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Development and transfer of technologies and implementation of the Technology Mechanism: joint annual report of the Technology Executive Committee and the Climate Technology Centre and Network

Subsidiary Body for Implementation

Forty-third session

Paris, 1–4 December 2015

Item 10(a) of the provisional agenda

Development and transfer of technologies and implementation of the Technology Mechanism

Joint annual report of the Technology Executive Committee and the Climate Technology Centre and Network

Guidance on enhanced implementation of the results of technology needs assessments: interim report by the Technology Executive Committee

Summary

The objective of this document is to recommend improvements to the existing guidance on technology needs assessment (TNA), technology action plans (TAPs) and project ideas for the enhanced implementation of priority technologies for development and climate change mitigation and adaptation. It reviews: existing non-TNA guidance for preparing prioritized technology options for implementation; existing guidance within the global TNA project for formulating TAPs and project ideas for implementation; and TAPs and project ideas within the global TNA project with a specific focus on the extent to which these contain the information that is required for preparing for implementation.

Based on this review it is recommended that a slim guidance document be prepared for accelerating the implementation of prioritized technologies with: a focus on people rather than on process; the three key steps of identification of barriers to technology implementation, actions to address these barriers, and implementation plans; enhanced guidance on how to attract funding for actions in TAPs; and an elaboration of the potential role and capacity needs of national designated entities and of the Climate Technology Centre and Network for providing technical support for the implementation of prioritized technologies. The findings of the document are reflected in the outline for guidance on the preparation of TAPs, contained in the annex.

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I. Executive summary

1. The core objective of this document is to recommend improvements to the existing guidance on technology needs assessments (TNAs), technology action plans (TAPs) and project ideas for the enhanced implementation of priority technologies for development and climate change mitigation and adaptation.

2. The document reviews:

(a) Existing climate-related, non-TNA guidance for preparing prioritized (technology) options for implementation;

(b) Existing guidance within the global TNA project for TAPs and project ideas for the implementation of prioritized technologies;

(c) TAPs and project ideas within the global TNA project with a specific focus on to what extent these contain the information that is required for successfully preparing for implementation.

3. From the **review of existing climate-related, non-TNA guidance**, it has been concluded that guidance documents intend to present a balanced approach to setting priorities and linking these priorities to action-oriented transactions (programmes, projects and activities). However, most guidance documents fail to define the requirements of the transactions that execute these priorities. A contributing reason for this failure is that the guidance insufficiently addresses the professional differences between policymakers and priority-setting processes on the one hand, and the requirements of specific transaction formulation on the other.

4. Therefore, no single model guidance document can be recommended for supporting the TNA stage of implementing prioritized technologies for mitigation and adaptation on the desired scale within a country. Instead, it is recommended that some of the processes, content, examples and good practices from the reviewed guidance be incorporated or referenced in the revised guidance for the implementation of TNA results.

5. Moreover, from the review of climate-related non-TNA guidance, it is also recommended that guidance for TNA result implementation be kept as streamlined as possible by being supplemented with more detailed guidance, training materials and actively managed web-based resources that expand on and connect directly to a revised TNA document.

6. The following sources of guidance for the implementation of TNA prioritized technologies have been reviewed:

(a) Process: chapter 6 of the United Nations Development Programme (UNDP) *Handbook for Conducting Technology Needs Assessment for Climate Change*¹ (hereinafter referred to as the TNA handbook);

¹ Available at <http://unfccc.int/tclear/misc_/StaticFiles/gnwoerk_static/TNR_HAB/b87e917d96e94034bd7ec936e9c6a97a/1529e639caec4b53a4945ce009921053.pdf>.

(b) Barriers and enabling actions: the UNEP DTU Partnership² (UDP) guidebook *Overcoming Barriers to the Transfer and Diffusion of Climate Technologies*;³

(c) Finance:

(i) The UNFCCC guidebook *Preparing and Presenting Proposals: A Guidebook on Preparing Technology Transfer Projects for Financing*;⁴

(ii) The UDP guidebook *Accessing International Financing for Climate Change Mitigation: A Guidebook for Developing Countries*;⁵

(iii) The UDP guidebook *Accessing International Funding for Climate Change Adaptation: A Guidebook for Developing Countries*;⁶

(d) Reporting: TNA and TAP report template for mitigation and adaptation.⁷

7. From the **review of current TNA guidance** it has been concluded that existing guidance documents:

(a) Provide substantial instruction and are superior to other available guidance documents reviewed;

(b) Do not lend themselves to the ready conversion of technology priorities into project ideas and action-oriented transactions for the implementation of technology strategies (programmes, projects and supporting activities);

(c) Could and should be streamlined, made more user-friendly and supplemented with clearly introduced 'fill in the blanks' templates for the formulation and presentation of technology implementation support actions and project ideas.

8. From the **review of TAPs and project ideas** within the global TNA project it has been concluded that countries have struggled with formulating TAPs and project ideas on the basis of their priority technology options. Moreover, most TAPs and project ideas are incomplete with respect to information about timelines of actions, costs and identified funding options.

9. Among the reasons identified for that is the limited involvement of practitioners with a finance and investment background in the full TNA process, so that TNA decisions are often insufficiently checked against criteria for feasible technology investments. The involvement of finance practitioners during both the technology prioritization and the TAP and project idea formulation steps, however, requires that TNAs and their outputs generate sufficient interest for them. This can be done by making their participation only 'part-time' (e.g. check technology choice against financial feasibility criteria) and enhancing the (political) profile of TNAs as processes to support countries' development in a climate-friendly way and for which resources are available.

² The partnership, formerly known as the UNEP Risoe Centre, operates under a tripartite agreement between Denmark's Ministry of Foreign Affairs, The Technical University of Denmark (DTU), and the United Nations Environment Programme (UNEP).

³ Available at <http://www.tech-action.org/-/media/Sites/TNA_project/TNA%20Guidebooks/TNA_Guidebook_OvercomingBarriersTechTransfer_10.ashx?la=da>.

⁴ Available at <http://unfccc.int/ttclear/templates/render cms_page?s=IMS_trm>.

⁵ Available at <http://mitigationpartnership.net/sites/default/files/tna_guidebook_mitigationfinancing.pdf>.

⁶ Available at <http://www.seachangecop.org/sites/default/files/documents/2012%2008%20UNEP%20TNA%20Guidebook_AdaptationFinancing.pdf>.

⁷ Available at <http://orbit.dtu.dk/ws/files/52417708/ReportingTemplates_Zhu.pdf>.

10. Based on the **review of TAPs and projects** within the global TNA project, existing non-TNA and existing TNA guidance, it is recommended that a slim guidance document⁸ be prepared for accelerating the implementation of priority technologies in a TNA with:

(a) **A focus on people rather than on process**, which includes the identification of actors and specification of their roles as ‘champions’ or ‘enablers’ in implementing enabling actions for mitigation and adaptation and examining what can be funded by whom;

(b) Three **key steps**: identification of barriers to technology implementation on the desired scale, actions to address such barriers, and plans for the implementation of these actions (TAPs);

(c) **Enhanced guidance on how to attract funding for actions in TAPs**, including minimum requirements for costs, comparing costs of actions with benefits and the identification of potential funders;

(d) An elaboration on the **potential role and capacity needs of nationally designated entities (NDEs)** as a contact or focal point in a country and of the Climate Technology Centre and Network (CTCN) for supporting the implementation of priority technologies in the countries concerned.

11. It is also recommended that the improved guidance document be made available to earlier TNAs (before 2009 and during phase I of the global TNA project) for enhanced implementation of their results.

12. In order to enhance the learning from the TNA implementation experience, it is recommended that the UNFCCC technology portal⁹ or the UDP tech-action portal¹⁰ be extended with lessons learned from the implementation of TAPs and project ideas, success stories and factors for success.

13. These improvements are recommended based on a critical review of myriad data and documents, including:

(a) TNA reports prepared during the period 2009–2013, including TAPs and project ideas;

(b) Good practice examples of progressing from national priorities to the implementation of priority technologies within a country on the desired scale;

(c) Available guidance for preparing technologies for implementation in a TNA, including the TNA handbook (chapter 6) and the UDP guidebooks on assessing barriers to and accessing finance for technology options for mitigation and adaptation;

(d) Available guidance under the Convention for preparing proposals for funding of technologies;

(e) Other guidebooks, outside the TNA context, which aim at identifying options in the light of national priorities and supporting their implementation on the desired scale within a country.

14. The findings of the document are reflected in the outline for guidance on the preparation of a TAP, as contained in the annex.

⁸ This document uses elements from the current TNA handbook, chapter 6, and uses the sources of guidance mentioned in paragraph 6 above on barrier identification and accessing international funding for streamlined guidance on preparing priority technologies for implementation on the desired scale.

⁹ <<http://unfccc.int/ttclear/pages/home.html>>.

¹⁰ <<http://www.tech-action.org>>.

II. Introduction

A. Mandate

15. At its twentieth session, the Conference of the Parties (COP) recognized the need for the TNA process to be improved in order to facilitate the implementation of the project ideas emanating from it. This could be done through the provision of technical assistance and finance to each TNA, which should also aim to integrate economic, environmental and social aspects into its development.

16. COP 20 requested the Technology Executive Committee (TEC) to provide guidance on how the results of the TNAs, in particular the TAPs, can be developed into projects that can be ultimately implemented, and to provide an interim report on its preliminary findings to the subsidiary bodies at their forty-third sessions.¹¹

B. Objectives, scope and approach

17. In line with the COP mandate, the objectives of this document are to:

(a) Review the existing guidance within the TNA programme (chapter 6 of the TNA handbook) for countries to formulate TAPs and project ideas for the technologies which they have selected as those delivering the strongest combined climate and development benefits within their country contexts;

(b) Review the TAPs and project ideas formulated by developing countries in their TNAs during 2009–2013;

(c) Identify gaps and challenges in the current TNA guidance with a view to implementing the prioritized technologies;

(d) Review comparable guidance for implementation which exists outside the TNA programme, but within the Convention, as well as successful guidance applied for implementation outside the Convention;

(e) Recommend, based on paragraph 17(a–d) above, improvements to the guidance on TAP and project ideas with respect to:

(i) What: which content and process improvements are required for accelerating implementation?

(ii) Who: which public and private sector enabling entities should play a role in this (e.g. the CTCN, NDEs, multilateral development banks, the Global Environment Facility (GEF), Green Climate Fund (GCF), development finance institutions, local finance institutions, specialized funds, donors)?

(iii) How: how can these entities be involved most effectively and efficiently?

(iv) When: when in the TNA process should the above-mentioned aspects be considered for high-quality TAPs and project ideas?

18. The document builds to a large extent on insights gained from:

(a) The third synthesis report on technology needs identified by 31 Parties not

¹¹ Decision 17/CP.20.

included in Annex I to the Convention (non-Annex I Parties);¹²

(b) The TEC briefs on the results and success factors of TNAs and on the possible integration of the TNA process with nationally appropriate mitigation action (NAMA) and national adaptation plan (NAP) processes;¹³

(c) The background paper for the 5th meeting of the TEC on the current status of the implementation of the results of TNAs, including success stories;¹⁴

(d) The background note for the 8th meeting of the TEC on project ideas identified from TNAs;¹⁵

(e) The background paper for the 9th meeting of the TEC on good practices of TNAs;¹⁶

(f) TNA handbook;

(g) The UNFCCC guidebook *Preparing Technology Transfer Projects for Financing*;¹⁷

(h) The UDP guidebook *Overcoming Barriers to the Transfer and Diffusion of Climate Technologies*;¹⁸

(i) The UDP guidebook *Accessing International Funding for Climate Change Mitigation: A Guidebook for Developing Countries*;¹⁹

(j) The UDP guidebook *Accessing International Funding for Climate Change Adaptation: A Guidebook for Developing Countries*;²⁰

(k) An experience-sharing workshop on TNAs organized by the UDP in collaboration with the UNFCCC secretariat and held in Bangkok, Thailand, in May 2015;²¹

(l) The findings of the in-session TNA workshop organized in conjunction with the 7th meeting of the TEC, held in Bonn, Germany.²²

19. To further support work on guidance, the TEC agreed to launch a call for inputs on the provision of guidance on how the results of the TNAs, in particular the TAPs, can be developed into projects that can be ultimately implemented. The information in the submissions made in response to the call for inputs was compiled and synthesized²³ to serve as a useful input into this work.

20. Finally, the recommendations in this document are to a large extent based on an analysis of the experience with formulating TAPs and project ideas in phase I of the global TNA project (2009–2013). While the recommended revision of TNA guidance would benefit TAP and project idea formulation in TNA phases II and III, it could also support the implementation of TAPs and project ideas formulated in phase I. Such implementation

¹² FCCC/SBSTA/2013/INF.7.

¹³ TEC documents TEC/2013/5/7 and TEC/2013/5/8. Available at <<http://unfccc.int/ttclear/pages/home.html>>.

¹⁴ TEC document TEC/2013/5/7.

¹⁵ TEC document TEC/2014/8/6.

¹⁶ TEC document TEC/2014/9/5.

¹⁷ Available at <http://unfccc.int/ttclear/templates/render cms_page?s=IMS_trm>.

¹⁸ As footnote 3 above.

¹⁹ As footnote 5 above.

²⁰ As footnote 6 above.

²¹ See <<http://www.tech-action.org/Events/Global-Experience-Sharing-Workshop-Bangkok>>.

²² TEC document TEC/2014/8/5.

²³ See TEC document TEC/2015/11/7.

could be organized with the help of the CTCN and its TNA implementation support programme.

C. Possible action by the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation

21. The Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation will be invited to consider this report with a view to determining further actions arising from it, as appropriate.

