



Technology Executive Committee

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Draft paper on experiences, lessons learned and good practices in conducting TNAs and implementing their results

Cover note

I. Background

1. At TEC 18 the TEC considered, as part of the discussion on the initial list of activities of its rolling workplan for 2019–2022, to conduct an analysis of experiences, lessons learned and good practices in conducting technology needs assessments (TNAs) and implementing their results.
2. At TEC 19, the task force on TNAs, with the support from the secretariat, will be invited to present a draft paper on experiences, lessons learned and good practices in conducting TNAs and implementing their results, for the TEC's consideration.

II. Expected action by the Technology Executive Committee

3. The TEC will be invited to consider the draft, and:
 - (a) Identify follow-up actions, including agreeing on a process for finalising the paper after TEC 19;
 - (b) Provide guidance to the task force on TNAs on possible elements of draft key messages and recommendations to the COP and the CMA on this matter.

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conducting TNAs and implementing their results

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Annex

Draft paper on experiences, lessons learned and good practices in conducting TNAs and implementing their results

I. Executive Summary

1. This paper:

(a) Describes experiences with technology needs assessments (TNAs) conducted in 36 developing countries in Phase I (2009-2013) and 26 developing countries in Phase II (2014-2018), with a specific focus on technology action plans (TAPs) and the process towards implementation of TNA results in the ‘post-TNA’ process;

(b) Presents good practice examples and identifies key factors for successful implementation of TNA results, both during conducting a TNA and beyond that;

(c) Provides recommendations for improving the TNA process and the ‘post-TNA’ phase to enhance conditions for implementation success.

2. This paper builds further on the 2015 Good Practices report, which mainly focussed on good practice examples of conducting TNAs and preparing TAPs in Phase I. In that report it was recognised that it remains a challenge to go from TNA results and TAPs to funding and implementation, and that most TAPs contained insufficient information to be considered for finance and investment. The focus of this paper is therefore on preparing TAPs that lead to successful implementation, and activities undertaken to that end in the post-TNA process.

3. 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.

4. It is good practice to consider possible funders for the TAP activities in an early stage of the TNA-TAP process. In case a specific funding organisation is foreseen, the TAP could be developed with the requirements for this funder in mind. When the funding source is not yet clear, the TAP can be developed as a ‘concept document’ with basic information on the proposed activities, so that the action plan can be offered to a range of potential funding sources in a later stage.

5. Even though TAP quality has improved, a ‘perfect’ TNA with ‘bankable’ TAPs does not guarantee implementation of the prioritised technologies. In this framework, the issue of ‘ownership’ becomes very important: for successful implementation, a sense of political ownership is important among key ministries (beyond the ministry of environment). The role of ‘champions’ has often been mentioned by interviewed TNA experts. These are people who have a task or a clear incentive to advance a technology to implementation, such as specific civil servants, politicians, or business leaders.

6. For the post-TNA process, it is important that TNA results are integrated into national-scale policy processes for development, climate, and finance. There are several good practice examples of countries that have used TNA outcomes as inputs in other planning and funding acquisition processes, such as the Green Climate Fund (GCF), Adaptation Fund (AF) and Global Environment Facility (GEF), and how this has supported funding and implementation of TNA prioritised technologies and action plans. It is recommended to share these good practice examples to stakeholders engaged in these funds and processes so that a wider national and international community emerges in support of TNA implementation.

7. In particular with a view to Nationally Determined Contributions (NDC), TNAs, with their detailed, participatory assessments on climate technologies, can be an important ‘planning tool’ for NDC design. This would have the advantage that implementation of TNA results (i.e. technologies as projects and/or programmes) is supported by support programmes for NDCs.,

8. It is also acknowledged that a tracking system can enhance the national and international awareness of the potential of TNAs and TAPs to upscale technology transfer, and also increase the exchange of knowledge and experiences between countries. Developing country Parties often do not have the resources and capacity to implement a tracking system. It is therefore recommended to integrate the tracking of implementation of TNA results, to the extent feasible, in an existing system, for example a monitoring system of the ministry of finance or a scheme set up under the Paris Agreement.

9. Examples of implementing TNA results show that TNAs have a strong potential to provide an effective and solid basis for countries to both scale-up and implement action on environmentally sound technologies for mitigation and adaptation. Updated TNA and TAP guidance has improved the quality of action plans in recent years. The recommendations in this paper for both the TNA process and the 'post-TNA' phase, on among others 'ownership', 'champions', interlinkages with national policies and NDCs, and a tracking system, can help to further enhance implementation of TNA results.

II. Introduction

A. Background

10. In the **Global TNA Project**, countries are assisted with targeted financial and technical support to conduct technology needs assessments (TNAs) and prepare technology action plans (TAPs), within the framework of Article 4.5 of the UNFCCC. TNAs result in portfolios of prioritised technologies for mitigation and adaptation that are consistent with countries' national sustainable development objectives. TAPs contain activities to be undertaken for implementation of prioritised technologies after completion of the TNA.

11. The TEC, in its **rolling workplan 2019-2022**, includes the following relevant activities for conducting TNAs and formulating TAPs:

(a) analyse experiences, lessons learned and good practices in conducting TNAs and implementing their results.

(b) update the TNA guidelines, building on previous work of the TEC, with a view to TNAs leading to enhanced implementation.

12. In its report to COP-24, the TEC, building on its work in 2018, delivered the following **relevant key messages**:

(a) Lessons learned from TNAs and implementation of technologies can generally assist countries in undertaking and implementing actions for mitigation and adaptation, and formulating NDCs and NAPs.

(b) Lessons learned from the work on TAPs may be particularly beneficial for Small Island Development States (SIDS) and least developed countries (LDC), which are mainly targeted by the ongoing Phase III of the Global TNA Project (2016-ongoing).

(c) Therefore, the TEC recommends that the COP:

(i) Further promote the mature methodology and the results of TNAs and TAPs in a broad international context, which would be beneficial in highlighting the added value of the TNA and TAP work of developing countries, and in assisting the implementation of the Paris Agreement.

(ii) Encourage Parties to enhance collaboration and knowledge sharing between national stakeholders and teams involved in the TNA and the NAP processes with the aim to enrich their efforts, effectively use the available results, and consider the lessons learned and good practices from both processes.

13. In May 2019, the Global Environment Facility (GEF) approved a programme to support the work on **Phase IV of the Global TNA project**, which will start in January 2020 and be concluded in September 2023. The programme will support fifteen developing country Parties, all SIDS or LDCs, in conducting a TNA.

B. Objectives of the paper

14. The **objectives** of this paper are to:

- (a) identify examples of how countries have successfully progressed prioritised technologies from a TNA report towards implementation.¹
- (b) identify key factors for successful implementation, both during conducting a TNA and beyond that, and;
- (c) discuss ways and means for improving the TNA process, including the guidance documents, to help Parties create or enhance the conditions, including capacity building, for implementation success after the TNA.

C. Scope and approach

15. The paper takes into consideration previous work by the Secretariat on identifying opportunities and challenges when conducting and reporting TNAs and implementing TNA results (UNFCCC, 2019). The paper also **builds further on earlier work** on this matter by the Technology Executive Committee (2015a; 2015b; 2016).

16. As a result of this work, **several improvements have been made to the TNA process**, such as:

- (a) Updates to the guidance on conducting TNAs for use in the Global TNA Project, with specific attention to organising a participatory country-driven process resulting in prioritised technology options for mitigation and adaptation, with action plans for implementation of these (Haselip, et al., 2019).
- (b) Specific guidance on preparing TAPs with detailed information on how to identify activities, responsibilities, cost details and funding opportunities for successful implementation of prioritised technologies (TEC & UDP, 2016).
- (c) Guidance on tracking the implementation status of TAPs after completion of a TNA (TEC, 2017).

