defined project portfolio yet.

59 From the comparative analysis, it is clear that the way countries describe their national development goals and main (climate) vulnerabilities in TNAs and NDCs is generally consistent. This is in line with the observation from interviews that TNAs increasingly take NDCs as a starting point or reference document, and that countries often assign work on both processes to the same consultants.

60 Similarly, the prioritization of strategic sectors in NDCs and TNAs is fairly consistent, although the number of sectors in TNAs and TAPs is usually smaller than in the more top-down oriented NDCs. It is thereby noted that NDCs tend to focus largely on mitigation actions, while TNAs are often equally focused on mitigation and adaptation (usually via two separate reports per country).

61 When comparing the prioritization of solutions, NDCs and TNAs become more different. In fact, little to no consistency was found in the proposed mitigation and adaptation techniques for the analysed countries in the TNA and NDC processes. In those cases where similarities can be found, the motivation behind the inclusion of these technologies in the NDCs seemed to be more related to a sectoral approach than to the findings of the TNAs or the technical solutions of the TAPs.

62 In conclusion, the analysis on the six countries that have recently conducted a TNA and communicated an NDC shows that there is consistency between both processes in terms of national priorities and defining the sectoral scope, but that the identification of solutions for mitigation and adaptation is often a different process in TNAs and NDCs.

63 This supports the observation from interviews that TNAs use NDCs as a starting point, and sometimes the other way round, but once started they follow their own process towards prioritizing solutions and action plans. Moreover, as one interviewed practitioner, though not from one of the six countries covered in this section, indicated, country circumstances may change so that portfolios with technologies resulting from a TNA could be outdated by the time the NDC is formulated.

64 In addition, an analysis has been done of updated first or second NDCs (by 38 countries) for this paper. This helped to obtain a picture of the composition of and differences between NDCs. NDCs were analysed against the following parameters:

a. GHG accounting procedures used for the NDCs;

b. Organization of the NDC process, involving ministries and stakeholders;

c. Type and calculation of the climate goal(s) foreseen in NDCs;

d. Planning for implementation.

65 Figure 8 presents a synopsis of this overview. From the analysis the following can be concluded:

a. NDCs communicated by different countries largely differ in terms of their content, level of detail, elaboration methods, quality of data sources, implementation plans and participatory processes used in their elaboration. Consequently, it is not possible to set unified criteria for evaluating NDCs;

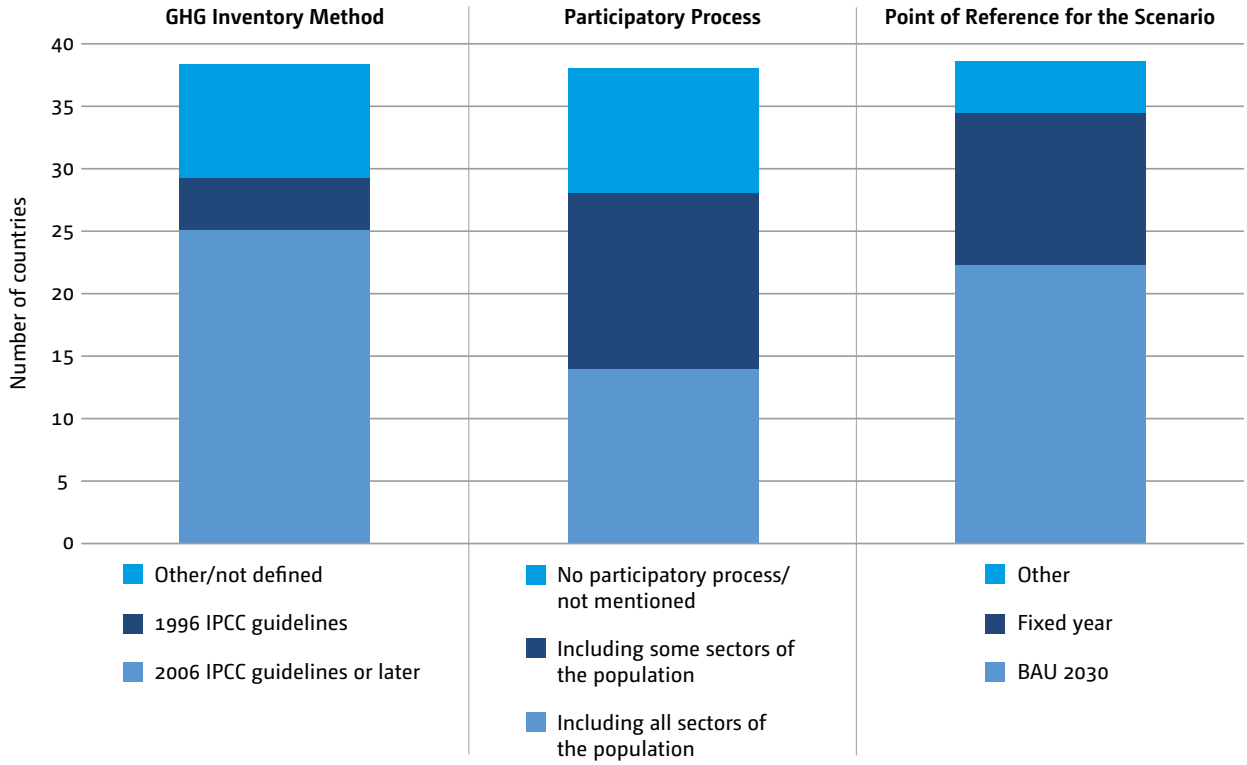
b. In many NDCs, implementation plans lack details to assess their 'bankability' and likelihood of implementation towards realizing the targets set by the NDCs;