III. Background and status of technology needs assessments

A. Technology needs assessments under the Convention

22. TNAs are central to the work of Parties on technology transfer. They present an opportunity to track an evolving need for new equipment, techniques, practical knowledge and skills, which are necessary to mitigate greenhouse gas (GHG) emissions and/or reduce the vulnerability of sectors and livelihoods to the adverse impacts of climate change. TNAs follow a country-driven approach, bringing together stakeholders to identify needs, methodologies and the areas and sectors to be covered and to develop plans to meet those needs (see box 1). They are further defined by the national context of Parties in relation to their national development priorities and the extent of their international opportunities.

23. By decision 4/CP.7, the COP adopted the framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention (hereinafter referred to as the technology transfer framework), as part of the outcome of the technology transfer consultative process (decision 4/CP.4) and the Buenos Aires Plan of Action (decision 1/CP.4).

24. The technology transfer framework aims to develop actions to enhance the implementation of Article 4, paragraph 5, of the Convention by increasing and improving the transfer of, and access to, environmentally sound technologies and know-how. The framework covers five key themes: technology needs and needs assessments; technology information; enabling environments; capacity-building; and mechanisms for technology transfer.

25. By decision 3/CP.13, the COP adopted a set of actions, for consideration by the Expert Group on Technology Transfer in formulating its future work programmes, for enhancing the implementation of the technology transfer framework, as set out in the recommendations contained in annex I to that decision. The purpose of those recommendations was to identify specific actions for enhancing the implementation of the technology transfer framework, as requested by decision 6/CP.10.

Box 1

Provisions of the framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention, relating to technology needs and technology needs assessments

The framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention (hereinafter referred to as the technology transfer framework) defines technology needs assessments (TNAs) as “a set of country-driven activities that identify and determine the mitigation and adaptation technology priorities of Parties other than developed country Parties, and other developed Parties not included in

Annex II [to the Convention], particularly developing country Parties. They involve different stakeholders in a consultative process to identify the barriers to technology transfer and measures to address these barriers through sectoral analyses. These activities may address soft and hard technologies, such as mitigation and adaptation technologies, identify regulatory options and develop fiscal and financial incentives and capacity-building.”

According to the technology transfer framework, the purpose of TNAs is “to assist in identifying and analysing priority technology needs, which can form the basis for a portfolio of environmentally sound technology (EST) projects and programmes which can facilitate the transfer of, and access to, the ESTs and know-how in the implementation of Article 4, paragraph 5, of the Convention.”

26. By decision 4/CP.7, paragraph 3, and decision 6/CP.8, paragraph 1(c), the COP requested the GEF to provide financial resources to non-Annex I Parties, in particular the least developed country Parties and the small island developing States, through its climate change focal area and the Special Climate Change Fund established under decision 7/CP.7, for the implementation of the technology transfer framework. In response to this mandate, the GEF provided funding for more than 90 non-Annex I Parties to conduct TNAs through its interim funding for capacity-building in priority areas (enabling activities – phase II), also known as the top-up funding. Within this process, the United Nations Environment Programme (UNEP) assisted 14 countries and UNDP assisted 78 countries to conduct and report on the first round of TNAs.

27. The COP, by decision 3/CP.13, encouraged non-Annex I Parties that had not yet undertaken or completed their TNAs to do so as soon as possible and to make these reports available to the secretariat for posting on the technology information clearing house (TT:CLEAR).

28. Furthermore, the COP, by the same decision, requested the secretariat to prepare a synthesis report or reports of the information included in TNAs for consideration by the SBSTA. It further requested the secretariat to provide regular updates on the progress of the implementation of the results of technology needs identified in TNAs, including success stories, for consideration by the SBSTA at its subsequent sessions, as appropriate.

29. By decision 1/CP.16, the COP established a Technology Mechanism consisting of the TEC and the CTCN. By the same decision, it decided that the TEC should further implement the technology transfer framework, and provide, as one of its functions, an overview of technological needs and analysis of policy and technical issues related to the development and transfer of technologies for mitigation and adaptation.

B. Technology action plans and project ideas as an output of technology needs assessments during 2009–2013

30. A TNA is a set of country-driven, participatory activities leading to the identification, prioritization and implementation of environmentally sound technologies to decrease GHG emissions (mitigation) and to decrease vulnerability to climate change (adaptation). The country-driven nature of a TNA is based on its link with a country’s development priorities. In the light of these priorities, technologies with the highest combined development and climate benefits are selected.

31. The next step in a TNA is to identify barriers to the successful implementation of prioritized technologies in the country and to assess how these barriers can be addressed so as to establish within the country an enabling framework for technology development and

transfer. The barrier analysis and enabling framework report form the second deliverable of a TNA.

32. Measures identified for addressing technology barriers are subsequently described in TAPs, which form the third deliverable of a TNA. Actions included in TAPs could be specific for each priority technology or identified as cross-cutting technologies at the sector level.

33. Finally, in their TNAs, countries formulate project ideas as concrete actions for the implementation of their prioritized technologies; for instance, to demonstrate the first few applications of a technology within the country. The project ideas are the fourth deliverable of a TNA process (see figure 5).

34. During the second round of TNAs (between 2009 and 2013) over 90 per cent of the countries prepared TAPs for their prioritized technologies for mitigation and adaptation. In line with the prioritized technologies, most of the Parties prepared mitigation TAPs for the energy industries and transport subsectors, and adaptation TAPs for the agriculture and water sectors.

35. The total accumulative estimated budget needed by Parties for their TAPs was USD 5.2 billion for mitigation and USD 2.4 billion for adaptation. However, as the budget descriptions differed significantly between the TAPs in terms of their magnitude and level of detail, it is difficult to use these numbers for the identification of precise funding needs.

36. Eighty-seven per cent of Parties developed project ideas in their TNAs. The estimated accumulative total budget required for the more than 250 project ideas identified by Parties amounted to approximately USD 24.7 billion. However, as the estimated budgets differed significantly between different Parties, the resulting median budget for a project idea is only USD 2 million.

37. A survey undertaken by the secretariat in 2013²⁴ shows that several project proposals from the TNA reports have been implemented. Out of the 40 project ideas (in six countries) analysed (based on inputs provided by countries in response to a questionnaire), 32 were claimed to be implemented. In addition, some of the policy and programme related TNA results, such as TAPs, facilitated the creation of new energy policies at the national level.

38. An earlier survey by the secretariat, carried out in 2010, analysed project ideas prepared in 11 countries in an earlier round of TNAs (before 2009). Of these, 4 countries provided information on several projects that had been implemented or were under implementation, 5 countries admitted that none of the projects had been implemented, and 2 countries were still considering future implementation. Most of the countries identified the lack of financing opportunities as the main barrier to implementation.

C. Review of technology action plans and project ideas prepared by developing countries in their technology needs assessments

39. From the analysis carried out in the TNA good practice report, based on TNAs conducted between 2009 and 2013, it was concluded that countries were well able to prioritize technologies for mitigation and adaptation against country development criteria. TNA reports showed that the prioritization processes had generally been participatory, with the involvement of country stakeholders. In support of that, countries had spent time familiarizing stakeholders with potential technologies and used tools such as multi-criteria decision analysis.

²⁴ See TEC document TEC/2013/5/7.

40. The report also noted good practice lessons in terms of TNAs considering the costs and benefits of introducing technologies within a sector on a larger scale, instead of at the level of a project only.

41. The TNA reports also showed that Parties have often conducted detailed analysis of identified barriers to technology implementation. Systems were described for technology implementation on the desired scale, thereby using tools such as market or system mapping. Identified barriers were subsequently analysed with the help of, for instance, root cause analysis, so that the deeper reasons for a barrier could be identified. Barriers were also categorized in terms of economic, legal and technical barriers, among others, and ranked so that the most important barriers could be addressed first.

42. However, as concluded by the TNA good practice report, while the TAPs and project ideas are generally based on actions identified to address barriers, TNAs generally lack information about the business case of technology implementation. For instance, for a government to decide on how to allocate resources for technology implementation, information is needed about the benefit to cost ratio of a technology-related programme or project.

43. Technology transfer practitioners interviewed (for the TNA good practice report) identified, based on TNAs conducted between 2009 and 2013, the following areas for improvement of the guidance for enhancing the implementation of priority technologies within the TNA project, given the time and resources available for TNAs:

(a) **Cost information:** generally, the cost information provided in TAPs, if included at all,²⁵ is limited to a rough estimate of the costs of actions for technology implementation. Practitioners recommended more active involvement of financial specialists to help the TNA, TAP and project idea process with identifying cost items and making cost estimates. Realizing that detailed cost estimates can be very data and resource intensive, it has been argued by practitioners that cost estimates in a TAP and project idea should be kept simple (e.g. limit to the identification of cost items and estimations of order of magnitude of cost levels);

(b) Closer comparison of the benefits of a technology with the estimated costs, for example, through **benefit to cost ratios** of technology-related programmes and/or projects: TNAs prioritize technologies on the basis of economic, social and environmental benefits for a country. These benefits can be compared with the basic estimates of the costs of technologies and actions in a TNA (as described above). With such information, technology investments can be screened for prioritization and allocation of resources in countries;

(c) **Clarity about funding sources:** most action plans do not make clear how estimated costs are expected to be covered. Identification of potential funders depends on the type of action to be funded: some actions in a TAP are more suitable for private funding sources, while policy or programmatic actions are more likely to be funded by public funding sources (including, for instance, multilateral funds);

(d) **Measure success:** although TAPs clearly identify actions and characterize these, only a few TNAs include in their action plans indicators to measure future success after implementation. Inclusion of such indicators enables measuring the impact of an action or project after its implementation. (See chapter VI below for specific guidance on tracking the results of TNAs).

²⁵ A total of 19 countries included budget estimates for actions specified in TAPs for adaptation, while 18 countries specified costs for TAPs for mitigation.

44. Practitioners interviewed for the TNA good practice report specifically emphasized the important **roles that professionals** could play in the preparation of action plans, such as technology owners and developers, sector experts in the countries, finance experts, representatives of bilateral or multilateral organizations, etc. It was acknowledged that this requires that the TNA and its results are sufficiently attractive for these professionals.

45. Regarding the previous point, the TNA good practice report recommended that TNA results meet reality checks (i.e. are the proposed plans feasible in the longer term?) and be considered by key ministries in national development planning processes. However, it was also argued by practitioners that stakeholders had low awareness of the opportunities and benefits of well-elaborated TNAs because of the limited resources available for a TNA. This resulted in too little interest in the TNA-TAP process by key decision makers.

IV. Review of technology action plans and project ideas of phase I of the global technology needs assessment project: comparison with implemented climate actions outside the technology needs assessment project

46. The above-mentioned review of TNAs has shown that with the current TNA guidance, countries have been well able to prioritize technologies in the light of their national development plans, but it has also become clear that countries struggle with formulating TAPs and project ideas on the basis of these priority technology options. While countries' TNA teams have mostly been able to specify barriers to the implementation of technologies (including on larger scales) with possible actions to overcome these, formulation of implementable action plans and project ideas has been a difficult step in the TNA process.

47. Possible reasons for this difficulty are that practitioners with a finance and investment background were often not involved in the full TNA process, and that both the technology prioritization and the action plan formulation stages were conducted by the same stakeholder groups, even though each stage usually requires different expertise. Moreover, TNAs are often done in isolation as stand-alone exercises, without strong links to other processes.

48. As a result, the information provided in action plans, including information about the (types of) costs of an action, responsibilities, and monitoring and verification aspects, is generally insufficient for attracting funders and investors.

49. In order to address this information shortage and recommend improved guidance for successfully moving from TNA climate and development priorities to low-emission and climate-resilient technology transactions, this document:

(a) Reviews existing or past programmes focusing on climate technology transfers to developing countries, and identifies factors for successful implementation of these technologies;

(b) Reviews TAPs and project ideas formulated during the second generation of phase I of the TNA project (2009–2013) with a view to ascertaining whether similar success factors have been considered and, if so, to what level of detail they have been assessed.

50. The review of existing or past programmes was based on three examples²⁶ of low-

²⁶ See TEC document TEC/2015/11/6, annex I.

emission and climate-resilient technology transfer programmes to developing countries. From this detailed analysis, common success factors were identified for the implementation of priority actions.

51. The three examples illustrated that technology programmes or action plans that meet top-down priorities and for which committed public and private sector implementing entities have been lined up are likely to prove more effective, require less time and money, and entail lower risks than programmes for which these conditions do not exist. This places a premium on a thorough understanding of the specialized actors and activities in a particular setting (a country) and the motivation of these actors to act before selecting priority technologies.

52. The set of examples discussed was small, but the detailed analysis of them resulted in the identification of some common factors that have contributed to the success of the programmes in terms of progressing prioritized actions into transactions and which can be useful for consideration when formulating TAPs and project ideas in a TNA. These common factors are as follows:

(a) Demand-driven: the technologies that form the core of the programmes are chosen on the basis of the priorities of domestic public and private stakeholders, which have the benefit that technology acceptance by stakeholders may be stronger. It is acknowledged, however, that it is important that technology choices are not determined by 'business as usual' considerations, but clearly go beyond that;

(b) Value chain: the programmes have examined the value chain for technology implementation, including barriers to be overcome, market enablers, enabling environments, technology suppliers, finance providers, supporting services and technology users;

(c) Scale: the programmes aim at deployment (in a market) and diffusion (to commercial application) of prioritized technologies and actions on a larger scale (e.g. hundreds of thousands of biogas units or widespread distribution of solar heating systems in a country);

(d) Costs: in their cost estimates, programmes have specified whether costs relate to upfront investments and to the exploitation of the programme, thereby applying net present value and/or internal rate of return techniques;

(e) Funding: the programmes examined have specified what type of funding is suitable for financing the deployment and diffusion of the priority technologies, as well as in what form this funding should be made available in order to make it affordable for the country stakeholders; for example, subsidies, co-funding and long-term finance schemes;

(f) Capacity-building: within each programme, capacity-building requirements have been identified and addressed, such as knowledge-sharing, awareness-raising and training;

(g) A clear view of the role of people, institutions and different types of funding in different programme stages, such as public-private collaboration, the role of technology champions, rules of engagement, sharing of risks, and the use of grants, subsidies and loans at different times;

(h) A clear view of the expected results of programmes or projects: the programmes examined contain steps for achieving programme results and contingency plans in case deviations occur between plan and realization.