17. With these improvements, which have been in line with the recommendations of the former TNA good practice paper (TEC, 2015a), it is aimed to enhance implementation of prioritised technologies. As explained in the above work, **the seeds for successful implementation need to be planted during a TNA**, such as embedding technology choices in countries' development strategies, engaging stakeholders for stronger ownership of technologies during the implementation stage and preparing 'bankable' proposals for consideration by potential investors.

18. The scope of this paper is different from TEC (2015a), as it mainly focusses on **what happens with TNA results once a TNA has been concluded in a country**. From that point on, countries face the challenge to proceed prioritised technologies, with their TAPs, towards implementation, without further support and resources from the Global TNA Project. Therefore, this paper identifies and analyses:

- (a) Good practice examples of actions taken after concluding a TNA to enhance technology implementation,
- (b) Challenges experienced with implementing TNA results and TAPs and ways to overcome these,
- (c) Potential interlinkages with NDC and NAP formulation processes to enhance implementation of TNA results and TAPs in a country, and
- (d) The support from national and international bodies to implementation of TNA results and TAPs, including the role of the Climate Technology Centre and Network (CTCN), the Nationally Designated Entities (NDE) to the CTCN, the Global Environment Facility (GEF), the

¹ With that the paper builds further on the paper on TNA good practices (TEC, 2015a) which mainly focussed on good practice examples of conducting TNAs and preparing TAPs; the focus of this paper is also on activities undertaken post-TNA for successful technology implementation.

Operational Focal Point (OFF) to the GEF, the Green Climate Fund (GCF) and the National Designated Authority (NDA) to the GCF.

19. For that, the paper:
- (a) reviews recent TAPs,
 - (b) analyses stories from TNAs, such as Bee, Traerup & Hecl (2017),
 - (c) interviews authors/coordinators of TNAs and TAPs, and other relevant stakeholders, to learn about their experiences, successes and challenges (see Annex 1 for a list of interviewees),
 - (d) lists good practices, based on the results of the above approaches (a-c),
 - (e) derives key factors of success on post-TNA implementation, and
 - (f) Recommends capacity needs for LDCs that conduct TNAs during Phase III and soon in Phase IV.

III. Background and status of TNAs and TAPs

A. TNA process, guidance and support

20. A TNA is a **country-driven, participatory process** with the aim to identify, prioritise and implement technologies that reduce greenhouse gas emissions (mitigation) or decrease the vulnerability to the effects of climate change (adaptation). In the TNA, technologies are prioritised in light of a country's development priorities in sectors where the strongest combined development and climate benefits can be achieved. An elaboration of prioritised technologies per sector is one of the initial deliverables of the TNA process.

21. The next step of the TNA process is the identification of barriers that may hamper successful implementation of prioritised technologies, as well as solutions for addressing or overcoming these barriers. These solutions form an enabling framework for technology implementation. The **barrier analysis and enabling framework** together are the second deliverable of a TNA.

22. The third TNA deliverable is the **TAP report**, which is a detailed characterisation of the solutions. It describes what actions need to be taken for successful, scaled-up implementation of a technology, when, by whom, how much this will cost and what funding opportunities exist for that. The actions as proposed in a TAP could be specific for each prioritised technology, but TAPs could also be identified across technologies at the sectoral or even national level.

23. The fourth and final deliverable presents concrete actions for the implementation of prioritised technologies, known as **project ideas, being a core element of the TAPs**. Specific project ideas could be, for example, pilot or demonstration projects.

24. TAPs are specifically focussed on creating an enabling environment for a prioritised technology, rather than facilitating the market to 'pick a winning technology'. Strictly speaking, a TAP is therefore not fully technology neutral. At the same time, the TNA itself is a technology neutral process as it starts from a country's development and climate priorities and only then, through a multi-criteria analysis of (dis)benefits and costs, results in choices for climate technologies.

25. **A stepwise guidance to the TNA** process and its organisation has been made available via UNEP DTU Partnership (UDP) (Haselip, et al., 2019). Moreover, several additional guidance documents have been added to support the TNA process, focussing on stakeholder engagement, gender aspects, finance, as well as support on content in specific sectors.²

26. Countries have received **operational and technical support** for their TNAs from UDP, and collaborating regional centres including the Asian Institute of Technology (AIT, Thailand), Environment and Development Action in the Third World (ENDA, Senegal), Fundación Bariloche (Argentina), Libelula (Peru), and the University of Cape Town (UCT, South Africa); in Phase III

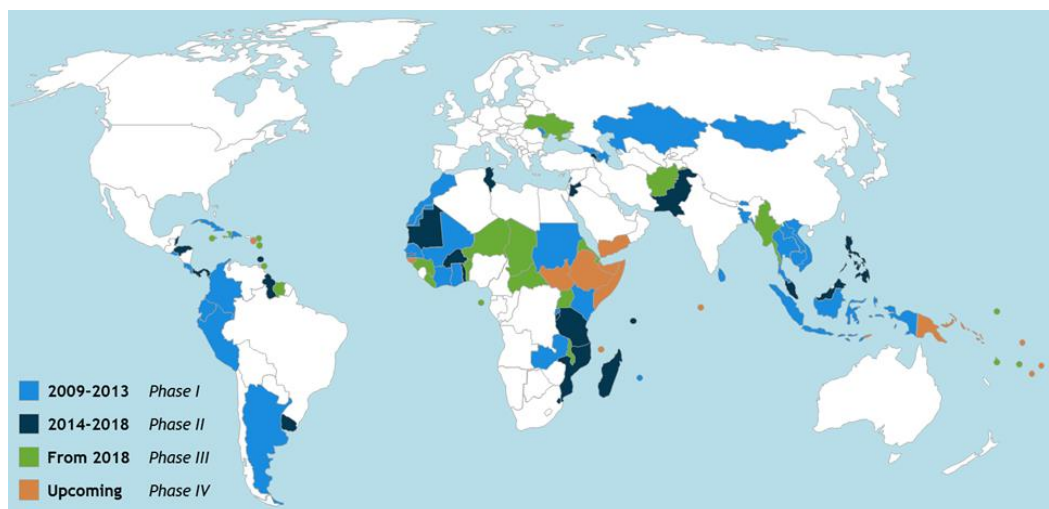
² These guidebooks can be downloaded from the UDP TNA website (UDP, 2019).

support has also been received from the University of the West Indies (UWI, Jamaica) and the University of the South Pacific (USP, Fiji).

B. TNA status overview

27. Before the start of the **Global TNA Project** in 2009, following a decision by COP13 in Bali (December 2007), already 69 countries had carried out a TNA project since COP7 in Marrakesh (November 2001) had encouraged developing country Parties to undertake assessments of country-specific technology needs. The Global TNA Project is funded by the GEF and operationalised by the UDP. Its **Phase I** was implemented in 36 countries between 2009 and 2013, followed by 26 countries in **Phase II** between 2014 and 2018. Currently, since 2018, Phase III is ongoing in 23 countries. For this phase, and also for the upcoming Phase IV, the focus is specifically on LDCs and SIDS.

Figure 1. World Map showing countries involved in the Global TNA Project



28. Throughout the TNA phases, the **key sector prioritised** for mitigation has been the energy sector: 82% of the countries prioritised this sector in Phase I and 86% in phase II. Secondly, the transport sector was prioritised by 41% (Phase I) and 32% (Phase II) of the countries. Concerning adaptation, by far the most important sectors have been agriculture (84% and 86%) and water resources (77% and 82%). Also, coastal zones (32% and 27%) has been selected as a focus sector for adaptation.

IV. Observing good practices of implementing TNA results

A. Improved TAP guidance and how it has been used by Parties

29. In TEC (2015a) it was concluded that in Phase I of the Global TNA Project (TNA I), **TAPs and project ideas often lacked information on the ‘business case’** for technology implementation. It was among others observed that financial experts were insufficiently involved in a TNA or too late, so that prioritised technologies were insufficiently checked on their financial feasibility and budget information was insufficiently clear for potential investors. Similarly, the limited engagement of high-level policy makers resulted in TNA results not or insufficiently being considered by line ministries.