c. The methodology used to create scenarios, such as for 'business as usual' and emission reductions, is often not described in detail, which complicates the replicability of the method in other countries;

d. The methods for GHG emission inventories per sector differ across NDCs, although in most cases countries apply the *2006 IPCC guidelines* (IPCC, 2006);

e. In many cases, it is not specified how stakeholders have been consulted in the participatory stages of NDC formulation.

Figure 8 Characterization of processes and information in recent NDCs



66 In conclusion, linkages exist in practice between TNA and NDC processes, in particular with TNAs using NDC processes as a starting point and backdrop for the assessment. According to interviewed practitioners, countries with completed TNAs use TNA outputs in their NDC process, although not always with specific references.

67 In some cases, this is due to timing. For example, one interviewee explained that most of the TNA countries in Phase III of the Global TNA project have established direct links between TNAs and NDCs. However, these links are not yet visible in reports, as these TNA countries have not yet completed their TAPs. Therefore, TAP preparatory work could feature in NDCs without a clear link to the reports as these are yet to be published.

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VIII TNA–NDC LINKAGES FOR HOLISTIC NDC APPROACHES

68 The exploration for linkages between NDC and TNA processes was called upon by COP 18, which noted that the technology needs assessment process should be integrated with other related processes under the Convention, including nationally appropriate mitigation actions, national adaptation plans and low-emission development strategies.[13]

69 The updated paper on linkages between NDCs and TNAs (TEC, 2018) elaborated on the basic steps of TNAs and NDCs and identified potential synergies, whereby outputs from one process could be used as input for the other (see Figure 1). A further analysis has been done on the nexus between NDCs and TNAs by Charlery and Traerup (2019), based on 71 NDCs. They conclude, "Further developing the TNAs could play a vital role in filling gaps in the existing NDCs, specifically those relating to identifying appropriate technologies, their required enabling framework conditions and preparing implementation plans for their transfer and diffusion."

70 Integration of the processes has thus far not taken place, but linkages between TNA and NDC processes have nevertheless been created by countries. As explained above, several NDCs refer to previously conducted TNAs. Most TNAs covered by the fourth synthesis report on TNAs see potential interlinkages with NDCs, for example by taking NDCs as a starting point for further analysis.

71 Interviewed practitioners for this paper have explained that several NDCs contain information gathered from ongoing TNA processes. This linkage is particularly facilitated as work on TNAs and NDCs is often done by the same consultants and working groups, or both processes are carried out by the same division.

72 In terms of coordination, the contact point for TNAs is most often the NDE of participating developing countries. NDEs, among others, facilitate effective support from the CTCN by identifying priority technology needs based on TNAs. For NDCs, the responsible contact point is a country's UNFCCC national focal point, which could be a coordinated effort between different ministries or based on a national coordinating climate policy body.