53. These factors were subsequently used for reviewing TAPs and project ideas of the global TNA project.

A. Review of technology action plans and project ideas of the global technology needs assessment project

54. The above-mentioned analysis of examples has resulted in a list of common factors for successful transactions based on prioritized actions. This section examines how and to what extent the TAPs and project ideas prepared during phase I of the TNA project (2009–2013) have taken these factors into consideration, in particular:

- (a) Have the factors for success been included in TAPs and project ideas?
- (b) What level of detail was used in specifying the factors?

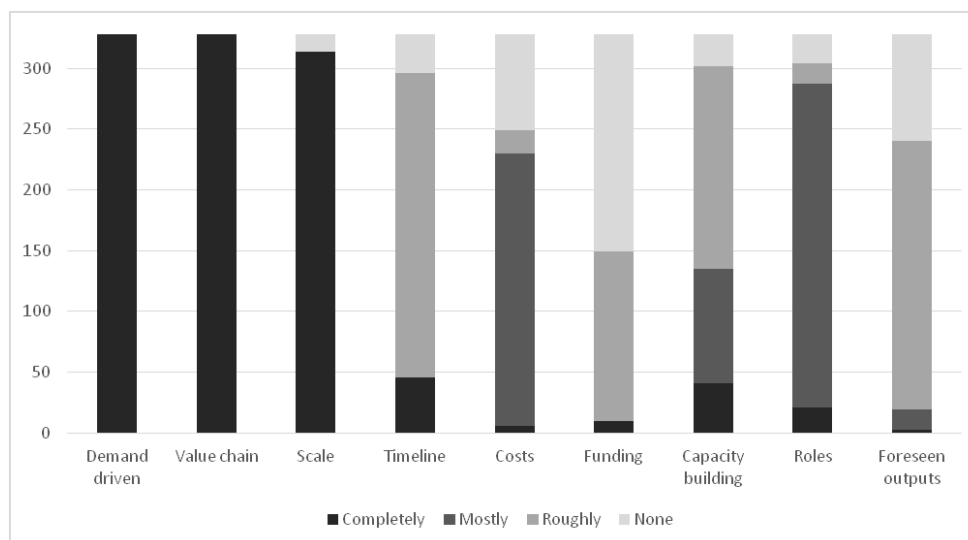
55. It should be noted that this analysis should not lead to the conclusion that TAPs and project ideas which do not consider and specify all identified success factors can by definition not lead to successful transactions. Rather, the analysis indicates how and to what extent the formulation of current TAPs and project ideas reflect such success factors or deviate from them. This will provide further input for suggesting improvements to the guidance for TAP formulation.

B. Technology action plans: success factors for implementation

56. During the latest round of TNAs (2009–2013), 29 countries developed 328 TAPs, of which 142 were for mitigation and 186 for adaptation. The above-mentioned success factors can be applied as criteria to the TAPs in order to identify the likelihood of their leading to successful implementation. Figure 1 shows to what extent the TAPs have adhered to the success factors (for a quick interpretation: the lighter the bars, the lower the level of detail in the TAPs). It is noted that none of the countries covered all the success factors in their TAPs in detail.

Figure 1

Extent to which technology action plans consider factors for implementation success (ranging from complete analysis to rough or zero consideration of success factors)



57. As all TAPs are based on the technology prioritization in the TNA process, they are all driven by demand based on country priorities, as revisited by domestic stakeholders, which differs from the concept of demand driven by market forces. All countries also

performed an analysis of the value chain for the implementation of the technologies, and all TAPs followed the analysis of market barriers and enablers.

58. Some 96 per cent of the TAPs aimed at the deployment and diffusion of priority technologies on a larger scale within the countries, while the remaining TAPs were merely designed to prepare for the implementation of a single project.²⁷

59. Fourteen per cent of the TAPs included a detailed overview of the planned timeline for implementation, including the order of required activities and the number of months needed. Ten per cent of the TAPs did not include any information on the timelines, while the remainder of the TAPs merely indicated whether activities would need to be implemented in the shorter or longer term.

60. With respect to the costs of actions in a TAP, only 2 per cent of the TAPs included detailed information about costs, including benefit to cost ratios. The majority of TAPs (68 per cent) did include a cost indication per activity, although without justifying the cost indication, and without specifying whether these costs relate to, for example, upfront investment costs or exploitation costs. Six per cent of the TAPs only provided such a cost indication for the programme as a whole (not broken down per activity), and the remaining 24 per cent did not include any cost information at all.

61. This finding is in line with the TNA good practice paper, which explains that providing detailed cost information is often a challenge as it requires specific expertise, analysis and data, which adds to TNA process costs and which in the case of some countries, such as the least developed countries, may not be feasible without additional support.

62. Only 3 per cent of the TAPs included a detailed specification of what type of funding is suitable for the various activities, and which potential investors may be involved. An additional 42 per cent of TAPs gave a rough indication of potential funding sources, such as 'international donors'. The remainder of TAPs did not indicate any potential funding sources. Similar to the observation on costs above, a detailed specification of funding options requires additional resources and capacity, which in some countries may not be available.

63. Most of the TAPs (92 per cent) contain some form of capacity-building, such as: (1) a capacity needs assessment; (2) the actual implementation of capacity-building through, for example, education, training courses and information campaigns; and (3) a plan for the longer-term continuation of capacity-building through, for example, the 'training of trainers' and the development of a related education programme in universities. Twelve per cent of the TAPs included all of these aspects, while 29 per cent included implementation and one of the other two aspects, and 51 per cent included only implementation.

64. Six per cent of the TAPs provided a clear overview of the roles and responsibilities of stakeholders during the implementation of the TAP. The majority (82 per cent) of TAPs merely indicated which actors would be involved for each of the activities, without clarifying the exact roles and responsibilities of these actors. Five per cent of TAPs merely provided a rough overview of related organizations, while 7 per cent did not mention the involved stakeholders at all.

65. With respect to observing whether expected results had been achieved, out of the 328 TAPs analysed, only 3 included a plan for this. Most of the TAPs (72 per cent) merely

²⁷ Owing to lack of data on the actual implementation of TAPs, it cannot be ascertained at this stage whether the TAPs designed for the implementation of a single project lead to less or more successful implementation results.

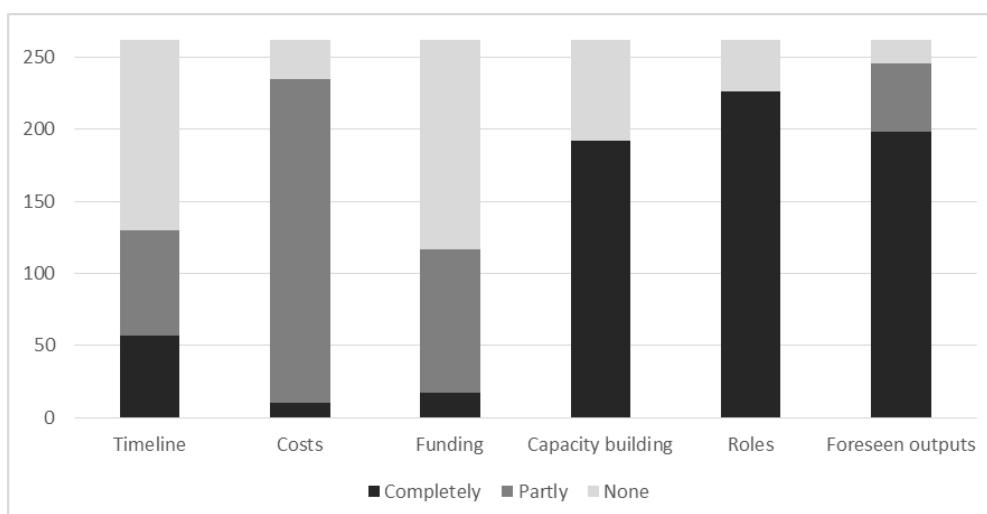
included indicators for monitoring success, of which a small part also added which organization would be responsible for this monitoring. However, none of these TAPs included a contingency plan. Twenty-seven per cent of the TAPs did not include any monitoring indicators.

C. Project ideas: success factors for implementation

66. During the latest round of TNAs (2009–2013), 26 countries developed 262 project ideas, of which 105 were for mitigation and 157 for adaptation. Although not all the success factors as identified in paragraph 52 above can be applied as criteria to the project ideas (as these factors are more applicable for larger-scale programmes), some of them can be used to identify the likelihood of the project ideas leading to successful implementation. Figure 2 shows to what extent the project ideas have adhered to these success factors. Similar to the discussion on TAPs above, none of the countries covered all the success factors in their project ideas in detail.²⁸

Figure 2

Extent to which project ideas consider factors for implementation success (ranging from complete analysis to rough or zero consideration of success factors)



67. Out of the 262 project ideas, 22 per cent included a detailed timeline for project implementation, such as a Gantt chart. On the other hand, half of the project ideas did not include any information on the planned timeline at all. The remaining 28 per cent of project ideas included some rough information on the project timing, without specifying the exact duration per activity and temporal relationships between tasks.

68. Although most of the project ideas (90 per cent) included information on the expected costs of the projects, only a very small share (4 per cent) included detailed figures with regard to, for example, the internal rate of return.

69. For 6 per cent of the project ideas it was indicated how the project would be financed, and which financiers would be involved. An additional 38 per cent of project ideas gave a rough indication of potential funding sources, such as 'international donors'. Fifty-five per cent of project ideas provided no indication of funding received.

²⁸ Owing to lack of data on the actual implementation of project ideas, it cannot be ascertained at this stage how successful project idea implementation has been.

70. Some sort of capacity-building and training activities were included in most (73 per cent) of the project ideas. The roles and responsibilities of the actors involved in the planned projects were described in 86 per cent of the project idea reports.

71. About 76 per cent of the project ideas included information on expected outputs. A further 18 per cent of the project ideas merely stated objectives, without indicating measurable outputs. Six per cent of project ideas did not include any output indicators at all.

V. Review of guidance outside the technology needs assessment project from priorities to implementation

72. The above analysis has indicated whether and to what extent TAPs and project ideas contain information about factors for implementation success as identified from a detailed analysis of climate-related 'priority-to-action' programmes. Before examining how to improve existing guidance for TAPs and project ideas in a TNA to address any shortcomings, in this chapter a set of six non-TNA guidance documents are examined from the perspective of identifying and translating priorities into projects, programmes or activities.

73. In examining these examples the focus is on the following questions:

(a) Does the guidance directly attempt to make the connection between priorities and specific actions?

(b) How good or detailed is the guidance with respect to the preparation of transactions, whether they be programmes, projects or activities?

74. In addition, in the next section, a critical analysis is presented of guidance documents that are available to support TNAs, based on the following key question: how does the non-TNA guidance discussed here compare with a set of (UNEP, UNDP and UNFCCC prepared) benchmark guidance documents which are available for supporting the implementation of actions and projects in a TNA?

75. For the review of non-TNA guidance, the following six guidance documents have been examined:²⁹

(a) GCF. 2014. Green Climate Fund approval process, including funding criteria (draft);

(b) Asian Development Bank (ADB). *Sustainable Energy Access Planning: A Framework*;³⁰

(c) United Kingdom of Great Britain and Northern Ireland Department for International Development (DFID)/Swiss Agency for Development and Cooperation (SDC). *The Operational Guide for the Making Markets Work for the Poor (M4P) Approach*;³¹

²⁹ Further details are available at http://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TEM_TEC_meetings/8ada1b9bcefd435e97d39c87f9e95a6d/43bd129ceecb4822bd60bd5284db4cbb.pdf.

³⁰ Available at <http://www.adb.org/sites/default/files/publication/160740/sustainable-energy-access-planning-fw.pdf>.

³¹ Available at <http://www.springfieldcentre.com/wp-content/uploads/2014/09/2014-09-M4P-Operational-Guide-with-watermark1.pdf>.

(d) UNDP. *Inclusive Markets Development Handbook*;³²

(e) Sustainable Energy for All (SE4All). 2013. *Africa Strategy for Decentralized Energy Services Delivery*;

(f) GEF. *Rules, Procedures and Objective Criteria for Project Selection, Pipeline Management, Approval of Sub-Projects, and Cancellation Policy*.³³

76. The sampled non-TNA guidance documents all indicate the importance of converting goals, objectives and priorities into action-oriented transactions.

(a) Some of the documents, especially those by the GCF, the GEF and UNDP, are more focused on meeting specific internal programme criteria and process requirements;

(b) Other guidebooks (especially that of DFID/SDC) are more outward looking. While these too are tailored to specific programmatic interests, they offer a more widely applicable approach to transaction preparation from a well-rounded perspective, which has more general applicability;

(c) The guidance documents from ADB and from SE4All emphasize the importance of getting from a macro (policy) level (priorities) to a sectoral or more micro level (implementation). However, they fall short in offering specific guidance on how to make that connection;

(d) While informative, the DFID/SDC guidance is detailed and dense, and may be difficult for the average reader and layperson decision maker to absorb and use.