30. Since then, **several papers and guidance documents have been published on improving the implementation of the results of the TNA process** (TEC, 2015b; TEC, 2016; TEC & UDP, 2016; TEC, 2017). These support Parties in:

- (a) Identifying responsibilities of different stakeholders in scaling up prioritised technologies, including financial experts and high-level policy makers,
- (b) Specifying a clear timeline for undertaking actions, both short and long-term,

- (c) Specifying cost items (preparing for implementation, operational and investment costs) for consideration by potential investors,
- (d) Assessing the overall economic benefits from wider scale application of a technology as compared to the costs for the economy and society,
- (e) Exploring possible funding sources for technology implementation and the preparation process for that,
- (f) Establishing links with processes such as NDCs for acceleration of technology uptake in a country, and
- (g) Keeping records of technology implementation success and obstacles for good practice examples and application for further assistance.

31. Based on a review done for this paper of Phase II TAPs it can be concluded that **many of the countries in Phase II have followed the update TAP guidance meticulously**, which has led to more concrete and specific TAP reports. Examples of countries that have prepared TAPs fully in line with the guidance are Armenia, Guyana, Madagascar, Pakistan, Seychelles, Tanzania, and Uruguay. Generally, the TAPs prepared in Phase II provide clearly specified information on activities to be undertaken, responsibilities for stakeholders, cost items to be covered and potential funding to be acquired, thereby mostly using the standard tables as suggested in the guidance (TEC & UDP, 2016). An important factor contributing to improved financial information in TAPs is the involvement of financial experts through the TNA-TAP process (as seen from the stakeholder lists in the reporting). In order to illustrate good practice of TAP development, and its improvements as compared to TAPs prepared in earlier stages, Box 1 describes how a TAP has been prepared in Seychelles for coastal risk mapping and monitoring.

Box 1

Good practice TAP preparation for implementation by Seychelles

Being an SIDS country with a small population, Seychelles aligned its institutional arrangement for the TNA with the existing structures for climate change coordination, in order not to ‘reinvent the wheel’. Therefore, the existing National Climate Change Committee (NCCC) also became the TNA steering committee, which engaged high-level decision makers in the TNA. The leader of NCCC, the principal secretary of the government’s Department of Energy and Climate Change, was also appointed as National TNA Coordinator.

For the execution of the TNA, Seychelles hired a **consultant**. Although the involvement of a consultant is considered useful or even indispensable for successful implementation of a TNA, too much reliance on the expertise of a consultant could leave government staff and other stakeholders ‘empty-handed’ once the TNA is completed and the consultant gone. Hence, it is important to ensure sufficient capacity within the government for after the TNA when technology options have to be implemented

To ensure **commitment of relevant stakeholders**, for each of Seychelles’ four priority sectors, a Technology Working Group was established. For the coastal zone sector, involved stakeholders included a range of experts from the government’s Coastal Adaptation & Management Section, but also other government officials such as representatives of the land use ministry, the disaster management department, and the meteorological agency. Technology experts and engineers were involved from local consultancies and the university, and representatives from NGOs including Sustainability for Seychelles and Nature Seychelles. In addition, a few international experts on coastal zone technologies and costs were involved. Seychelles received support from UDP, and the University of Cape Town as regional centre.

Two TAPs were prepared for the coastal zone sector: one on coastal risk mapping and monitoring and one on coastal ecosystem restoration, including both wetlands and dunes. Closely following the TAP guidance (with proposed tables), Seychelles’ TAPs provide **detailed and concrete information**. Following an assessment of measures based on effectiveness, efficiency, interactions, suitability, and costs and benefits, the TAP consists a clear final selection of actions with activities to implement these. The TAP for coastal risk mapping and monitoring consists of five actions with in total 26 activities.

Following steps 3 and 4 of the TAP guidance (TEC & UDP, 2016), Seychelles identified key stakeholders and their roles in the implementation of the TAP. Timelines are clearly explained, as well as the estimated capacity building needs and the estimated costs. Although specific funding for the actions has not yet been secured, the TAP describes how the required budgets can be acquired: partly through support from international agencies and partly through specified local government funding mechanisms.

Regarding **management planning**, the TAP contains a few risks associated with technology implementation, including ways to mitigate these. An immediate requirement to proceed with TAP implementation is the allocation of staff within the government agency that can oversee the progress of the technology implementation. Finally, as suggested by the TAP guidance, '**TAP summary table**' was prepared by Seychelles for each TAP so that the TAPs can be examined 'at a glance'.

Although the guidance and templates for TAP development were considered useful, especially the stepwise approach, Seychelles did not follow these fully to the letter. The interviewed expert in Seychelles explained that the tables provide a solid guidance, but some flexibility is needed in order to allow for 'creativity' or own interpretation. An example of such a diversion is that, while the guidance suggests that per prioritised technology a stand-alone TAP is prepared, Seychelles opted for pursuing a systematic ecosystem approach, combining both hard and soft measures in one TAP.

For **tracking the implementation results** in the 'post-TNA' process, Seychelles, similar to other analysed countries, uses an 'informal tracking system' with key stakeholders in the TNA process being aware of progress in the 'post-TNA' phase. In the future, a tracking system may be developed through the Ministry of Finance, considering that this ministry will be aware of funds flowing into the country from international funding agencies.

In Seychelles, consistency with NDC formulation is checked as both the TNA and NDC process are carried out under the NCCC. Moreover, the same consultant was hired to support both NDC and TNA development. Considering that the development of Seychelles' intended NDC took place in 2015, the TNA process could benefit from the multi-stakeholder process that had already taken place for the INDC. In order to enhance implementation of TNA results, it has also been noted in the TAPs that its actions should be included in the work programme of the NDC review process. In this way the TNA results can benefit from the political backing for the NDC.

B. Good practice examples of proceeding to implementation of TNA results

1. Implementation actions after completion of TNA process

32. The improved TAP guidance, following TEC (2015a), aimed at strengthening the TNA-TAP process for higher quality technology 'business plans.' This paper adds to that a specific focus on distilling good practice examples of implementation **actions to be taken after completion of the TNA-TAP process.**

33. Obviously, what can be achieved post TNA largely depends on **how the TNA process is organised.** For example, involvement of financial experts during the TNA process helps country stakeholders to be realistic about financial feasibility and to keep an eye on potential funders to be approached after completion of the TAP. Next to a ministry responsible for climate change (e.g. a Ministry for Environment), also key ministries for national development planning (e.g. ministries of Economic Affairs, Industry, Agriculture, and Transport) are recommended to be involved in the TNA and TAP preparation. Their involvement and commitment can support the implementation of TNA results.

34. A good practice has been to form an inter-ministerial TNA committee, which engages national stakeholders that are responsible for the interface with international organisations and funders, such as NDE (to CTCN), NDA (to GCF), OFP (to GEF), and the Designated Authority to the Adaptation Fund (AF). Also, the involvement of local government officials helps a TNA to reflect local level issues next to scaled up national level aspects.

35. However, a ‘perfect’ TNA with ‘bankable’ TAPs does not guarantee implementation of the prioritised technologies. For instance, there is a risk that work on proceeding technologies towards implementation halts once a TNA is concluded and the reporting finalised. From then on, a TNA receives no further resources through the Global TNA Project and subsequent implementation actions need to be taken using different resources, i.e. money and staff available from other processes, ministries or private initiatives.

36. This section highlights a number of examples of TNA countries that have nevertheless, for multiple reasons been successful in progressing TAPs towards implementation. The examples have been taken from the overview of TNA success stories as published by the UNFCCC Secretariat and UDP (Bee, et al., 2017). This information has been supplemented by presentations by TNA coordinators at TNA-related workshops and detailed interviews with eight of them. Specific focus is on:

- (a) Actions taken to continue work on TNA implementation once the TNA project itself is concluded.
- (b) the potential role of one or more stakeholders as ‘technology champions’, including proposing a technology programme or project to a potential funder or investor, at a scale as prioritised by the TNA.
- (c) Capacity conditions which determine whether a TAP is considered for funding.
- (d) Project and programme-specific protocols to monitor implementation progress and take actions when implementation is not taking place according to plan.