73 As argued by Hofman and Gaast (2018), coordinated efforts for TNAs and NDCs can support endorsement of TNA results by national climate policymaking (and that, for example, TNA results are not overlooked by national climate planning processes). Currently, however, most TNA and NDC interactions take place informally and on an ad hoc basis, for example via consultants who support both processes. As one interviewed TNA practitioner explained, "without us there would not be a link between TNA and NDC."

74 However, how the processes are organized is only part of the story of linkages (or lack thereof) between TNAs and NDCs. A key factor is the potentially different scope of analysis between NDCs and TNAs. According to Article 4, paragraph 4, of the Paris Agreement, NDCs must have a national focus, and developing countries are encouraged to move over time towards economy-wide emission reduction or limitation targets.

75 TNAs mostly consider a limited number of key sectors for mitigation or adaptation as their starting point for analysis (also for practical reasons, such as budget, the sectoral scope is limited). For each sector, technology options are then prioritized and prepared for implementation with TAPs. While TNAs may, when all is added from the bottom up, cover a large part (e.g. 75 per cent) of a country's GHG emissions or climate vulnerability, the starting point is not a top-down national climate target orientation as in NDCs.

76 This is reflected, for example, in Myanmar's profiles of NDCs and TNAs. The country's NDC contains conditional annual targets for increasing the share of renewable energy by 53 per cent compared

13 Decision 13/CP.18, para. 12.

to 'business as usual' projections. Myanmar's TNA for the energy sector, however, contains a detailed prioritization of technology solutions, such as a solar mini-grid, replacing incandescent and fluorescent lamps with light-emitting diode lamps, and reducing the use of fuelwood for cooking.

77 The difference between top-down (NDC) and bottom-up (TNA) orientation could also result in methodological differences between the two processes. TNAs follow a highly participatory analytical process with active stakeholder engagement, which is supported by a toolbox with mainly qualitative research methods. TNAs are suitable for supporting the NDC process in countries that lack the capacity to operate quantitative (modelling) tools and record reliable data for quantitative research. Hence, the interlinkage between NDCs and TNAs could be strongest for countries that are LDCs or SIDS.

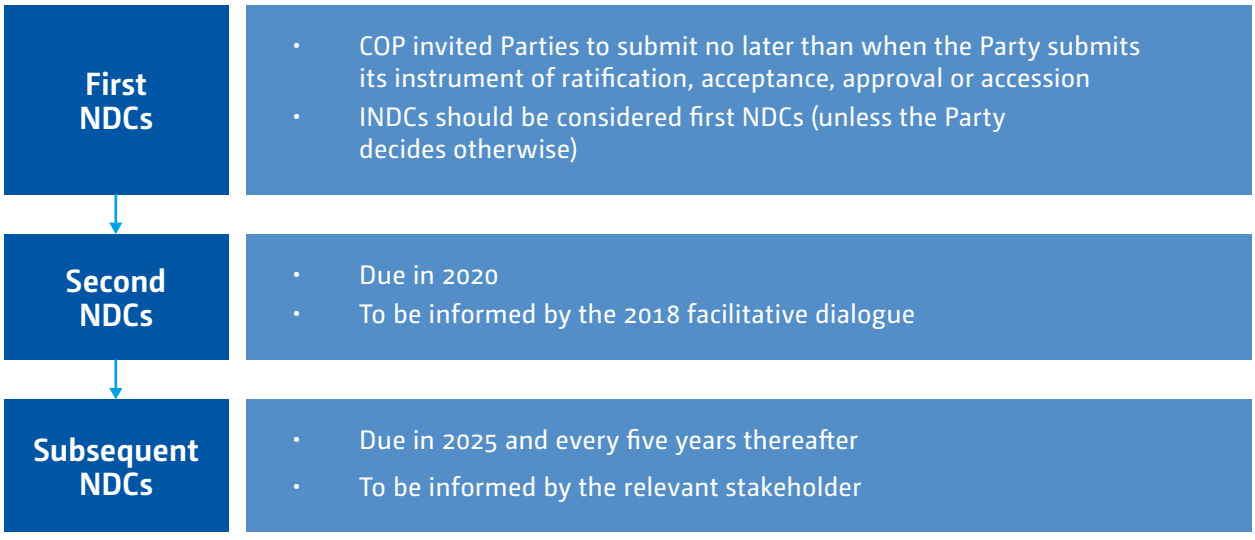
78 Moreover, as pointed out by an interviewee, TNAs add 'bottom-up technology realism' to a country's NDC planning. According to this view, top-down processes based on a national target with policies and measures to reach this could forget what is realistic (e.g. by favouring state-of-the-art technologies that are less feasible for scaled-up implementation within a country context). TNAs, with TAPs for instance, could help NDC planners to consider detailed implementation actions that have been checked and brokered with country stakeholders in terms of feasibility and affordability.