77. From the review, it can be concluded that the non-TNA guidance documents intend to present a balanced approach to setting priorities and linking these priorities to action-oriented transactions (programmes, projects and activities). However, most guidance documents attempting to reach this dual objective (of setting priorities and defining transactions for implementation) fail to define the requirements of the transactions that execute these priorities. A reason contributing to this failure is that the guidance documents reviewed here insufficiently address the professional differences between policymakers and priority-setting processes on the one hand, and the requirements of specific transaction formulation on the other.

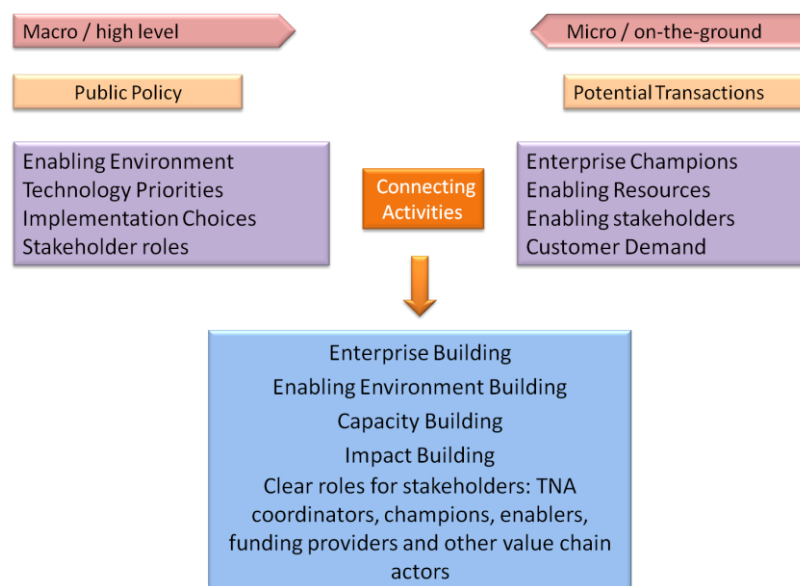
78. In order to correct this disconnection, the interaction of representatives from both the world of policy and priority setting (largely the public sector) and the world of transaction ‘champions’ (largely the private sector and civil society) is recommended, in combination with professional editing to ensure that ‘language gaps’ can be avoided. It is thereby acknowledged that getting from a macro (policy) to implementation level requires continued engagement, greater definition of the connecting activities with the highest potential, perseverance and persistence, with corresponding demand for time and resources.

79. This is illustrated in figure 3, which provides examples of the connecting activities that can link the macro and the micro levels, within the narrower scope of low-carbon energy initiatives.

³² Available at <<http://www.undp.org/content/dam/undp/library/Poverty%20Reduction/Private%20Sector/undp-psd-imdhandbook-en-2010>>.

³³ Available at <<https://www.thegef.org/gef/node/472>>.

Figure 3

Framework for identifying common activities at the policy and on-the-ground levels

Abbreviation: TNA = technology needs assessment.

80. From the above-mentioned review, no model guidance document can be recommended for supporting the TNA stage of implementing prioritized technologies for mitigation and adaptation on the desired scale within a country. Instead, it is recommended that some of the processes, content, examples and good practices from the reviewed DFID/SDC and UNDP guidance be incorporated or referenced in the revised guidance for the implementation of TNA results, such as: effective mission building, market mapping, logical framework use, “developing the offer”, developing business membership organizations and “making a deal with lead firms”, value chains, understanding incentives, “giving grants to business” and “simulating demand”.

81. Moreover, from the review of non-TNA guidance in this chapter it is also recommended that guidance for TNA result implementation be kept as streamlined as possible by developing process guidance for TAP and project idea preparation, which is supplemented with more detailed guidance, training materials and actively managed web-based resources.

VI. Review of guidance for technology action plans and project ideas in the global technology needs assessment project

82. The TNA handbook offers guidance for each step of the TNA process: organizing the process, prioritizing technologies for mitigation and adaptation in the light of a country’s development priorities and preparing for technology implementation. In addition to the handbook, a set of other guidance documents have been made available to support countries in overcoming barriers to technology transfer, assessing international funding sources for priority technologies, and reporting on TNAs, TAPs and project ideas.

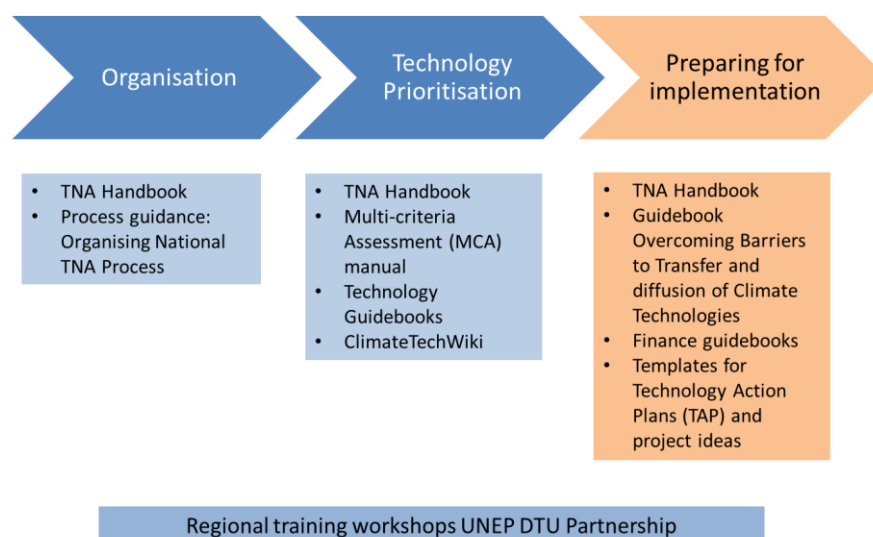
83. This chapter reviews existing guidance for supporting the implementation of priority technologies in a TNA, especially for preparing TAPs and project ideas. From a review of

good practice of TNAs conducted between 2009 and 2013,³⁴ as well as the discussion in chapter III above, it has become clear that information in TAPs and project ideas is often insufficient for successful implementation of priority technologies. Based on this, recommendations for improving the guidance are provided in chapter VII below.

84. As shown in paragraph 6 above, various sources of guidance are available for preparing for implementation of TNA prioritized technologies (see figure 4). These publications are reviewed in chapter VI.A–D below from the perspective of how they could be improved in a way that would ease the transition from priority setting in a TNA into the creation of improved TAPs and project ideas. The findings from chapters III and IV will be considered with respect to current shortcomings in TAPs and project ideas in TNAs, as well as good practice with climate-relevant investments and guidance. As some guidebooks were made available at a later stage during the global TNA project, the review also considers harmonizing the guidebooks.

Figure 4

Main technology needs assessment stages and guidance available for each stage



Box 2

Process of updating the handbook *Conducting Technology Needs Assessments for Climate Change* during 2008–2010

At its thirteenth session, the Conference of the Parties requested the secretariat, in collaboration with the Expert Group on Technology Transfer, the United Nations Development Programme, the United Nations Environment Programme and the Climate Technology Initiative, to update the handbook *Conducting Technology Needs Assessments for Climate Change* (TNA handbook).³⁵ The updating work had two main components, as shown below.

1. In chapters 1–5 of the updated version of the TNA handbook, the process of prioritizing technologies has been further specified in more detailed steps, so that all technology needs assessments (TNAs) would follow a similar process, which would also

³⁴ <http://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TEM_TEC_meetings/d8024d9b950f43d594fc17fd22b5477a/6d4c53c874c74baab1ee4b287ec9292e.pdf>.

³⁵ Decision 3/CP.13.

facilitate synthesizing TNA results across countries. Moreover, stakeholders are further supported in considering technology options for mitigation and adaptation in the light of countries' national environmental, social and economic development planning. The updated guidance contains steps to make TNA stakeholders familiar with possible technology options.

2. The updated TNA handbook contains a new chapter (chapter 6) on formulating national strategies on the basis of prioritized technologies for mitigation and adaptation, which discusses the ways in which development and transfer of prioritized technologies within a country can be accelerated on a scale required or desired for achieving a country's climate and development benefits.

An important consideration during the updating process of the TNA handbook during 2008–2010 was to make it applicable for other national policymaking processes in developing countries. A limitation during that process was that relevant processes under the Convention were being negotiated and it was unclear what possible interlinkages between TNAs and these processes could look like.

Therefore, the TNA handbook took the position that the national strategy and action plan resulting from a TNA would best be conceived as part of a country's overall development and climate change strategy (e.g. nationally appropriate mitigation actions (NAMAs) and national adaptation programmes of action). As a result, chapter 6 of the handbook was prepared as comprehensive guidance with a high level of detail and addressing a high policymaking level, so that its relevance for NAMAs and national adaptation plans would become more likely.

A. Process: review of guidance on preparing strategy and action plans for prioritized technologies (chapter 6 of the *Handbook for Conducting Technology Needs Assessment for Climate Change*)

85. Chapter 6 of the TNA handbook contains three main steps towards strategies and action plans for technology implementation:

- (a) Clarifying priorities and establishing key milestones;
- (b) Identifying measures to develop capacities and enabling frameworks;
- (c) Compiling an overall national strategy and action plan.

86. The first step takes the portfolios of prioritized technologies as a starting point and examines the scale on which these need to be implemented in order to meet sector goals (milestones). Chapter 6 suggests specifying the scale of technology implementation by first revisiting the goals of a sector or country in line with development and climate priorities (such as a 30 per cent share of renewable energy in the energy mix), followed by specification of how the technology concerned can contribute to these (e.g. solar energy can provide one third of all renewable energy to the country).

87. In the second step, the handbook recommends a system level approach by mapping out, during a participatory process (such as a workshop), the existing environment for each priority technology in the country concerned. Such a system or market map helps stakeholders to gain insights on the barriers in a system for technology development and implementation. Subsequently, solutions can be identified for these.

88. A particular aspect of this step is that the handbook recommends that solutions be categorized under "core elements for a national technology innovation strategy". Examples of these core elements are: stakeholder networks, policies and measures, organization and behavioural change, market and system support, training and awareness-raising programmes.

89. The third step in chapter 6 of the handbook consists of compiling a technology strategy with an action plan, combining the elements collected in the first two steps. It takes the sector or national goals defined in step 1 as a future reference point and aims at formulating a pathway towards these goals, in the form of a strategy. The TNA handbook recommends that actions identified for multiple technology strategies are compared, in order to identify overlaps and to explore whether the technology strategies can be combined into sector or national technology strategies.

90. Implementation guidance for projects and programmes is limited to a text box with recommended steps for identifying barriers and system blockages. Most of the guidance in chapter 6 is focused on scaling up technology implementation and motivating stakeholders to go beyond single technology projects.

91. As such, chapter 6 could be interpreted as a step before a decision on the implementation of technologies. The handbook's intention to consider the national strategy and action plan as part of a country's overall development and climate change strategy (e.g. a NAMA or a NAP; see box 2) has resulted in a relatively high-level guidance chapter, with limited concrete guidance on actual implementation of priority technologies.

92. An overview of the strengths and weaknesses of chapter 6 of the TNA handbook, based on the above review, is shown in table 1.

Table 1

Strengths and weaknesses of chapter 6 of the *Handbook for Conducting Technology Needs Assessment for Climate Change*^a

<i>Strengths</i>	<i>Weaknesses</i>
Connects the scale on which technology development and transfer take place with a country's longer-term development vision and milestones	The chapter is rather 'packed' with multiple steps and details, which makes it difficult to read
Stimulates 'system thinking': successful larger-scale development and transfer of prioritized technologies require efficient systems or markets. Chapter 6 provides detailed guidance for that	The link with underlying guidance material, such as the finance guidebook and barrier analysis guidebook, is rather weak, which is partly caused by the later availability of the latter
Supports a country in formulating strategies for technology development and transfer, which can be at the level of a technology, a sector or area, or an entire country	The link between technology action plans (TAPs) and project ideas is not fully clear; for example, whether project ideas originate from TAPs or can also be formulated independently of TAPs
Aims at connecting technology needs assessment (TNA) results with nationally appropriate mitigation actions and national adaptation plans, so that TNA outputs can be linked to these processes	The proposed process from technologies to strategies is recommended to be participatory, but, during TNA phase I, the possible role of stakeholders in implementation preparation is not specifically highlighted (e.g. role of 'developers', 'champions', 'enablers'). In order to address this aspect, the United Nations Development Programme and the UNEP DTU Partnership ^c (UDP) are developing a specific guidebook for stakeholder mapping and engagement under TNA phase II ^b

<i>Strengths</i>	<i>Weaknesses</i>
Underlines the need for rationalizing actions for technology development and transfer across multiple sectors within a sector or nationally, in order to avoid gaps and overlaps	While countries in their TNAs present their TAPs and project ideas in a common format, the level of specification of identified actions differs between countries
Stimulates TNA countries to present TAP and project ideas in a common format (in combination with TAP and project template prepared by UDP)	

^a Available at <http://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TNA_HAB_infobox_1/3a34f12bf10d4b7bae791d0d7ad572eb/c29096556b034760b94273b0124039ac.pdf>.

^b *Identification and Engagement of Stakeholders in the TNA Process: A Guide for National TNA Teams*. Available at <<http://www.tech-action.org/Publications/TNA-Guidebooks>>.

^c The partnership, formerly known as the UNEP Risoe Centre, operates under a tripartite agreement between Denmark's Ministry of Foreign Affairs, The Technical University of Denmark (DTU), and the United Nations Environment Programme (UNEP).