Table 1. Overview of selected success stories on TNA implementation

	<i>Priority according to TNA</i>	<i>Action to advance implementation</i>
Lebanon (phase I)	harvesting rainwater to make up for lower precipitation	3 pilots by UNDP and Ministry of Environment to harvest rainwater from greenhouse tops
Jordan (phase II)	grassland management	pilot project funded by GEF; then concept note for GCF, supported by CTCN / UDP and TNA outcomes
Mali (phase I)	field contouring to prevent rainwater runoff	field contouring applied in rural Koutiala with help from CTCN
Mauritius (phase I)	energy efficient boilers using waste heat recovery	based on TAPs, boiler economisers in the GEF-UNDP-EEMO project, as part of a broader project on energy efficiency in industry
Morocco (phase I)	solar electricity technologies	based on TNA, NAMA on solar PV in household sector - facilitating implementation and readiness for mitigation project; during 2015-2025 30,000 solar pumps installed
Senegal (phase I)	biomass for electricity	governmental feed-in tariff system for RE technologies; projects initiated by private company and national office of sanitation; uptake biomass in energy transition programme in NDC
Moldova (phase I)	health; medical emergency care and rehabilitation	medical emergency care and rehabilitation as identified in TNA-TAP introduced by Ministries of Health, Education, Interior as well as local authorities
Bhutan (phase I)	intelligent transport systems	use TAP for application to CTCN; training and field visits and additional training on developing a NAMA

Thailand (phase I)	precision farming; decision support system freeware	TNA incorporated in Thailand Climate Change National Plan 2015-2050; pilot project to develop decision support scheme freeware for farmers
Mongolia (phase I)	Energy efficiency and renewable energy technologies	XacBank used TNA outcome to develop loan programme; first private sector entity from developing country to receive funding from GCF (USD 20 million) to extend XacBank's existing business loan programme of USD 60 million; expected impact: 149,290 tCO ₂ emission reduction per year
Honduras (phase II)	sustainable livestock production	sustainable livestock NAMA was action in TNA-TAP. NAMA and TNA in tandem.

2. Examples of progressing TNA prioritised technologies towards implementation

37. Bee, Traerup and Hecl (2017) highlight the experience of eleven countries with converting their TNA results into concrete actions (see Table 1 for an overview and the TNA phase that Parties participated in). The examples have been selected to describe experiences of countries in different regions and sectors, as well as with actions on climate change mitigation and adaptation.

38. In **Lebanon**, three pilot projects have been developed by the national government for harvesting rainwater from greenhouse tops. With that, an additional water source can be generated for irrigation purposes and water use by farmers, as prioritised in the country's TNA. Through collaboration between the Lebanese Ministry of Environment and UNDP, guidelines have been developed for farmers to replicate the technology in the country.

39. In 2018, in the Lebanese transport sector a tax incentive was introduced for hybrid and electric vehicles, which provides financial support to technologies prioritised in the country's TNA. An important stimulus for this development has been the lobbying for these incentives by an 'informal transport group' which emerged as a stakeholder group during the TNA process. It continued to collaborate beyond the TNA, including through (co-)organising the first e-motor show in the Middle East (held in Lebanon in 2018) and the e-mobility conference in Lebanon, planned for this year.

40. The case of Lebanon also shows how combining different private and policy perspectives has helped to move a technology option forward beyond a TNA. For example, while car owners are interested in electric or hybrid vehicles for the fuel saving perspective, for the Ministry of Energy the main benefit of scaling up e-mobility is that it leads to lower energy demand from transportation. Bringing these perspectives together requires awareness raising and lobbying which the informal stakeholder group was able to do, with the specific outputs from the TNA in their baggage.

41. Funding acquisition from international funds has turned out to be complex in the case of Lebanon. Generally, according to an interviewed expert, it is a big step from a TAP to a full proposal to be funded by the GCF, in terms of scope, scale and level of detail required (and thus the financial resources needed for preparing a proposal),³ while the chances of success remain uncertain. Eventually, Lebanon was able though to acquire USD 7 million from the AF (in 2012) for the AgriCal project (Adaptation Fund, 2019). Technology options for this project had been prioritised by Lebanon during TNA I.

42. Another example of an adaptation-based success story is that of **Jordan**, where grassland management was prioritised in the TNA. Supported by funding from the GEF, Jordan has prepared a concept note to apply for GCF funding, which has been supported by CTCN and UDP. CTCN also supported a project in **Mali** (in rural Koutalia) based on the technology option of field contouring, which helps to prevent rainwater runoff, and which was prioritised in the country's TNA as an option for adaptation.

43. In general, CTCN can support countries in making stronger business cases for prioritised technologies, by providing technical assistance regarding enabling frameworks and clearing, in

³ See footnote 8.

particular, economic and financial barriers (TEC, 2018). With the National Designated Entities (NDEs) CTCN can form a bridge between TAPs and project funding mechanisms, such as the GCF or multi-lateral development banks. CTCN can help to conduct feasibility studies and support the integration of climate technology priorities into national plans.

44. In **Mauritius**, the TAP for waste heat recovery for energy efficient boilers was used for preparing a proposal to the GEF (GEF6), addressing energy efficiency in industries. Mauritius also acquired funding from the International Atomic Energy Agency (IAEA) to implement (parts of) a TAP on micro irrigation in agriculture, in pilots with smallholder farmers, thereby using nuclear techniques to curb pests in agriculture. This success can largely be explained by the personal contacts between staff of Mauritius' Food and Agricultural Research and Extension Institute (FAREI) and IAEA, which resulted in a clear view at both ends on opportunities for funding and pilots. For integrated pest management activities, as identified in a TAP, funding has been acquired from the Global Climate Change Alliance (a programme managed by the EU).

45. Success on TNA implementation can also be observed in Mauritius' coastal zone sector where several TNA-prioritised technologies for adaptation have been moved into action. However, according to the interviewed expert, it is difficult to directly attribute technology implementation to the TNA-TAP process, as, in fact, implementation would have taken place anyway under other programmes, parallel to the TNA, supported by bilateral funding from donor countries.

46. Collaboration between several ministries on a specific technology has been a success factor for implementation of health-related adaptation measures in **Moldova**. Medical emergency care and rehabilitation actions for adaptation to climate change impacts, as prioritised in Moldova's TNA, have thus been included in a widely supported national government activity, in which also collaboration with local authorities is foreseen. Another example of implementation of a TNA prioritised technology option for adaptation is the medical emergency care in combination with prompt rehabilitation during critical periods of heat waves. This is carried out by the Civil Protection and Emergency Situations Department (Ministry of Internal Affairs) during heatwaves in Chisinau and other cities of Moldova.

47. In the agriculture sector of Moldova, technologies prioritised in the TNA, such as no-till and mini-till options, have also been prioritised by the Ministry of Agriculture, Regional Development and Environment for a subsidy programme targeting farmers. The subsidies enable farmers to purchase no-till and mini-till equipment for agricultural conservation. Moreover, promoting conservation agriculture technologies in Moldova is supported international support programmes such as: Special Accession Programme for Agriculture and Rural Development (SAPARD), the European Neighbourhood Programme for Agriculture and Rural Development (EPARD), and the World Bank project Competitive agriculture in Moldova /MAC-P-2015. With this funding, TNA-prioritised technologies become eligible for implementation support.

48. An example of how through the initiative of a private bank TNA-prioritised technology options have been supported for implementation can be found in **Mongolia**. XacBank used the TNA results to develop a loan programme for purchasers of energy efficiency and renewable energy equipment. In order to keep interest rates relatively low, XacBank successfully applied, as the first private sector entity from a developing country, for funding (USD 20 million) from the GCF.