79 In combination with the other responses, this could lead to a vision of an holistic approach in countries that combines the formulation of national NDC targets with bottom-up assessments of technology options, including detailed implementation actions. Here, earlier TNAs could be updated in support of NDC planning, thereby utilizing the TNA toolkit with tools for active stakeholder consultation, barrier analysis and TAP preparation.

80 Of these tools, some of interviewed practitioners highlighted the role of TAPs, especially after the TAP guidance (TEC & UDP, 2017) was updated. Beyond the TAPs, implementation success, whether under TNAs or NDCs, depends on the ability to write winning proposals. One interviewee explained how the CTCN has supported proposal writing in their country through a feasibility analysis of proposed actions.

81 An important aspect of how to organize TNA–NDC interlinkages for holistic climate planning and implementation, as mentioned by interviewed experts, is the timing of both processes. As illustrated in Figure 9, NDCs follow a five-year cycle of preparation and implementation, as agreed within the context of the Paris Agreement. TNAs, instead, are implemented under the Global TNA Project, which usually has two- or three-year phases, with 25–30 developing countries participating per phase.

Figure 9 Timing of NDCs (TEC, 2018)



82 Consequently, a country's TNA results, generated in an earlier phase of the Global TNA Project, may require an update before these can be used as input in an NDC. Although some developing countries have updated their TNA in newer Phases of the Global TNA Project, updates of TNAs are irregular or do not happen at all.

83 As explained by one interviewee, in an effort to renew their TNAs or bring these to the next level, several developing countries have started to utilize the GCF Readiness and Preparatory Support Programme (see also GCF (2021)), for conducting new or updated TNAs. This would make countries less dependent on the schedule of the Global TNA Project and enable them to align their TNAs with the NDC schedule.

84 At the same time, interviewed experts highlighted the advantages of the continued use of the TNA support and peer-learning infrastructure offered by the Global TNA Project. Its proven hands-on training for technology prioritization, through engaging a wide range of stakeholders, including government officials, in climate technology decision-making, and preparing for implementation through TAPs, is considered valuable. Moreover, the Global TNA Project enables peer learning and experience sharing, as multiple countries conduct TNAs at the same time. For instance, TNA participating country representatives meet at around five regional and global meetings during a TNA process.