B. Barriers and enabling actions: review of the UNEP DTU Partnership's guidebook on overcoming barriers to the transfer and diffusion of climate technologies

93. In order to support barrier identification and analysis, UDP prepared the *Overcoming Barriers to the Transfer and Diffusion of Climate Technologies* guidebook.³⁶

94. The aim of the guidebook is to provide guidance on how to assess, address and overcome barriers to prioritized technologies in a TNA in the countries concerned. In this respect the guidebook complements the TNA handbook, which provides general guidance on barrier assessment (in chapter 6). At the same time, the guidebook is not a manual or blueprint for elaborating measures for technology transfer. Its aim is to identify options and tools for the analysis of barriers and solutions.

95. The focus of the guidebook is on prioritized technologies, not a whole sector (e.g. transport) or a group of technologies (e.g. energy efficiency options). For prioritized technologies, barriers are analysed with a view to the objective of their larger-scale deployment and diffusion. The guidebook specifically focuses on the role of governments in accelerating technology transfer and thus addressing barriers.

96. The guidebook distinguishes between technologies as market goods (consumer goods and capital goods) and those that are in the categories of publicly provided goods and other non-market goods. For market goods, the main tool recommended is that of market mapping, which is a participatory process with stakeholders in a country to prepare a 'snapshot' of the market system for a technology, including its value chain, enabling environment and supporting services. Based on this picture, market inefficiencies or barriers can be identified and solutions to address these recommended.

³⁶ As footnote 3 above.

97. With the addition of publicly provided and non-market goods the guidebook aims to address barriers that are specifically related to mitigation and adaptation technologies such as large-scale hydropower schemes, sea dykes, flood defences; infrastructure such as roads, bridges and sewage systems; and mass transport systems such as metros.³⁷

98. In terms of method, the guidebook for overcoming barriers recommends the following steps:

(a) Identification and categorization of the following types of barrier: economic and financial; market failure; policy, legal and regulatory; network failure; institutional and organizational capacity limitation; lack of human skills; social, cultural and behavioural; lack of information and awareness; technical; and other barriers such as lack of physical infrastructure;

(b) Screening of barriers according to their significance, whereby the long list of identified barriers is sorted into key and non-key barriers;

(c) Decomposition of barriers in terms of category of barrier (e.g. economic and financial), barrier within the category (e.g. high cost of capital), elements of the barrier (e.g. high interest rate) and dimension of the barrier element (e.g. 15 per cent interest per year);

(d) Causal relations between barriers are explored in order to identify the 'true problem' or root cause of barriers, so that solutions for addressing barriers are focused not on the symptom but on solving the fundamental problem.

99. Once barriers have been identified and analysed, the guidebook explains how measures can be identified to address the barriers. This process is also proposed to be participatory. Identified measures are categorized in a similar way to the above-mentioned categorization of barriers. A recommended tool for this is logical problem analysis, which helps to formulate a barrier problem into a solution and identifies steps towards realizing that solution.

100. After an initial prioritization of measures, in terms of which measures are essential for addressing barriers, the guidebook recommends that measures may be grouped for several technologies. This enables measures identified for a single technology and which also apply to other technologies to be organized such that they benefit the transfer and diffusion of multiple technologies.

101. From the third synthesis report on TNAs³⁸ it can be concluded that Parties generally have followed this guidance on barrier identification and solution formulation, as they categorized and prioritized barriers and formulated enablers as solutions for the barriers. Most TAPs contained solutions for specific technologies, rather than cross-technology solutions.

102. An overview of the strengths and weaknesses of the *Overcoming Barriers to the Transfer and Diffusion of Climate Technologies* guidebook³⁹ is shown in table 2.

³⁷ The distinction between market and non-market goods in the guidebook does not mean that technologies in the non-market category may not be traded in a market place like consumer goods and capital goods. The guidebook, in fact, acknowledges that these technologies are purchased by public entities from private constructors and manufacturers, but explains that their market is often not as liquid as the markets for market goods, as the public entities purchase their goods through a tendering process, which may be restricted to a limited number of invited national and international construction companies.

³⁸ FCCC/SBSTA/2013/INF.7.

³⁹ As footnote 3 above.

Table 2

Strengths and weaknesses of *Overcoming Barriers to the Transfer and Diffusion of Climate Technologies*^a

<i>Strengths</i>	<i>Weaknesses</i>
Supports the screening of barriers, which goes beyond simply categorizing them, as it supports analysing the root cause of barriers and prioritizing them in terms of which ones are essential for successful technology implementation	It is not a step-wise guidebook, which complicates its usability. Technology needs assessment teams may need advice on when to use which section of the guidebook
Allows solutions to be identified by formulating objectives: what should the situation look like once the barrier has been removed?	It focuses mainly on technology and is not specific about the scale of technology implementation. This seems to disconnect from the <i>Handbook for Conducting Technology Needs Assessment for Climate Change</i> , ^b which suggests that technology needs assessment stakeholders first determine a desired scale of technology implementation, and identify barriers on that implementation scale. The guidebook implicitly addresses scaling up, but is not specific on that
Distinguishes market from non-market, public goods and technologies, thereby acknowledging that some technology options (such as many options for adaptation) are not easily transferred through a market and may require different value-chain analysis	
Suggests participatory processes for barrier assessment	

^a Available at <http://www.tech-action.org/-/media/Sites/TNA_project/TNA%20Guidebooks/TNA_Guidebook_OvercomingBarriersTechTransfer_10.ashx?la=da>.

^b Available at <http://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TNA_HAB_infobox_1/3a34f12bf10d4b7bae791d0d7ad572eb/c29096556b034760b94273b0124039ac.pdf>.

C. Funding: review of guidance on preparing for financing priority options for mitigation and adaptation

1. UNFCCC guidebook on preparing and presenting proposals for technology transfer projects for financing

103. The UNFCCC publication *Preparing and Presenting Proposals: A Guidebook on Preparing Technology Transfer Projects for Financing*⁴⁰ can specifically support the implementation of project ideas (deliverable IV in figure 5). It includes guidance on the

⁴⁰ As footnote 4 above.

skills and tools needed to prepare a proposal (transaction), including an introduction to preparing basic accounting and financial analyses.

104. The guidebook contains seven steps for preparing proposals in the form of the following questions:⁴¹

- (a) What is being proposed?
- (b) Where will the proposal be implemented?
- (c) Who will champion the proposal and see it to completion, and who else will be involved?
- (d) How will the proposal be implemented?
- (e) Why is the proposal important and why should it be supported?
- (f) What if things do not go as planned?
- (g) To whom is the proposal addressed?

105. Once these questions are addressed, the guidebook provides directions on and templates for preparing a base case set of financial data, as well as guidance on presenting proposals to different funding interests in both the public and the private sector, depending on the project risk-return potential and stage of development. For donors, carbon monetization resources, lenders and investors, the guidance offers customized instructions.

106. In support, the guidebook contains various documents and resources related to transaction completion, such as:

- (a) Manual and Excel input templates for proposal preparation;
- (b) A detailed proposal sample following the question approach and provided templates;
- (c) A glossary;
- (d) An annex of web and other resources, including organizations offering funding as well as programme (activity) support;
- (e) Illustrative (algebraic) calculations of financial measures;
- (f) An illustrative term sheet and a due diligence checklist to show how financiers (investors and lenders) examine proposals.

2. UNEP DTU Partnership's guidebook on accessing international funding for climate change – adaptation and mitigation

107. The *Accessing International Funding for Climate Change Mitigation*⁴² guidebook has been prepared by UDP in support of implementation of TNA results and made available during the TNA Project of 2009–2013. It includes:

- (a) An introduction to financing sources with particular emphasis on the requirements of the GEF and multilateral, bilateral and private sources, especially climate funds;
- (b) A description of the types of finance available and their requirements;

⁴¹ This question approach also appears in the UDP guidebook on accessing international financing for climate change (see footnotes 5 and 6 above).

⁴² As footnote 5 above.

- (c) Differentiation of projects and programmes;
- (d) A review of multilateral, bilateral and carbon finance resources.

108. It contains a set of eight introductory (general and informational) criteria to be met for successfully attracting financial support for priority technology options. These criteria are in the following categories:

- (a) Programme design, including programme objectives and target markets;
- (b) Implementation plan and partners;
- (c) Technical assistance and capacity-building needs;
- (d) Budget and use of funds;
- (e) Expected results, evaluation plan and impact metrics;
- (f) Direct results and indirect effects (including market transformation effects);
- (g) Pathway to sustainability and replication;
- (h) Programme implementation risks and risk mitigation.

109. In order to support TNA teams in preparing proposals based on priority technologies, a specific chapter has been dedicated to proposal preparation, which is supported by a detailed appendix.

110. Similar to the above-mentioned UNFCCC guidebook on preparing and presenting proposals for finance, the guidebook embraces the ‘who, what, why’ question approach in providing guidance. Also consistent with the UNFCCC guidebook are the risk assessment criteria presented, although the UDP guidebook referred to in paragraph 107 above, places greater emphasis on non-revenue aspects given the emphasis on public financing resources.

111. The TNA-related guidebook by UDP titled *Accessing International Funding for Climate Change Adaptation*⁴³ includes an overview of adaptation financing options with a good level of detail on financial flows. It follows a similar structure to the guidance on accessing funding for mitigation options, but puts, where needed, specific emphasis on adaptation-related aspects.

112. For instance, the guidebook contains seven eligibility information criteria for accessing international funding for adaptation options, which are elaborated on with the help of the ‘who, what, why’ question approach, as follows:

- (a) Adaptation rationale and additional cost argument: what is the ‘business as usual’ development for the targeted sector? What are the projected climate change impacts? What are the specific adaptation activities to be implemented to reduce the climate change vulnerability compared with the ‘business as usual’ situation?
- (b) Urgency and prioritization: how and why was this particular project idea identified among the many alternatives that could have been addressed with the same funding?
- (c) Weighting of project activities: how much funding will be allocated to investment activities, capacity-building activities and project management activities?
- (d) Sustainability of intervention: how will the project ensure that the benefits achieved through its investments are sustained beyond the lifetime of the project?

⁴³ As footnote 6 above.

(e) Cost-effectiveness: a qualitative discussion of how the principle of cost-effectiveness has been applied in the selection of the specific project activities among the alternative options to achieve the same objective(s);

(f) Institutional set-up and comparative advantage of implementing institution: who will implement the project and what are its advantages and capacity compared with other potential implementing institutions? How will the project be coordinated with (and/or mainstreamed into) related development activities of the targeted sector?

(g) Results-based management and logical framework: presenting the project in a way that is consistent with the principles of results-based management, which implies a strong focus on directly linking all project activities to clear measurable adaptation outputs, outcomes and impacts.

113. Based on these criteria, the guidebook contains a template and an example for funding request proposals for adaptation options.

114. Finally, the guidebook contains a high-level overview of critical concepts and requirements for accessing private financing for adaptation and a number of case studies, with numerous cross-references to the Climate Technology Initiative – Private Financing Advisory Network.⁴⁴

115. An overview of the strengths and weaknesses of the funding acquisition guidebooks is shown in table 3.

Table 3

Strengths and weaknesses of guidebooks on funding acquisition

<i>Strengths</i>	<i>Weaknesses</i>
Comprehensive documents with detailed background information, explaining how funding requirements and supply depend on the nature of a project or action, and on whether a technology is in development or (nearly) ready for commercial application	In general, the guidebooks contain much reading material and thus risk trying to do too much under one set of ‘roofs’, which makes the content dense and less user-friendly
The UDP guidebooks contain a detailed overview of possible funding sources, including the types of activities they aim at, which could possibly form the starting point for an electronic database as foreseen in Climate Technology Centre and Network TNA/TAP implementation support programme (see chapter VI)	The UDP guidebooks on accessing international funding for climate change mitigation and adaptation, as well as the 2006 UNFCCC finance guidebook, while instructive on basic concepts, inventory of funding sources, flows of resources, and reconciliation of private and public sector differences and interests, run the risk of quickly becoming outdated
The UDP guidebooks make an explicit distinction between funding requirements for options for mitigation and those for adaptation, thereby acknowledging that funding requirements for the two types of options can differ considerably	The finance guidebooks focus more on ‘why this is important’ or reflecting ‘cut and paste’ sections from the main body of the report rather than showing ‘here’s what you need to know to get a quick start’

⁴⁴ For further information, see *CTI-PFAN Background Paper on Adaptation*. Available at <http://www.cti-pfan.net/sites/default/files/CTIPFAN_AdaptationPaper.pdf>.

<i>Strengths</i>	<i>Weaknesses</i>
The guidebooks contain an excellent elaboration on general criteria for successfully attracting funding and on information requirements for doing that	At times the documents are too focused on one or another funding priority (e.g. the Global Environment Facility) rather than on general guidance for funding acquisition
The guidebooks elaborate on the distinction between projects, programmes and activities (although not always consistently)	

Abbreviations: TAP = technology action plan, TNA = technology needs assessment, UDP = UNEP DTU Partnership (formerly known as the UNEP Risoe Centre and operating under a tripartite agreement between Denmark's Ministry of Foreign Affairs, The Technical University of Denmark (DTU), and the United Nations Environment Programme (UNEP)).