49. In **Senegal**, uptake of biomass-based technologies for electricity production, as prioritised in the TNA, has been accelerated through public-private collaboration. The government provided a feed-in tariff scheme for renewable energy technology use while a private company was responsible for technology implementation. This has resulted in concrete biomass-based electricity production which supports the inclusion of biomass use in Senegal's energy transition programme for its NDC.

50. **Thailand's** TNA priority of supporting its farmers with precision farming tools for adaptation to climate change has been advanced towards practical application via a pilot project launched in 2017 by the country's National Science Technology and Innovation Policy Office. In this project, the focus is on developing decision support system freeware for farmers. Overall, Thailand has incorporated its TNA into the Thailand Climate Change National Plan for 2015-2050.

51. Other success stories highlight interlinkages between TNAs and processes such as NAMAs, NDCs and NAPs as a leverage to advance TNA results towards implementation. In **Morocco**, following the prioritisation of upscaling the use of solar PV for electricity production in the TNA, a NAMA has been developed in the country, for inclusion in the project *Facilitating Implementation*

and Readiness for Mitigation (UNEP & UDP, 2019) This project intends to install 30,000 solar PV units. **Bhutan** identified in its TNA intelligent transport systems as a priority technology for mitigation and subsequently used actions from its TAP as input for NAMAs. Training for that was obtained from CTCN. In a reverse order, in **Honduras**, a NAMA on sustainable livestock was included in the TAP for the agricultural sector.

52. The examples discussed above show that TNAs have a strong potential to provide an effective and solid basis for countries to both scale-up and implement action on environmentally sound technologies for mitigation and adaptation. However, from the above discussion, no specific conclusions can be drawn about the role of public and private sector stakeholders, in particular that of technology ‘champions’ who take it upon them to advance a technology option with a sector or the country.

V. Gaps and challenges related to the implementation of TNA results

53. While the above examples have demonstrated ways for successful implementation of TNA results, the interviews with TNA experts and stakeholders have also revealed gaps and challenges that Parties face when implementation of prioritised technologies. These gaps and challenges apply to both the TNA process itself, and the ‘post-TNA’ process in which implementation of TNA results has to be achieved.

54. The **quality of TAPs** is of vital importance for the likelihood of implementation of TNA results. As explained in section III, analysis of TAPs prepared during the TNA II Phase shows that the quality of information in TAPs has generally improved, following the updated TAP guidance. However, there are different views about what is the most important aspect of the TAPs and the level of detail required. Generally, interviewed experts find the TAP guidance a robust methodology for developing solid action plans.

55. However, Parties would also like to have the possibility to deviate from the recommended tables in the TAP guidance if deemed necessary or useful. For example, when it is clear upfront which funding source will be pursued (e.g. GCF) for an action, the TAP can be developed according to the funder’s proposal template, e.g., a funding proposal for the GCF. In TNA III, GEF provided additional funding to support countries in doing precisely this. In this context, it is recommended to underline in the TAP guidance that the steps and tables form a suggested structure for compiling a TAP, rather than a prescriptive methodology.

56. In line with that observation, the interview round made clear that the use of TAPs in implementation of the TNA results can differ across countries. For example, **the private bank that used TNA results for preparing GCF funding proposals** for Mongolia did not use the TAP for that, but only the TNA report on sector and technology prioritisation for the country, including the barrier and enabling actions analysis.

57. While the structure of the TAPs has improved during recent TNA stages, its quality (such as technical information or budget estimates) strongly depends on the knowledge, skills and capacity of the involved staff and stakeholders. In many countries, especially LDCs and SIDS, a consultant was hired to support or carry out the TNA process. Although this generally leads to robust TNA and TAP reports, there is a risk that the TNA process does not lead to **capacity building** among government officials (see the example of Seychelles in **Error! Reference source not found.**).

58. Therefore, while consulting experts during the TNA-TAP process generally strengthens the process strongly, governments should avoid becoming ‘empty-handed’ once the TNA is done and the consultant gone. For example, one consulted expert recommended that countries use the TNA-TAP results for, e.g., the GEF, AF, and GCF project pipelines. Then, countries would also receive support from these funds to develop their TAPs into bankable projects.

59. Related to that is the issue of **which ministry or ministries will be responsible** for implementation of the TAP. As explained above, in earlier TNAs, the technology prioritisation and TAP process were often carried out by the Ministry of Environment. According to interviewed TNA experts, this ministry often does not have the resources, opportunities nor leverage for progressing climate technology implementation. Interviewees, therefore, emphasise that making relevant key ministries (e.g. Ministry of Economic Affairs or Ministry of Agriculture) (co-)responsible for implementation of TNA results is an important condition for its success.

60. In this framework, the role of ‘**champions**’ has often been mentioned by interviewees. These (technology) champions are people who have a task or a clear incentive or motivation to advance a technology to implementation. Champions have often been involved in the process coincidentally or their role has developed spontaneously, such as in the case of Lebanon, where a stakeholder champion group emerged in the transportation sector.

61. However, identifying a champion with clear task specification is often not part of the TNA, despite the guidance on engaging stakeholders in the process. Consequently, systematic adoption of prioritised technologies by a champion is not yet common practice in TNAs.

62. Considering that a TNA is implemented as a project with a clear starting and end point, a misalignment may arise with opportunities to **mobilise climate finance**. The relatively long time that it takes to complete the TNA and a TAP (about two years)⁴ can lead to missing specific windows of opportunity to apply for funding. One interviewed expert explained that in practice the timeline for preparing an NDC is much shorter than that of a TNA. As a consequence, the two years that are needed for completing a TNA could easily be too long to for properly feeding TNA results into an NDC.

63. It has also been experienced by interviewed experts that there is often a **mismatch between the priorities as selected in TNAs and the preferences of international donors**. As one interviewed expert noted: “We push for adaptation options that are not popular in donor community, while the donor community pushes technologies that we have not prioritised in a TNA.” At the same time, a consulted expert recommended that governments clearly promote their priorities when they are approached by funders/donor countries (instead of doing what the donor wants to do), thereby using the TNA-TAP results.

64. Many climate policies, such as NDCs, are ongoing or recurrent processes. TNAs on the other hand are set up as **one-time projects**,⁵ with the risk that the results are no longer considered and pursued once a TNA has been completed. It is therefore a challenge to embed the results of a TNA-TAP in other processes for their implementation, monitoring and review.

65. An obstacle here is that TNAs are conducted as a bundle in the Global TNA Project, while countries do not carry out strategic decision-making processes all at the same time. Ideally, TNA completion would be planned about a year before, e.g., an NDC revision, so that the NDC process can make optimal use of the latest TNA outputs. Repeating and updating TNAs would enable countries to have their changing policy environments reflected in their portfolios of prioritised technologies and communicate these with, e.g., processes to compile or update an NDC.

66. This could be done by having the TNA fully **embedded in ongoing policy processes** or institutional structures. The other way around, in some countries conducting a TNA has resulted in the creation of, e.g., a technology implementation unit or a sectoral working group, with the task of continuing the work of the TNA and getting its results implemented, as well as periodically revisiting aspects of the TNA should domestic priorities change over time. Obviously, integration of the TNA process and its results in an ongoing process such as that of NDCs can be a way to increase chances of implementation (see also below).

67. Finally, learning from implementation of TNA results is hampered by the absence in a TNA of steps and resources for **monitoring and evaluation**. The TNA process concludes with the delivery of the TAP. The lessons learned from the TNA success stories as collected by Bee, Traerup & Hecl (2017), however, show the benefits of collecting information about how countries proceed with TAPs, how they link TNA results with other ongoing strategic processes, and what they undertake to apply for national and international funding.