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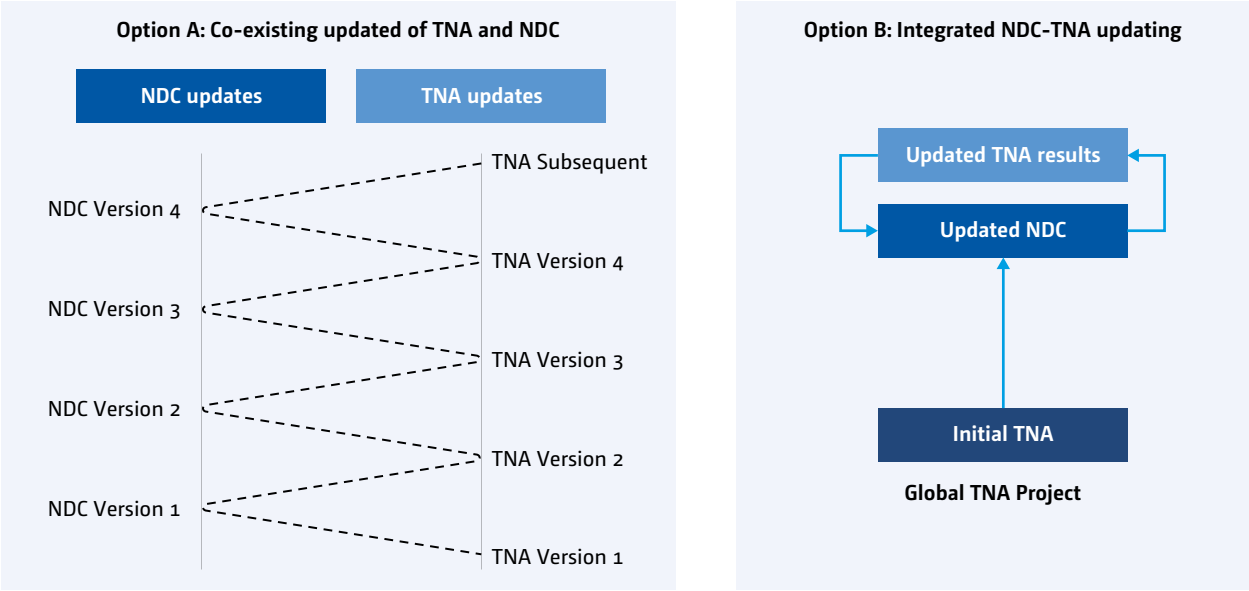
IX WAY FORWARD

85 Based on the above analysis and interviews held with TNA and NDC practitioners, two options are suggested as ways forward for updating TNA work in support of robust NDCs:

a. Setting up a TNA updating/refreshing infrastructure similar to the Global TNA Project, as managed by UDP, to help countries to regularly update their TNA outputs for inclusion in NDCs. This would enable continued technology-related capacity-building in developing countries and peer learning by government officials. In this option, TNA update processes would coexist with NDC update processes.

b. Integrating updates of TNA results within developing countries' NDC cycles. This could involve utilizing tools from the TNA toolbox for updating information on priority technology options within the country context, sector-level implementation conditions such as barriers and enablers, cost data and potential funding opportunities. The abovementioned example of countries utilizing funding from the GCF Readiness and Preparatory Support Programme to update their earlier TNA results could be in line with this option. Figure 10 shows options for integrating the TNA -NDC processes.

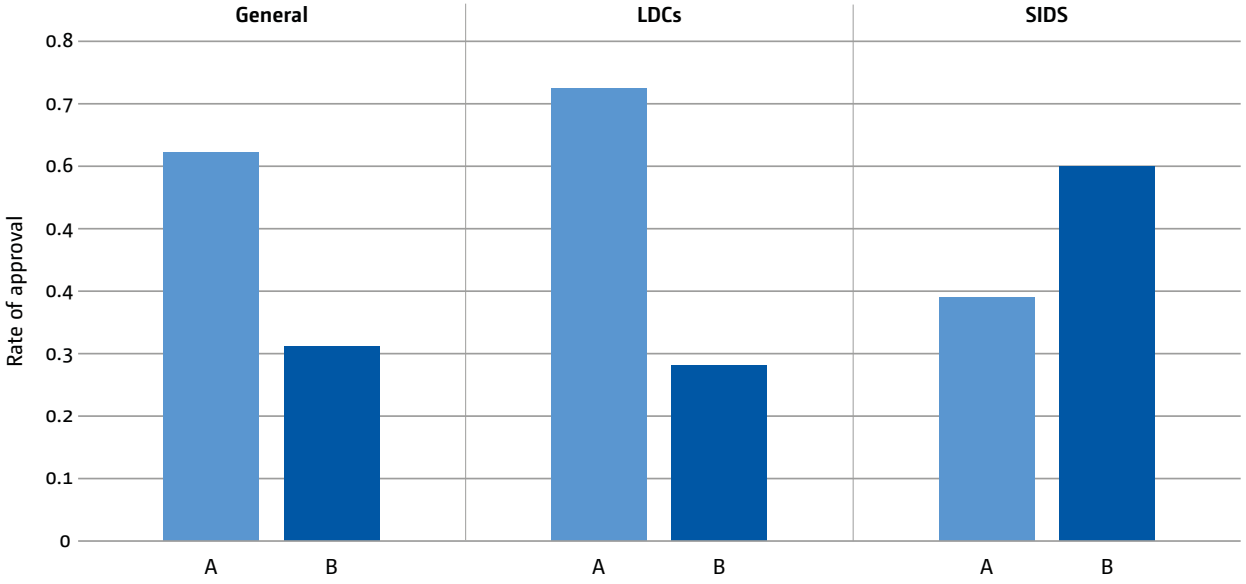
Figure 10 Options for integrating the TNA–NDC processes