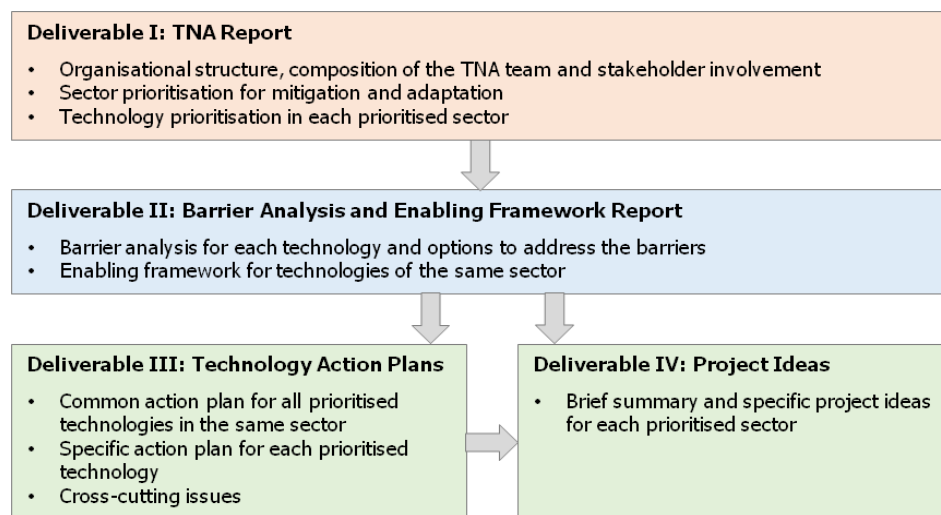
D. Reporting templates for technology adaptation plan and project ideas

116. In order to support reporting on TAPs and project ideas, reporting templates have been made available by UDP for the TNA project.⁴⁵ These templates suggest the structure for the following four reports (see figure 5):

- (a) Content of the TNA and TAP report for mitigation or adaptation (report I);
- (b) Report on barrier analysis and enabling framework (report II);
- (c) TAP report (report III);
- (d) Project idea report (report IV).

Figure 5

Overview of four technology needs assessment reports^a



^a Available at <http://orbit.dtu.dk/ws/files/52417708/ReportingTemplates_Zhu.pdf>.

117. The reports are structured in such a way that they can be read independently from the TNA report (which could be over 200 pages long). According to the templates, the TAP

⁴⁵ Available at <http://orbit.dtu.dk/ws/files/52417708/ReportingTemplates_Zhu.pdf>.

reports need to be short as they are meant to be disseminated to policymakers and other decision makers. The templates also explain that as the GEF and other donors are interested in the project ideas from the TNA project, project ideas are prepared in separate reports.

118. For each report, the templates contain annotated outlines, explaining the type of information to be included in each section, suggesting the length of the text and referring to possible background documents (e.g. TNA handbook and UDP guidebooks). Basically, the report structures for TNAs, TAPs and project ideas are similar for mitigation and adaptation, but if there are any differences, these are specified. The reports are recommended to have a relatively short main text, with further details in annexes.⁴⁶

119. The templates are more detailed than the suggested reporting structure in the TNA handbook (chapter 7, “Synthesize technology needs assessment process in a report”). A particular difference is that the templates recommend that each report contain separate chapters for each prioritized sector. As a result, readers can easily turn to their sector of interest and in each report find priority technologies, barriers, enabling actions and project ideas for that sector.

120. Table 4 summarizes the strengths and weaknesses of the templates for TNA project reporting.

Table 4

Strengths and weaknesses of templates for technology action plan and project ideas used during technology needs assessment phase I

<i>Strengths</i>	<i>Weaknesses</i>
The templates provide practical reporting guidance in the form of an annotated outline, with suggested content, references and text length	The link with the <i>Handbook for Conducting Technology Needs Assessment for Climate Change^a</i> structure, especially chapter 6, can be strengthened, so that the suggested templates become an integrated part of the handbook and each step in chapter 6 of the handbook coincides with a chapter or section in the reporting template
The reports, in particular technology action plan and project idea reports, can be read as stand-alone documents by different audience groups (funders, policymakers and decision makers)	In the current situation, users need to go back and forth between the TNA handbook and the reporting templates
The reports contain individual chapters for each prioritized sector, so that sector experts can easily find sector information in the report	

Note: This guidance is currently being revised by the UNEP DTU Partnership for use during TNA phase II.

Abbreviation: TNA = technology needs assessment.

^a Available at <http://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TNA_HAB_infobox_1/3a34f12bf10d4b7bae791d0d7ad572eb/c29096556b034760b94273b0124039ac.pdf>.

⁴⁶ Examples of annexes are: technology factsheets (report 1); market maps and policy factsheets (report 2); and list of stakeholders engaged in the TNA (all reports).

E. Summary

121. From the review in this chapter of existing TNA guidance for TAPs and project ideas for the implementation of prioritized technologies for mitigation and adaptation it has been concluded that available TNA guidance documents:

- (a) Provide substantial instruction and are in several ways better than other available guidance documents reviewed;
- (b) Do not lend themselves to the ready conversion of technology priorities into project ideas and action-oriented transactions for the implementation of technology strategies (programmes, projects and supporting activities);
- (c) Need to reflect the engagement of finance and project professionals earlier and more deeply;
- (d) Should be streamlined to form a coherent whole with user-friendly main steps, with clearly introduced ‘fill in the blanks’ templates for TAP and project idea formulation and presentation, and with clear references to underlying training or supporting material.

VII. Way forward

A. Technology action plans as technology implementation plans for delivery of development and climate benefits

122. Based on the above analysis of available guidance on TAPs and project ideas, this chapter suggests ways forward to improved TAP guidance with a view to enhancing the implementation of TNA results, including TAPs and project ideas.

123. The work on TAPs and project ideas usually starts with the output of the technology prioritization process (TNA handbook, chapters 1–5): portfolios of technologies which have been prioritized for their social, environmental and economic benefits and their contribution to climate mitigation or adaptation.

124. TAPs are subsequently developed for these prioritized technologies by:

- (a) Considering the **scale** of implementation, given the costs;
- (b) Developing an **idea** of the type of transfer required to deliver the benefits, such as turnkey imported technology options, joint venture technology acquisition and local supply chain development;
- (c) Incorporating **gender** and ethnic groups’ considerations into TAPs;
- (d) Identifying **barriers** and system-level inefficiencies which prevent technology implementation on the desired scale in a country;
- (e) Identifying **actions** that need to be taken to address those barriers;
- (f) Formulating a **plan** on how each action will be implemented, including who will be responsible, when the action is planned to start and conclude, how the success of the action will be measured and which cost items are to be covered;
- (g) Monitoring whether the plan covers all **factors for success**.

125. TAPs may result in the development of national policies and programmes, the development of laws and regulations, the implementation of financial and fiscal incentives at the sectoral level, training programmes and the demonstration of a new technology.

126. Projects can also result from project idea reports, such as the realization of a micro-hydropower plant, and the transfer and deployment of drip irrigation and rainwater harvesting technologies (see table 5). However, projects alone are unlikely to set in motion the wheel of achieving development and climate goals in a country on the desired larger scale, as this often requires system improvements (including removing value chain inefficiencies) which go beyond the usual project scales.

127. Table 5 shows examples of how project ideas can differ from TAPs in terms of focus, implementation time frame and scale.

Table 5

Examples of how project ideas and technology action plans can differ in a technology needs assessment

<i>Project ideas</i>	<i>Technology action plans</i>
A project idea can be the installation of a single unit of a priority technology, for the operation of which engineers in the country receive training from colleagues from abroad	For the priority technology, the technology action plan (TAP) leads to the development of a national-level education plan (with universities and schools) to train a future generation of engineers for operating and maintaining the technology (on a larger scale)
A project based on a priority technology can receive upfront funding from an investor in, for example, the carbon credits that the project generates	A TAP focuses on improving the country's financial system so that project investments can more reliably be made
A project can be the installation of a small-scale hydropower unit in a mountainous area, and include addressing local barriers and arranging a power purchase agreement	A TAP can focus on larger-scale diffusion of small-scale hydropower units in the country regions where potential for that exists. The TAP addresses power network stability aspects and proposes required investments
A project can be a programme of, for example, implementation of 500 small-scale biogas cook stoves in a targeted region within two years	A TAP can contain a 20-year plan for rolling out more than 100,000 cook stoves across the country's rural areas, in multiple stages, including an education programme with maintenance instructions

128. Formulation of a TAP takes place in two main stages. While the first stage is about **what** to do, the second stage is a process for determining **how** the required transfer of technologies or measures for mitigation and adaptation can be effectively implemented. The following are the major areas of the process to be facilitated:

- (a) How to tailor the process to achieve the type of transfer required, for example, joint venture or local supply chain;
- (b) How to ensure that the benefits are delivered;
- (c) How to ensure that the identified actions are carried out on time and budget;

- (d) How to ensure that the range of stakeholders, taking into account gender, and ethnic groups' considerations, are involved throughout the process;
- (e) How to ensure that appropriate measuring and reporting procedures are used and learning feedback mechanisms are in place for a flexible, responsive process;
- (f) How to assemble a suitable financial package to deliver not only the technology hardware but also the benefits expected and the accelerating strategy activities to facilitate long-term successful roll-out;
- (g) How to ensure strong overall management of all the parallel activities in the whole process on time and budget.

129. In addition to **what** and **how**, the question of **when** is important in the TAP formulation process, especially for adaptation (but also for some of the technologies for mitigation). The focus of adaptation is not only on responding to immediate needs, but also on fitting it into longer-term planning. Not all technologies or measures for adaptation can be put in place at the same time.

130. It is acknowledged that since TNA time and resources are limited, detailed characterization of actions (e.g. cost estimates) may not always be feasible. It is therefore proposed to **focus on information that potential funders** (ranging from commercial finance institutes to multilateral development organizations) **will need as a minimum to consider funding an action**. More detailed information can be provided later (beyond the TNA and in collaboration with the potential funders).

131. While a clear process for formulating TAPs and project ideas is necessary, too strong a focus on processes and process steps may imply the risk that the main goal is to complete each step, while the end result may be a TAP which is not ready for consideration by potential funders and investors.

132. Therefore, it is recommended that the role of stakeholders in the implementation of technologies and accelerating actions be clearly described in a TAP. This includes the identification of actors and specification of their roles; for example, intermediary agents or companies (who can address investment risks in a country), brokers (who should have a good understanding of the banking sector), technology 'champions' (who will see a TAP through to completion by, inter alia, lining up resource providers) and enablers (who actually supply resources to champions). This point also covers gender and ethnic groups' considerations in technology transfer, development, adoption and use, for more effective planning and implementation of the TAP.

133. TNA coordinators can be particularly important champions in this respect as they have detailed knowledge of how technologies have been prioritized and of any important bottlenecks for technology implementation within a country. They can advise on the roles of different ministries in considering TNA results as part of national planning processes and identify the key stakeholders for successful technology implementation. They are encouraged to take into account gender and ethnic groups' considerations, and local knowledge, and so design capacity-building and technical assistance needs for the implementation of the TAP.

134. To facilitate funding for the implementation of the actions identified in TAPs, **allocation of a part of the budget to support implementation** at the beginning of the TNA project could be an option. The TNA of China may serve as an example of this: it has a budget of USD 6.7 million, of which USD 0.8 million is allocated for implementation supporting activities. Among the stages of the project (which was approved by the GEF for

a grant of USD 5 million for a three-year programme)⁴⁷ are capacity-building and pilot project support, which together represent between 25 and 30 per cent of the total project budget.

B. Recommendations for improved guidance on technology action plans and project ideas

135. In terms of focus and presentation, it is recommended that a new guidance document be prepared, which would take the output of the TNA handbook, chapters 1–5, as starting point (i.e. priority technologies for climate and development benefits) and which would integrate the current guidance materials for TAP and project ideas:

(a) The first step in the new guidance document would focus on identifying actions for technology implementation and delivering its benefits, including actions to address barriers;

(b) The second step in the new guidance document would focus on preparing for the implementation of identified actions, including a description of: what are benefits to be achieved (why); stakeholder roles (who); time frame for technology implementation (when); cost items and estimates (how much); measuring and evaluation needs (how to measure); and possible funding and financing sources (how to fund).

136. These two steps will result in a list of actionable items with a plan for their implementation in a period of time:

(a) Action items would include **commercial and non-commercial investment**, as well as activities aimed at information dissemination, capacity-building and the improvement of the ‘ecosystem’ that enables implementation at the country level, that is, both soft and hard actions;

(b) These action items would need to be collected in a somewhat centralized manner. **From a ‘centralized point’ the actions would need to be made available to a universe of funders.** An online platform with controls would be simple enough to organize, possibly in collaboration with the knowledge platform developed by the CTCN;

(c) It is recommended that an action implementation **checklist be added** to ensure that the information needed for implementation is prepared and available.

137. An important challenge in the improved guidance, therefore, is to **establish a connection** between the higher-level ‘public purpose’ actions, and actions and project ideas identified at the micro level (‘on the ground’).

138. This is done by considering **key factors at the macro and micro level and how these can be connected**. For example, while the larger **enabling environment** for wider-scale technology implementation is an important ‘**macro factor**’, identification of **technology champions** within this environment is an important ‘**micro factor**’ (see figure 3).

139. The following suggestions are aimed at improving guidance for proposals for the implementation of TAP actions and project ideas:

(a) **Streamline the guidance to a minimum** level of ‘Here is what you, the user, needs to know in order for this guidance to be meaningful’. This implies that the user needs to be carefully described and differentiated from the broader range of readers of the

⁴⁷ Further details are available at <<http://www.worldbank.org/projects/P120932/china-technology-needs-assessment-tna?lang=en>>.

guidance. The user in this case is the in-country generalist (usually within a broader purpose organization and usually having multiple responsibilities) who must organize an action or a project idea as it evolves;

(b) **Provide this targeted user with support** along the lines of ‘If you want deeper background or information on A, B and C, here are web-based or other existing resources to keep up to date’. Trying to put all the easily out-of-date information on sources of funding and support under one roof is not recommended. Instead, a readily accessible website is recommended solely for TAP project idea formulation and presentation, such as the current TNA project portal;⁴⁸

(c) **Focus on the basic requirements of multi-purpose ‘good quality’ action proposals and project ideas** instead of focusing on proposals to targeted financing sources. This guidance places a premium on in-country generalists and organizations being the first audience for ideas. In other words, countries need to satisfy themselves (and their country’s priorities as identified by the TNA) first before tackling one or another resource provider’s requirements. Then, these good quality actions and ideas can be customized as needed;

(d) **Improve the terminology**, reduce the jargon and acronyms, and emphasize neutral terms (e.g. ‘equity’ and ‘sponsor’ mean many things to different people). Carefully edit guidance so that it is clear that actions and project ideas refer to all manner of programmes, projects and activities;

(e) **Downplay the distinction between public sector and private sector** ideas, specialized funds and such conventions as public–private partnerships. The elements of good-quality proposals for TAP actions and project ideas are universal and should not be skewed by a grant, loan, concessionary finance, financial engineering or commercial equity investor perspective;

(f) Emphasize that **complete and balanced mitigation and adaptation action and project proposals share certain qualities**, which need to be explained. Meeting this entry-level quality will allow proposals to be easily customized for specific audiences.