68. Therefore, the latest TAP guidance includes a step for **tracking the implementation of TNA results** in the post-TNA phase, but the challenge remains to incentivise country stakeholders to actively allow other to keep track of their implementation results (or lack thereof). Interviewed TNA

⁴ The TNA-TAP process could in most countries be completed within a shorter timeframe. However, in order to ensure that all countries involved in a TNA phase will be able to finalise their process, it has been chosen to reserve two years. Obviously, the time required for a TNA could also be shortened by limiting the number of sectors or technologies prioritised.

⁵ TNAs can be followed up in new TNA Phases, but continuation of TNAs is not institutionalised in the Global TNA Project, while NDC renewal has been defined as a requirement under the Paris Agreement.

coordinators agree that a tracking system is useful, but they warn that many countries currently do not have the capacity to implement such a system.

VI. Enhancing implementation of TNA results

A. Interlinkages with other processes, such as NDCs

69. Already since, at least, the UNFCCC workshop on TNAs, held in Bonn in June 2011, there have been discussions on establishing **interlinkages between TNA and other processes under the Convention**, both for mitigation and adaptation. Initially, the focus was on harmonising TNAs with NAMAs and NAPs and after the Paris Agreement, the TEC, at subsequent meetings, considered interlinkages between TNAs and the NDC processes (UNFCCC secretariat, 2011; TEC, 2013; 2018a; 2018b).

70. Important reasons for considering these interlinkages are that it:

(a) Broadens the community for implementation of TNA prioritised technologies; e.g. ministries involved in the other process can, through the interlinkages, acquaint themselves with TNA results that might otherwise not come to their attention, and

(b) Harmonises multiple processes so that, e.g., TNA outputs can be inputs for other processes, and the other way around, so that

(c) Efficiency gains can be achieved, such as avoiding double work on data gathering and analysis, and

(d) Avoids stakeholder fatigue as these processes, similar to TNA, are participatory and invite inputs from similar (types of) stakeholders.

71. In TEC (2015a), to these reasons was added that interlinkages with, e.g., NAMAs and NAPs would make TNA-prioritised technology options eligible for wider ranges of (policy) funding opportunities and thus implementation. As explained below, several TNA experts interviewed for this paper have provided recent examples of how TNA results have been considered for NAMAs and included in the UNFCCC NAMA Registry. Advancing TNA results can also be achieved via inclusion of options for adaptation in NAPs, as mentioned by some of the interviewed experts. However, in practice the scope for interlinkages between TNAs and NAPs has been limited as so far only thirteen NAPs have been communicated.

72. TEC (2018a) contains a detailed analysis of how developing countries have **used TNA results in their published NDCs**. The paper, among others, concludes that in practice TNAs and NDCs may implicitly interact, especially when processes co-exist, via contacts between stakeholders and process coordinators. However, “parties would benefit by making these inter-linkages explicit, and capitalising on the efficiencies that may be realised through commonalities between the two processes.”

73. The key question addressed in this section is how interlinkages with NDCs can support implementation of prioritised technologies *after* a TNA has been concluded. As has been explained above, a potential weakness of a TNA is that the phase of implementing TAPs and technology projects or programmes, including its monitoring and evaluation, is not part of the formal TNA process. Therefore, incentives for implementation mainly have to come from outside the TNA process.

74. These incentives can be diverse, such as: business opportunities from technology implementation, funding for R&D on prioritised technologies, organisations or individuals who act as technology ‘champions’, and national programmes with targets and timelines which use TNA outputs to specify strategies and action plan. In section III, several examples have been given of such incentives. Below, the scope for advancing implementation of TNA results through interlinkages with NDCs is elaborated on.

75. One way to progress with technologies prioritised in a TNA is to consider these when formulating strategies for reaching NDC targets. For example, when an NDCs contains a specific goal for mitigation or adaptation, e.g., for a sector or country area, then TNA results can be used to identify (technology) options for realising this goal and enabling actions for that. As explained by

interviewees explained how: the TNA coordinator is also involved in NDC processes; consultants who conducted preparatory work for TNAs are also asked to support NDC preparations (e.g. ArmCTCN which has been established in Armenia as a supporting unit for both TNA and NDC); the same agencies and experts are involved in TNAs and NDC, such as via a National Climate Change Technical Committee which has experts on board from several ministries; etc.

81. Through interlinkages with NDCs, implementation of TAPs would directly or indirectly fall under the provision in Articles 13.7 and 13.10 of the Paris Agreement, which say that “Each Party shall regularly provide ... information necessary to track progress made in implementing and achieving its nationally determined contribution...” and “Developing country Parties should provide information on financial, technology transfer and capacity-building support needed and received.” Potentially, **being included, directly or indirectly, in the monitoring actions under the Paris Agreement increases the likelihood of TAP implementation** as it becomes part of the overarching Paris Agreement in which achievements are measured.

82. Obviously, measuring an NDC’s impact on mitigation and adaptation via this provision depends on the type of NDC or action communicated via the NDC. For example, should an NDC contain an emission reduction target below a base year level, then the monitoring under the Paris Agreement will focus on this target. Whether this target has been achieved with technologies prioritised such as in a TNA, is then an implicit assumption. In case the NDC is a programme to advance a set of technologies, for instance, based on TNA outputs and TAPs, implementation of TNA-prioritised technologies becomes an explicit topic of NDC implementation monitoring.

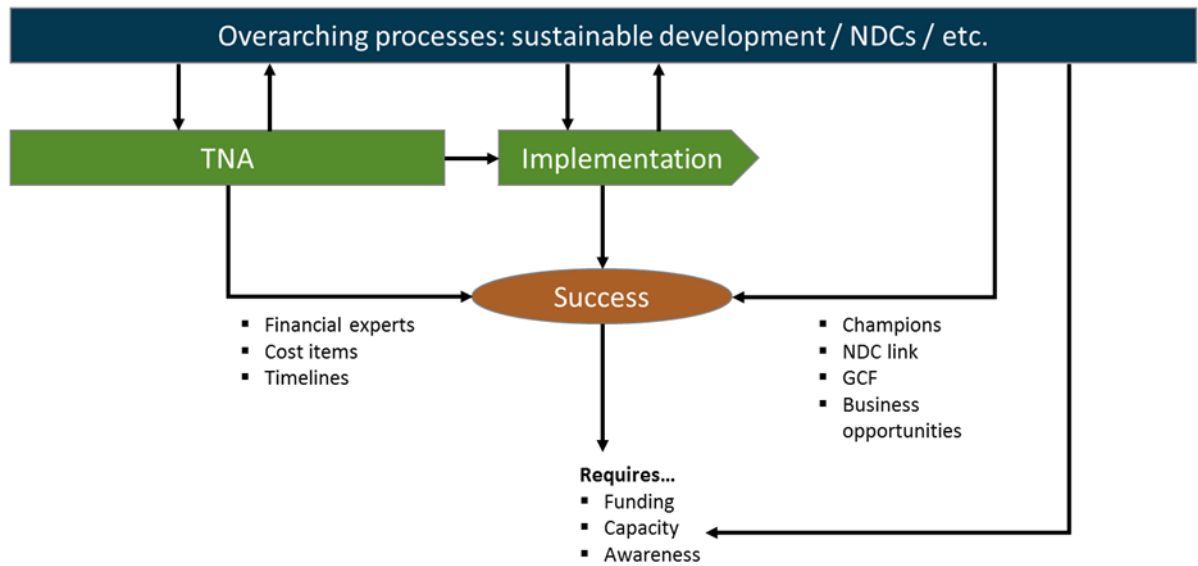
83. Whether implicit or explicit, **regular monitoring and reporting on NDCs** enables a consistent documentation and sharing of (implementation) experience, including progress with implementation of (TNA prioritised) technologies, their support actions, as well as the institutional organization of these. As argued by TEC (2018a), this also offers opportunities for targeting support to Parties through information generated from the monitoring system.