86 Regarding option (A), it was noted from the interviews that an institutional structure for TNA updates would further strengthen countries' capacity and resources for technology prioritization and planning, "as TNAs are a 'huge resource bank', such as with technology factsheets, from which other processes benefit." However, concern was expressed that continued coexisting processes could place an extra burden on policymakers and stakeholders in developing countries.

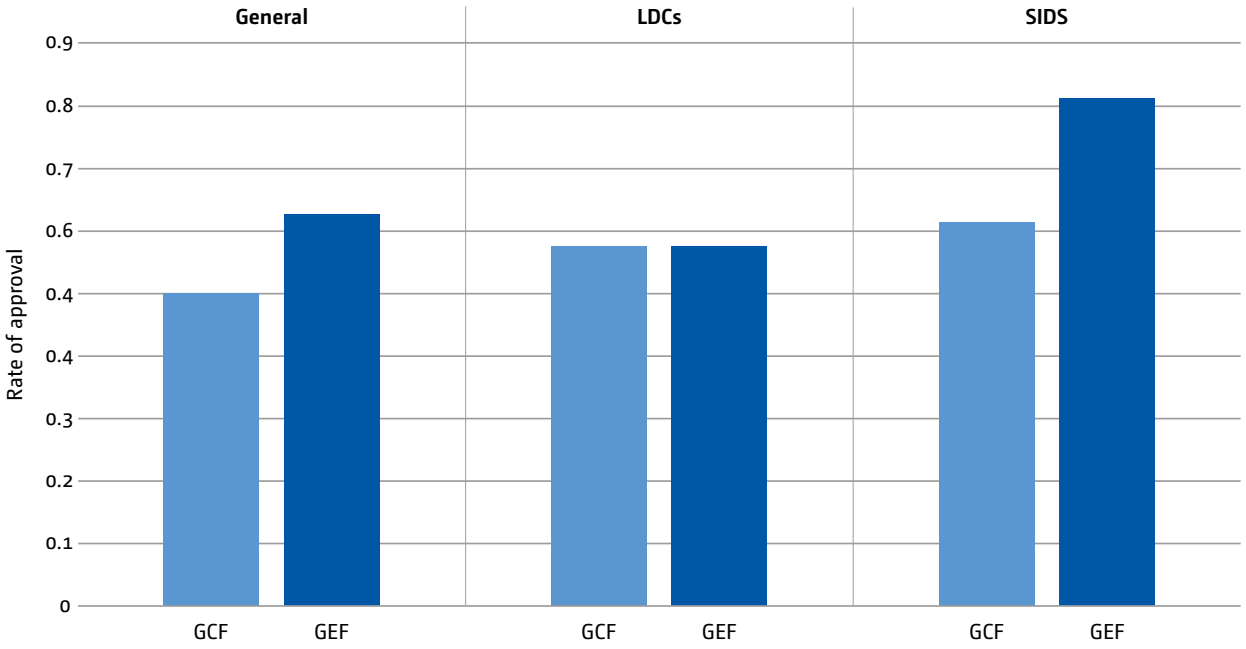
87 Both options have been communicated with TNA coordinators, with the support of UDP, in the form of a questionnaire. Of the 70 coordinators who received the questionnaire, 16 responded (response rate 22 per cent). Two-thirds of the respondents expressed their preference for option (A) (co-existing TNA and NDC processes informing each other). Analysing the answers from LDCs and SIDS separately shows that coordinators from SIDS prefer option (B) (integrating TNA and NDC updates), and answers from TNA coordinators of LDCs are in line with the overall picture of two-thirds being in favour of option (a) (see Figure 11).