140. A specific element in TAPs and project ideas which was mentioned by most of the interviewed practitioners in the TEC background paper on good practices of TNAs is that of **costs**, and they noted that preparing **detailed cost estimates may be complex, given the limited resources for a TNA**.

141. Where cost information is lacking but technology priorities and the ‘broad strokes’ of project ideas exist, it may be practical to **provide benchmark ranges** that could be used for a first approximation and to determine the required next steps, as follows:

(a) For example, a capital cost range of USD 1,500 to USD 3,000 per kW might be suggested for hydroelectricity projects in the 10 to 30 MW range;

(b) Output estimates can be made of high, medium and low output conditions supplied with a corresponding ‘all-in’ tariff (based on levelized costs), which is needed to recover capital and operating expenses over the life of the facility;

(c) Countries would use these simple data points of benchmark ranges to present illustrative action or project ideas by describing the selected technology, its approximate size or scale, capital costs, levelized tariff and, most important, the next planning steps and resources needed to convert this illustrative action or project idea into more concrete details;

⁴⁸ <<http://tech-action.org>>.

(d) Though speculative, full capital costs for a project idea or action can be approximated in order to estimate the ‘pre-construction’ costs (feasibility analysis, siting, geotechnical aspects, design, procurement and finance planning) as a percentage of the expected capital cost;

(e) Benchmark data for low-emission energy projects and mitigation activities could be assembled from existing resources (see, for example, the Renewable Energy Policy Network for the 21st Century (REN21) report on renewable energy *Annual Report 2014*)⁴⁹ and centres of excellence;

(f) Comparable benchmark resources would be required for adaptation projects, programmes and support activities.

142. Finally, with respect to the presentation of the guidance and templates, the following recommendations are made:

(a) **Revisit general criteria for successful TAP action and project idea proposals** as the first level of instruction and guidance. (A list of criteria for consideration in proposals for TAP actions and project ideas for mitigation and adaptation will be annexed to the **new guidance document**);

(b) **Elaborate on these general criteria** with a limited number of specific ‘what, where, how’ questions (see the discussion on non-TNA guidance in chapter V above) that are targeted to the general criteria and a starting list of what constitutes a good proposal for TAP actions and project idea quality. In this elaboration it is important to keep the proposals realistic and avoid an impulse to ‘please everyone and all the institutions’;

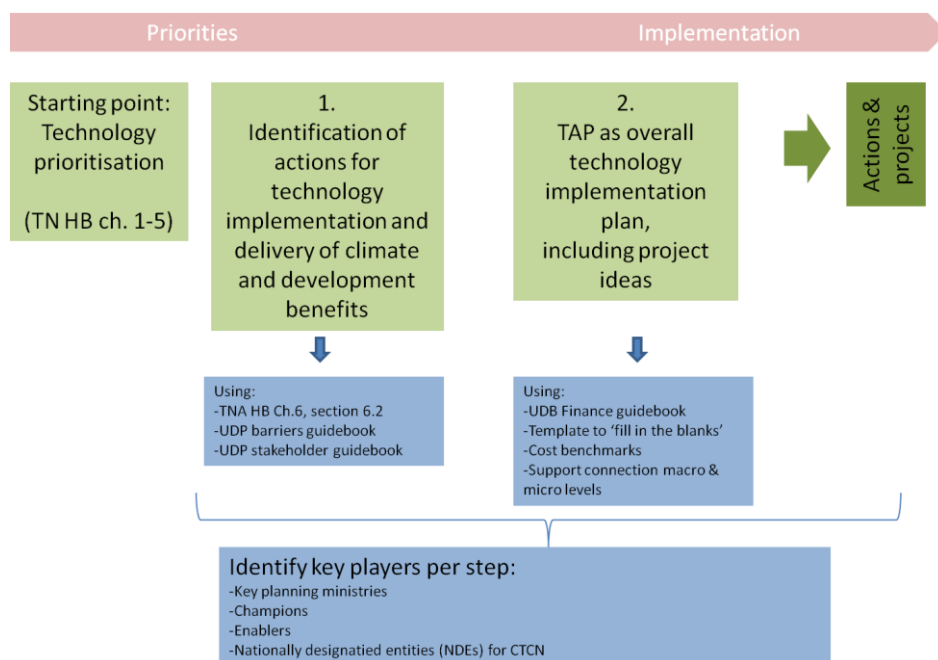
(c) **Employ ‘fill in the blanks’ answers** that allow for general narrative and quantitative answers (e.g. total cost of the action or project is USD 1.3 million) and for optional details only if **available** (e.g. technical assistance: USD 125,000; design, construction and pre-commissioning costs: USD 875,000; capacity-building: USD 50,000; contingencies, financing and legal expenses: USD 250,000);

(d) **Provide on-call or distance-learning or coaching** as action proposals and project ideas evolve. This should be user-driven, one-on-one coaching and assistance to avoid the formalities of ‘Here are my comments on your draft document’.

143. Figure 6 summarizes the recommendations listed above for revised guidance for accelerated technology implementation.

⁴⁹ Available at <<http://www.ren21.net/about-ren21/annual-reports/>>.

Figure 6
Overview of steps in revised guidance for accelerated technology implementation



Abbreviations: CTCN = Climate Technology Centre and Network, TAP = technology action plan, TN HB = The United Nations Development Programme *Handbook for Conducting Technology Needs Assessment for Climate Change*, UDP = UNEP DTU Partnership (formerly known as the UNEP Risoe Centre and operating under a tripartite agreement between Denmark's Ministry of Foreign Affairs, The Technical University of Denmark (DTU), and the United Nations Environment Programme (UNEP)).

144. The previous recommendations have been further worked out into an outline for guidance on the preparation of TAPs, as described in the annex.

C. Tracking lessons from technology needs assessment result implementation

145. In earlier reports, the secretariat reported on the outcomes of surveys that were conducted among TNA national coordinators about the implementation of the TNA results. A short overview of these surveys has been provided in chapter II above.

146. In order to enhance the learning potential from experience with implementing TNA prioritized technologies, it is recommended that the UNFCCC technology portal⁵⁰ or the TNA project portal of UDP⁵¹ be extended with information on:

- (a) The status of implementation of actions in a TAP and project ideas;
- (b) Progress made with the implementation of actions and projects, including the time frame and criteria for checking such progress;
- (c) How funding for implementation has been made available (and by whom);

⁵⁰ <http://unfccc.int/ttclear/pages/tech_portal.html>.

⁵¹ <<http://www.tech-action.org/>>.

(d) How enabling support (e.g. training, capacity-building) has been made available (and by whom);

(e) What the decisive incentives or factors for success have been.

147. Such information, which TNA countries are requested to make available, possibly through NDEs, allows for the generation of success stories and factors for successful implementation. More important, sharing information about implementation practice, preferably also from earlier TNAs (before 2009 and global TNA project phase I), can help TNA countries and practitioners to improve their action and project proposals.

148. Moreover, with regard to TNA implementation practices a mixed picture may be emerging in terms of the implementation aspects which have been, and have not been, successful. Such a mixed picture could emerge as countries differ in terms of, for example, context, institutions, available capacity to prepare TAPs and project ideas, and capacity to attract funding. TNA practitioners can learn about these aspects from the experiences of their colleagues through the technology portal so that they can enhance their success rate, and report on that. This could contribute to the identification of minimum requirements for implementing a new priority technology.

149. Growing experience with the implementation of TNA priority technologies may lead to 'larger pictures' with, for instance, region-specific implementation bottlenecks (e.g. funding limitation or lack of institutional capacity). This type of information can be instructive for international or multilateral organizations in organizing their potential support according to region-specific needs.

150. It is acknowledged that the above-mentioned suggestions for tracking lessons from TAP and project idea implementation will require additional actions, which may put pressure on available resources for TNAs.

D. Role of the Climate Technology Centre and Network in catalysing technology action plan implementation

151. At the time the TNA handbook was developed and introduced, the UNFCCC Technology Mechanism did not yet exist. Nowadays, implementation of TNA results may benefit from the existence of the CTCN as the operational arm of the Technology Mechanism, providing technical assistance to countries towards implementation of their nationally endorsed actions.

152. An important task of the CTCN, as indicated in its TNA Implementation Support Programme, is "to provide support to developing countries in conducting TNAs and enhancing implementation of TNA outputs in the form of technology projects, programmes or strategies."⁵² Possible areas indicated by the CTCN where it could help countries to move from TAPs to the implementation of technologies are: making a stronger business case of technology implementation, strengthening information on benefit to cost ratios, and making available to TNA countries the required expertise upon their request.

153. The link between the CTCN and TNAs with a view to technology implementation will be organized through the TNA/TAP implementation support programme, which is coordinated by the UNEP Technology Unit. With regard to the programme, two important considerations are as follows:

⁵² CTCN Advisory Board document AB/2015/5/17. Available at <<https://www.ctcn-n.org/calendar/events/5th-ctcn-advisory-board-meeting>>.

(a) Recommended updates of TNA guidance for enhanced implementation of priority technologies through improved formulation and implementation of TAPs and project ideas should be aligned with the key activities foreseen in the implementation support programme, so that TNA guidance and the activities of the programme remain complementary and harmonized for TNA countries and their stakeholders;

(b) As the TNA implementation support programme envisages key activities for the implementation of TAPs and project ideas from TNA phase I, II and III, this creates an opportunity to use the recommended revision of the TAP guidance for the implementation of TNA results in all three TNA phases. Specific activities foreseen in the programme, which align with the recommended guidance revision are to: provide coaching services to countries; ‘sell’ prioritized technologies to decision makers, the private sector, donors and financiers; add multi-country or regional capacity-building and training support; provide regular updates on TNA progress and findings; facilitate networking of TNA practitioners and experts; and design technology compendiums for common technologies and a database of funding opportunities.

154. The above elaboration on the links between the CTCN TNA implementation support programme and TNAs has not considered financial aspects. As explained elsewhere in this document (and in the TNA good practice paper), resources for TNAs are generally limited, which implies that after prioritization of technologies for mitigation and adaptation, relatively few resources remain for formulation of TAPs and project ideas (including assessment of barriers and enabling actions). A link with CTCN TNA implementation support programme could relieve the TNA process as it supports availability of external resources for TAP and project idea formulation. At the same time, however, this implies that additional resources may be required for the CTCN to effectively respond to TNA countries’ requests for additional support.

155. The active participation of NDEs as key players in the implementation of nationally prioritized technologies can facilitate CTCN support for the implementation of TNA results. However, in order to perform a function of tracking implementation actions endorsed by TNA countries and submit them to the CTCN, NDEs may require capacity-building support (to be able to inventory a country’s endorsed actions, technologies, capacity, knowledge, training and finance needs, and fulfil the requirements of the CTCN).

156. The above considerations show that while improvements can be made in terms of streamlining TNA guidance, additional financial and human resources are likely to be needed for the availability of support, for example, through the CTCN and the implementation support programme, for enhanced implementation of TNA results.

VIII. Key findings and recommendations by the Technology Executive Committee on technology needs assessment

157. From a **review of existing, non-TNA project and programme experience and related guidance**, for action plans and project ideas to become better ‘action-able’, it is concluded that:

(a) Guidance needs to be **streamlined** to a minimum level of ‘Here is what you, the user, needs to know in order for this guidance to be meaningful’;

(b) There should not be an attempt to **put** all the (easily out-of-date) **information** on sources of funding and support **under one roof**;

(c) The focus should be on the **basic requirements** of multi-purpose ‘good quality’ action proposals and project ideas, instead of on proposals to targeted financing sources;

(d) In the absence of detailed cost and performance data, consideration should be given to providing TNA practitioners with ranges of **benchmark data** to allow preliminary estimating and, more important, to describe the next steps envisioned to develop these preliminary estimates further;

(e) **Terminology** used in guidance should be neutral and **easy to understand**, with limited use of jargon and acronyms;

(f) The **distinction** between public sector and private sector ideas should be **downplayed**;

(g) Complete and balanced mitigation and adaptation proposals share certain **qualities**, which need to be explained.

158. Based on a review of TAPs and project ideas (chapter III.B above), prepared during the global TNA project of 2009–2013, it is concluded that **most TAPs and project ideas are incomplete with respect to information about timelines of actions, costs and identified funding options**. This lack of information makes the implementation of priority technologies for mitigation and adaptation difficult as potential funders have difficulties with, for instance, assessments of costs against benefits and type of costs for which funding is needed.

159. From the review of existing TNA guidance for TAPs and project ideas⁵³ for the implementation of prioritized technologies for mitigation and adaptation it is concluded that available TNA guidance documents:

(a) Provide substantial instruction and are better than other available guidance documents reviewed;

(b) Do not lend themselves to the ready conversion of technology priorities into project ideas and action-oriented implementation of technology strategies (policies, programmes, projects and supporting activities);

(c) Need to reflect the engagement of finance and project professionals earlier and more deeply;

(d) Should be streamlined, made more user-friendly and supplemented with clearly introduced ‘fill in the blanks’ templates for project idea formulation and presentation.