84. Nevertheless, linking TNA with NDC is no guarantee either for successful implementation of prioritised technologies through their TAPs. NDCs, too, need “champions”, who help advance (technology) options for mitigation and adaptation within a country. Moreover, NDCs require country-wide capacity building support and financial assistance. On this capacity, all related processes, such as TNA, NAP, NAMA can build further. **Error! Reference source not found.** illustrates interlinkages between TNA and overarching processes in a country, as identified from good practice examples in this paper, and how through these interlinkages implementation of TNA results can be supported (benefitting from funding, capacity building and awareness creation under the overarching processes).

85. With respect to the latter, TAP implementation, through linkages with NDCs, can benefit from initiatives such as the **Climate Finance Explorer tool** (NDC Partnership, 2019),⁶ which helps countries to search a database of international public climate finance options. In addition, UDP have indicated that they will develop/update the *Guidelines on Identifying Finance Opportunities*, which will also cover private sector venture capital and commercial funding options. It would help TNA stakeholders to identify multiple types of funding for the activities included in a TAP and break down financial needs towards the most suitable types and sources of both public and private financing, such as grants, commercial loans, subsidies and revenue from goods and services.

86. This section has described examples of how in practice interlinkages have been established between TNAs and NAMAs, NAPs and particularly NDCs. With these links TNA results have been brought to the attention of a broader policy process in the countries which is often led by line ministries. Therefore, results of TNAs, which are often managed by the Ministry of Environment, enter into the mainstream of country policy planning on climate and development. Finally, included in NDCs, TNA results have a stronger likelihood of being considered for funding, e.g., through international climate finance mechanisms.

⁶ Developed by the World Resources Institute, NDC Partnership, German Federal Enterprise for International Cooperation, Government of Morocco, and the UNFCCC secretariat.

Figure 3. Visualisation of TNA implementation success; source: authors

B. Key factors for successful implementation of TNA results

87. From the examples of implementation of TNA results as discussed in Section III, the following factors for success can be derived:

(a) The **engagement of stakeholders and ministries** during the TNA and post-TNA in order to include TNA-prioritised technologies in new or ongoing governmental programmes, so that sector-level goals can be achieved with help of concrete actions from TNAs and TAPs. This also helps substantiate requests for funding from international funding programmes.

(b) **Co-development of TNAs and TAPs with NAMAs, NDCs, GEF and AF pipelines** helps to mainstream TNA outcomes in overarching national strategies and programmes for climate and sustainable development.

(c) This also **avoids “reinventing the wheel”**, as recognised by regional TNA support centre for Africa, Enda Énergie (2019). The TNA institutional structure can be aligned with an existing climate committee, such as a group set up for drafting the NDC.

(d) **Development of pilots to demonstrate a technology option**, with financial support from multilateral funding programmes and development partners, and technical support and advice from CTCN (training, development of pilots, writing of concept notes for funding proposals, etc.).

(e) Consideration of TNA prioritised technology options in **proposals submitted to the GCF**, even though the step from a TAP to a GCF proposal can be considered (too) big in practice.⁷

88. It is noted that **success factors may differ per country** (based on e.g. local context and country size) so that caution is needed regarding generalisation of lessons. For example, while an interviewed expert from an SIDS Party warned against overreliance on consultants (potentially leaving the government ‘empty handed’ when it is time for implementation), interviewees from larger TNA countries explained that in their countries the main challenge is how to organise a wide ministerial representation in the TNA process and consideration of TNA results in national policy making. These countries also contract consultants to help conduct TNAs, but once concluded, TNA results can be moved into policy action, provided that the line ministries feel committed to the TNA.

89. This observation links to the aspect of ownership of TAPs in the post-TNA process, as highlighted by interviewees. **Clarity on ownership among the key stakeholders** increases the chances of implementation of TNA results. While the TNA process itself is often coordinated and ‘owned’ by a ministry of environment, it is good practice to discuss from an early stage who will

⁷ To illustrate, conducting a TNA-TAP process (two years, participatory and multi-sector) in a country costs about USD 235,000. The costs of writing a GCF funding proposal could range from USD 150,000 to USD 300,000.

take responsibility for implementation of the TAP. This could be a specific line ministry, but there are also good practice cases where governmental working groups take the responsibility for implementation actions beyond the finalisation of the TNA process.

90. A working group, often an informal public-private partnership, can discuss and advance progress on TNA results. For that, **strong coordination** is crucial from the beginning of the TNA process, with responsibilities and the ‘sense of ownership’ transferred by the coordinator to people and organisations with sufficient resources, mandate, and enthusiasm. Without that, ministries and other stakeholders may feel that the ‘ownership’ for the TNA and its results remains with the TNA consultants or the ministry of environment, which may not have the capacity nor authority to get the TNA results implemented within the country.

91. Related to this is the role of **technology ‘champions’**, which TNA coordinators and consultants emphasise as being of crucial for technology implementation. By discussing the ‘ownership’ of TAPs from an early stage, technology ‘champions’ could be also identified and/or appointed upfront. In various countries it was experienced that oftentimes the ‘champions’ are medium-level planners at the ministries, as these usually have more in-depth technical knowledge and relevant contacts, and are less susceptible to political versatility than high-level policy-makers and politicians.

92. Potentially, a ‘champion’ or supporting role could be played by an institute that is equipped and trained to continue work beyond a TNA, such as the NDEs as CTCN focal points and national entities for technology development and transfer. As explained elsewhere in the paper, the example of ArmCTCN in Armenia shows how a national body can provide CTCN-like support and advise to stakeholders who aim at implementation of technologies, including help on identification of funding, and writing of project/business plans.

93. **Integrating TNA results into national-scale policy processes**, including country partnership strategies of multilateral development banks and country programming processes for GEF, GCF, and AF, could reduce the risk that local level concerns and priorities are not considered by national level strategies and planning. As one interviewee explained: “many initiatives [in my country] are national scale, gearing huge investments without reflecting the ground-level activities.”

94. As TNA’s bottom-up process enables engagement of local governments, their familiarity with, e.g., smallholder farmers’ concerns are then better incorporated in national-scale climate planning. On the other hand, connections with the national government helps to offer institutional support for, e.g., acquiring funding. A TNA stakeholder explained: “we tried to involve the private sector in the TNA process, especially the financial sector for considering loans. But for loans the financial stakeholders need a guarantee from the government.”

95. **Concerning the interlinkages with other processes** such as GCF, GEF, and AF, it is recommended that the findings of this paper are shared with stakeholders and national bodies engaged in these processes. This helps build their awareness of the TNA results, *i.e.*, prioritised technology options for mitigation and adaptation with action plans, and how these can be incorporated in their strategies and pipelines for a country.

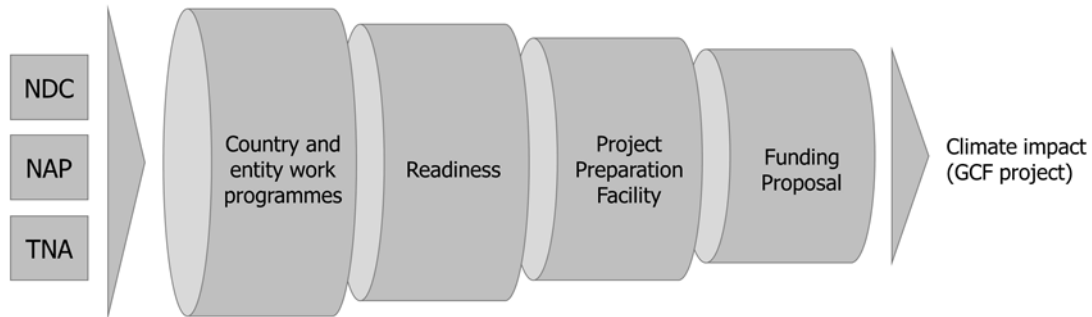
96. It is good practice to **engage possible funders for the TAP activities in an early stage** of the TNA-TAP process, which can inform country stakeholders about what funders will fund and avoid (or reduce) mismatches between countries’ and funders’ priorities. For that, particularly in-country donors and national focal points of international climate finance mechanisms are recommended to be engaged for the TNA to become a collaborative process leading to higher chances of funding and implementation.