Figure 11 Processes preference for NDC–TNA coordination options A or B per country type



88 TNA coordinators were also asked which funding mechanism they would consider for future updates of their countries' TNAs. As possible answers, the options of GEF and GCF funding were provided, as well as 'other'. As shown in Figure 12, respondents generally expressed a slight preference for GEF funding, with coordinators from SIDS having a stronger preference for this than coordinators from LDCs. Some of the respondents suggested that funding could come from both mechanisms (e.g. through blending of funds).

Figure 12 Preference for GCF or GEF funding per country type



89 Whichever option will be pursued, updated TNA results would need to be available around halfway through the five-year NDC cycle. Updates reflect recent country circumstances, technology developments and implementation conditions. In year 5, the NDC process would take stock of all updated information within the country, including the updated TNA work, towards providing an updated submission in the final year of the cycle. In the meantime, through the platform for monitoring, reporting and verification for NDCs, implementation success of TNA results is supported indirectly.

The NDC Partnership

The NDC Partnership supports the coordination and funding of the NDC process in countries. It provides countries with the institutional infrastructure to leverage resources and expertise for the development and implementation of their NDCs. It was established after the Paris Agreement and is constituted by over 180 members who work directly with national governments, researchers and the private sector.

See https://ndcpartnership.org/.

90 In order to support developing countries in integrating the technology prioritization and implementation perspective in holistic NDC processes, the TEC could consider the following ways forward. If option (a) would be pursued, the TEC could provide guidance and good practice inputs to the design of such a TNA updating infrastructure and advice on funding opportunities for it. Should Parties prefer option (b), then the TEC could offer advice to Parties (including NDEs) and, inter alia, the NDC Partnership (see Box 2), on how to tap into the vast knowledge base of TNAs, for use in NDC development, and how to keep this knowledge up to date for future NDCs.

91 In particular, the TEC could provide guidance to developing countries on the application of tools from the TNA toolkit for different steps of NDCs. This could especially be helpful when NDCs need to take decisions on the scale of climate technologies that are technically feasible, economically viable and socially acceptable. Part of this guidance can be the paper by the TEC on innovative approaches for scaling up climate technologies (TEC, 2020).

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X KEY FINDINGS

92 The latest NDCs and TNAs show that developing countries, in practice, frequently connect work in both processes, albeit to different extents and often in a non-explicit, informal way. In many of the latest TNA cases, NDCs are the starting point for analysis on technology needs for climate and development. This is further enhanced, as in many countries the consultants and working groups are the same for TNA and NDC processes.

93 The analysis of the six countries that recently conducted a TNA and communicated an NDC shows that there is consistency between both processes in terms of setting national priorities and defining the sectoral scope. With a view to identifying solutions for mitigation and adaptation, TNAs and NDCs tend to become more diverse. One reason for that could be that NDCs and TNAs, once started, apply different analytical methods for prioritizing solutions and action plans. Another reason is that the latest TNAs often do not have completed reports yet, so that links between TNAs and NDCs are not yet visible in reports.

94 This paper has provided arguments that TNAs can make strong contributions to NDCs in developing countries, thereby holistically combining bottom-up technology realism to national climate target settings. As the latest phases of the Global TNA Project focus mainly on LDCs and SIDS, it is most likely that the strongest TNA contribution to the NDC formulation can be identified in these countries. This is also in line with their special position in Article 4 of the Paris Agreement.

95 In addition, the paper has identified tools from the TNA toolkit, which developing countries can in general use in their NDC design and planning, such as for identifying and clearing barriers, enabling actions and TAP guidance, and enhancing stakeholder engagement.

96 Based on the review of synthesis reports and interviews with TNA and NDC practitioners it is suggested that TNA updates could be (a) institutionalized, similar to the present structure of the Global TNA Project, with capacity and peer learning support, or (b) carried out as integrated steps of the NDC process in countries. The TNA coordinators consulted on this via a questionnaire expressed a preference for Option (A).

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TEC

About the Technology Executive Committee

The Technology Executive Committee is the policy component of the Technology Mechanism, which was established by the Conference of the Parties in 2010 to facilitate the implementation of enhanced action on climate technology development and transfer. The TEC analyses climate technology issues and develops policies that can accelerate the development and transfer of low-emission and climate resilient technologies.

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