97. In case a specific funding organisation is foreseen, the TAP could be developed with the requirements for this funder in mind, or even using the funding proposal template as made available by this funder instead of the more general TAP guidance. Often, however, it is not clear beforehand which funding sources can be pursued. As suggested by TNA coordinators, in those cases it is more efficient to prepare the TAP as a ‘concept document’ with basic information on the proposed activities. These concept documents can be converted into more detailed project proposals using the requirements and designs of funders in a later stage.

98. **The Green Climate Fund acknowledges that TNAs can be helpful to ensure broad engagement of stakeholders in the identification of technology interventions and solutions for project concepts** (GCF, 2019). Through that, projects proposed to GCF are more likely to be

country-driven, ensuring local ownership.⁸ TNAs can thus provide input for the GCF project pipeline, and be used for analysing readiness needs and preparing readiness support proposals under the Readiness and Preparatory Support Programme⁹ (see **Error! Reference source not found.** for an example of how TNA and other process can eventually feed into a GCF funded project). In general, involvement in a TNA of actors who typically play a role in GCF funding proposals on behalf of the country, in particular the NDA, would strengthen the likelihood of TNA results being funded by GCF.¹⁰

Figure 4. TNA as input for GCF pipelines (based on GCF presentation material at TNA workshop in Bangkok, 2018)



99. A recommendation for TNA countries is to raise awareness about their TAPs by specifically bringing them to the attention of donors. Apart from the active involvement of donors and financial experts in a TNA process, this can be done by **organising a ‘donor conference’ as a final step of the TNA process**. This is now planned for TNA III and IV. In this context, it is also recommended by interviewees to show actual results and success stories based on TNAs, as this builds trust and confidence among potential public and private sector funders. Keeping track of implementation results of TNA-prioritised technologies would support that, as discussed below.

100. While the Global TNA Project equally focusses on mitigation and adaptation, TNA practitioners observed that technologies for mitigation are usually more attractive for funding than those for adaptation. A recommended good practice is to identify co-benefits of adaptation projects for society, the economy and the environment, as well as identifying mitigation technologies that have adaptation co-benefits. This recommendation is in line with the application of the concept of **‘triple-dividend’**, i.e. a well-designed solution for adaptation results in (i) avoided losses, (2) economic benefits, and (3) social and environmental benefits (Global Commission on Adaptation, 2019).

101. Under the Global TNA Project dozens of countries have completed a TNA or are currently working on it. This leads to enormous **opportunities for cross-learning** with regard to TNA experiences, both on the process itself and on the post-TNA implementation phase. In the current setup of the TNA phases, TNA coordinators and consultants meet each other at the regional workshops. Supplementary to this could be a programme in which TNA coordinators or working groups learn from a TNA country from a previous phase, for example through a site visit. In the workshops and trainings of Phase III a number of TNA experts from previous phases have already been involved. This enables more South-South Cooperation and learning from actual experiences.

VII. Key findings and issues for further consideration

102. This paper has described a range of example of countries who have successfully advanced TNA results towards implementation (Objective a of this paper). The examples make clear that most prioritised technology options have been embedded in national programmes for development and climate or have been adopted by national policy makers for further support. Some examples have

⁸ Note though that elsewhere in the paper it has been mentioned that country-driven priorities may not be in line with what funders can support. The paper also provides suggestions for better alignment of country and donor priorities.

⁹ For enhancing access to GCF project funding, the GCF provides funding and technical assistance through its Readiness and Preparatory Support Programme.

¹⁰ Possibly also the members of the technical committees that have to approve concept proposals that that the NDA will endorse to go to GCF.

been discussed where TNA-prioritised technologies are considered in proposals to be submitted to the GCF, including through commercial financial organisations.

103. Based on these examples and interviews with TNA stakeholders, the paper has highlighted a range of key factors for implementation success, which are often beyond the scope of a TNA project (Objective b).

104. A key success factor is **clarity on the ‘ownership’ of TNA results and TAPs**. Often, a TNA is managed by the Ministry of Environment, while the eventual implementation of prioritised technologies will often be the responsibility of other ministries, e.g. Ministry of Economic Affairs and Ministry of Agriculture and Forests, while the Ministry of Finance needs to be involved regarding funding aspects. Engaging these ministries as co-owner of a TNA would increase the chances of implementation of TNA results.

105. **Related to this is the role of ‘champions’** which are stakeholders in a country – either within the government or beyond – that take it upon them to advance a technology towards implementation. A champion can act at the level of a project (e.g. a consultant) where, based on a clear incentive such as a business interest or need to pilot a technology for increased social acceptability, he/she leads the preparation of an investment proposal and mobilising the right people for making the project works.

106. A champion can also act at a more aggregate level, such as a sector or a country, and observe the process of scaling up a technology for realising a sector/country’s climate and development goals. The champion can thus be triggered by a personal interest or motivation (e.g. political career opportunities) or in his/her role as representative of a wider stakeholder community or interest group. Champions can be drivers for change as they advance solutions, such as climate technologies, to be picked up by higher-level policy or decision-making and use it for formulating a policy (framework).

107. Another success factor observed from good practice examples is the **landing of TNA results in overarching policy frameworks in the country concerned, such as for development and climate**. Through that, prioritised technologies support policy processes in being country- and stakeholder-driven, while the technology options themselves are more likely to be financially supported under the processes. From a perspective of technology neutral policies, the link with TNAs is also attractive as a TNA is an unbiased process to shortlist technology options against a country’s social, economic and environmental priorities and recommend measures for optimising market conditions for these.

108. An important example of a national framework is the commitment for countries to communicate NDCs under the Paris Agreement. TNAs, with their detailed, participatory assessments on climate technologies, can be an important ‘planning tool’ for NDC design, which could also enhance implementation success of TNA results through NDC support programmes. Indeed, among the success stories of TNA implementation are those that have established interlinkages between TNA-prioritised technologies and other processes such as NDC and NAMAs. Benefits can be mutual, as this can also enhance NDC implementation success.

109. Examples in this paper have also shown how **TNA results can be eligible for funding by the Green Climate Fund**. Interviewed experts have indicated though that often the step from a TAP towards a successful GCF funding proposal, for resource and capacity limitation issues, is large, if not unfeasible. A good practice example described in this paper is that of a private bank, operational in a TNA country, considered TNA-prioritised technologies for that country as input for a GCF funding proposal. The value of the TNA in that case has been its country- and stakeholder-driven prioritisation of technologies and clear and robust analysis of barriers and actions to clear these.

110. With respect to ways and means to improve the TNA process for enhanced technology implementation (Objective c) it has been concluded that TNA practitioners find the current TNA steps and guidance sufficient for preparing robust technology priorities and action plans. Yet, some suggestions regarding application of the TNA-TAP guidance have been recommended. First, there may be cases where strictly following the TAP guidance is not desired as a country may prefer to shape the TAP as a more flexible and potentially even technology-neutral view on future developments. The example of XacBank’s application to GCF has shown that the TAPs prepared in Mongolia’s TNA were not even used for the proposal. Second, there remains a continuous need for capacity building among government staff and other stakeholders in the TNA countries, including

for NDEs. This would also allow for future periodic reviewing, updating, or repeating of TNA prioritisation and TAP development.

111. Finally, it has been recommended that tracking of implementation of TNA results is not only included as a final step of the TAP development, but also as an issue to be discussed upon the start of the TNA process. By then, stakeholders can discuss existing monitoring systems for the TNA to become a part of (e.g. NDC monitoring requirements under the Paris Agreement), or identify the need for capacity building with regard to tracking. An additional reason for tracking implementation results is that it can streamline the process of iterative TNAs, in which a country decides to review or repeat the TNA process, or parts thereof.

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