160. Based on the review conducted of non-TNA guidance documents, existing TNA guidance and TAPs and project ideas from the global TNA project, the following **recommendations** for improved guidance are made:

(a) Specify the **role of key stakeholders**, which includes the identification of actors and specification of their roles (stakeholder mapping) as ‘champions’ or ‘enablers’ in implementing enabling actions for mitigation and adaptation and examining what can be funded by whom;

(b) Develop a **slim guidance document** to identify actions for the implementation of priority technologies on a scale for delivering desired social, environmental and economic benefits and to formulate a TAP to manage these actions;

⁵³ TNA handbook, especially chapter 6; UNEP handbooks on financing mitigation and adaptation projects (see footnotes 5 and 6 above); UNFCCC guidebook on preparing and presenting proposals for financing and reporting (see footnote 4 above); templates for TNAs, TAPs and project ideas (see footnote 7 above).

(c) Enhance guidance on **how to attract funding for actions in a TAP** by informing TNA teams on: minimum requirements for determining costs of actions in a TAP (so that potential funding providers can ascertain the cost items related to TAP actions, when cost estimates are to be made, and what are the estimated amounts); comparison of costs with benefits (with the help of benefit to cost ratio techniques); and identification of potential funders for actions in a TAP;

(d) Elaborate on the potential **role and capacity needs of NDEs** as a contact or focal point in a country, and of the CTCN for supporting the implementation of priority technologies in the countries concerned.

161. It is recommended that the **improved guidance** be also made **available** for supporting the implementation of results of the TNAs that were conducted before 2009 and during the global **TNA project phase I** (2009–2013).

162. In order to enhance the learning potential from experience with implementing TNA prioritized technologies, it is recommended that the **UNFCCC technology portal** or the **TNA project portal of UDP**⁵⁴ is extended with information on:

- (a) **The status of implementation** of actions in a TAP and project ideas;
- (b) **Progress made with the implementation** of actions and projects, including the time frame and criteria for checking such progress;
- (c) **How funding for implementation has been made available** (and by whom);
- (d) **How enabling support** (e.g. training, capacity-building) **has been made available** (and by whom);
- (e) What the decisive incentives or **factors for success** have been.

⁵⁴ <<http://www.tech-action.org>>.

Annex

Outline for guidance on the preparation of technology action plans: implementation of priority technologies on the desired scale for the delivery of benefits for climate change mitigation, climate change adaptation and national sustainable development

A. Background

1. This guidance outlines the essential information to be included in a technology action plan (TAP). Building on a technology needs assessment (TNA), a TAP is a concise plan for the development, transfer, deployment and diffusion of priority technologies within a country on a scale that is desired for contributing to the country's social, environmental and economic development and to climate change mitigation and adaptation.
2. The scope of a TAP is therefore broader than that of a single project as it is aimed at larger-scale development and transfer of a technology.
3. The focus of a TAP can be on actions for the implementation of:
 - (a) A single technology with larger-scale potential within a country or sector;
 - (b) Multiple technologies for which common actions have been identified.
4. The actions identified in a TAP are based on the assessment of barriers to the development, transfer, deployment or diffusion of a technology and analysis of how these barriers can be addressed. The process of identifying barriers and measures is highly participatory with the active involvement of relevant stakeholders at all stages.
5. In a TAP, these actions are further specified with a view to their (sequence of) implementation, by elaborating on:
 - (a) Primary benefits and beneficiaries;
 - (b) Relationship of actions in a TAP to the delivery of benefits for development and climate;
 - (c) Who will be responsible for these actions;
 - (d) What are the financial requirements for the actions;
 - (e) Possible funding sources;
 - (f) How the success of the actions will be measured.
6. The TAP formulation is based on a number of steps which are further specified in this outline. It is acknowledged that, given the steps specified below, the eventual content of a TAP is likely to depend on the context of the country conducting the TNA. For instance, a country with strong capacity and data needs may focus in its TAP largely on actions to support capacity-building and data collection for enhanced technology implementation. It is furthermore noted that in developing the guidance for the preparation of a TAP, gender considerations will be taken into account. With these reflections in mind, this outline describes the following main stages for TAP formulation:
 - (a) Determine the **ambition** for the TAP – the target date for and scale of technology development, and the deployment and diffusion date for delivery and implementation of a technology's climate and development benefits. For example, by 2030,

30 per cent of heat consumption in the country will be produced by the prioritized technology;

(b) Categorize the **measures and actions** (taken from the ‘barrier assessment’ stage in the TNA process) under the categories of the barriers which they address, for example, capacity-building, financial support and institution building;

(c) Take a **final decision** on measures and actions to be included in the TAP and characterize them in terms of responsibilities, timeline, investment and operational costs, risks and monitoring requirements.

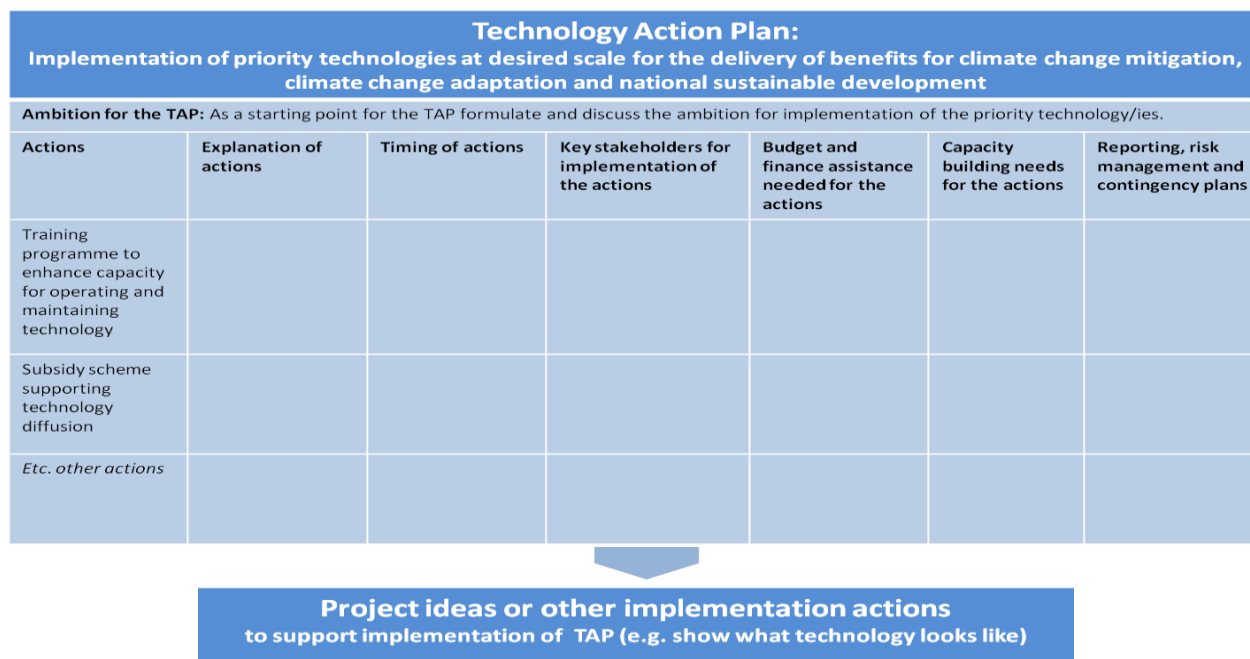
7. A TAP can contain actions of different natures. For example, as also described in figure 7, a TAP could recommend the development of higher education programmes for training engineers to operate a technology on a larger scale within the country (to address the barrier of lack of skills for operating the technology). Another action in the TAP could be an incentive scheme for making the priority technology more competitive (to address the barrier of lack of incentives to apply the technology). A third action could be an infrastructure investment to support the technology (to address the barrier of lack of appropriate infrastructure).

8. Some of the actions in a TAP could turn into project ideas, such as a project to demonstrate a technology within the country context or a training programme to enhance capacity for operating and maintaining a technology.¹ Project ideas could be based on a single technology, but could also be a programme covering multiple technologies. Guidance on the formulation of project ideas will be made available in addition to the guidance on TAPs and is therefore not covered by this outline.

¹ Not all actions may be suitable for being turned into project ideas. For instance, actions or measures focused on policies, incentive schemes or regulations could require different forms of implementation, which should be explained in the TAP.

Figure 7

Illustration of how a technology action plan can contain several actions, with supporting information to help to turn each one into an implementable action or project idea



Abbreviation: TAP = technology action plan.

9. The sections below provide an annotated outline for guidance on the preparation of a TAP. Considerations for the guidance are:

- (a) The guidance takes as inputs earlier TNA steps: identification of priority technologies, barriers, and measures to address barriers (see figure 8);
- (b) The guidance supports the formulation of the TAP and recommended actions, such as: a training programme to enhance skills for operating the technology; an incentive scheme; or modification of the technology for operation in country climate;
- (c) The guidance helps to prepare a funding or an investment proposal for each action or a set of actions within the overall TAP.

Figure 8

Overview of steps from identifying priority technologies towards a technology action plan

Steps: From TNA to TAP



Abbreviation: TNA = technology needs assessment.

B. Introduction

10. In this section, the guidance elaborates on TAP development as a next step in the TNA process to prioritize technologies and prepare for their implementation on the desired scale within the country. The section also briefly describes the relevant sector or context for the TAP (the TAP is a stand-alone report, which could be read in isolation from other reports).

11. The following topics are suggested for formulating a TAP:

- (a) Introduction to TNAs and other efforts before a TAP;
- (b) Overview of a TAP;
- (c) Roles within the country's TNA team for TAP preparation, including stakeholders;
- (d) Next steps after a TAP.

12. In order to introduce the relevant country, sector or area context for the TAP, the following information should be considered:

- (a) Role of the sector in the country, including how important it is for the country's development goals;
- (b) Greenhouse gas emission level and trend in the sector (if a mitigation sector) or vulnerability of the sector (if an adaptation sector);
- (c) Brief introduction to the prioritized technology(ies) covered by the TAP, including the current level of research and development and the level of deployment and diffusion in general and in the country, and how the technologies are expected, based on earlier TNA stages, to contribute to achieving the development priorities and goals of the sector and the country as a whole.

C. Ambition for the technology action plan: why?

13. During the prioritization of a technology or set of technologies, earlier in the TNA, assumptions have been made about the desired scale of implementation of the technology or technologies in the country for the delivery of development and climate benefits.

14. Guidance will be provided on describing the scope and rationale for the TAP. As a starting point, the TAP should formulate and discuss the ambition for this technology implementation, based on the benefits identified in the TNA for the priority technology or technologies.² This can be based on existing country development plans (e.g. specific goals and targets from national or sectoral development plans, as well as other processes under the Convention such as the development of intended nationally determined contributions) and stakeholder discussion on how the specific technology could contribute to reaching sector goals, as well as achieving social, environmental, economic and climate benefits. In this respect, gender considerations will be recognized in technology transfer, development, adoption and use for more effective planning and implementation of the TAP. For instance, making this distinction enables consideration of different vulnerabilities of different social groups to climate change.

15. Scale and timing should be described. For example, it is recommended that new and improved drip irrigation systems replace at least one third of irrigation systems, to improve water use efficiency in agriculture and optimize crop production, by 2025. Based on current data for the country, this corresponds to systems of installed capacity.

16. Finally, the ambition should include the type of technology transfer suitable for the priority technology or technologies covered by the TAP, such as turnkey imported technologies, joint venture technology acquisition or local supply chain development.

17. This section will provide guidance on the organization of the work on the TAP:

- (a) How the TNA team can set the stage for work on the TAP;
- (b) How TNA consultants can support setting the objective for the TAP, based on the actions identified in the report “Barrier analysis and enabling framework” (TNA deliverable II) as measures to address barriers;
- (c) Who should be involved in setting the overall objective, facilitating the political process within the TNA country, etc.

D. Identification of actions in the technology action plan: what?

18. This section describes how to identify TAP actions and their sequence of implementation, which is based on the participatory analysis of barriers to implementation of priority technologies and identification of the measures identified to address these (in the TNA deliverable “Barrier analysis and enabling framework”).

19. Although all measures identified for addressing barriers are important, the final choice of one set of measures [to overcome barriers for transfer and diffusion of a technology] over another is a country driven issue. The proposed set of measures will therefore have to be discussed, negotiated and agreed upon by relevant stakeholders at the country level so as to be consistent with domestic objectives, and finally to be discussed at

² For this section, the TAP could revisit earlier TNA stages: how the technology was prioritized among the many alternatives that could have been addressed, what the key characteristics are of the technology and its benefits for climate change mitigation or adaptation as well as other benefits, and who will be the primary beneficiaries (customers, users) of the TAP.

the highest level in the ministries involved before selecting the final set of measures to be presented in the technology action plan (TAP).

20. The guidance will explain how to organize such a participatory process³ and suggest tools to facilitate decision-making, based on identified measures to be included in TAPs.

21. Selected actions are then introduced by elaborating on how they are expected to address the barriers identified as obstacles to larger-scale development and transfer of the technology or set of technologies. For example, it would be explained how higher education institutes in the country would develop a skills training programme focused on operationalizing the priority technology(ies).

E. Timing of actions in the technology action plan: when?

22. This section of the guidance describes:

- (a) The implementation and operational steps for the actions in the TAP;
- (b) A timeline that includes all actions and their sequence, including the length of time needed for each action.

23. The identification of roles of key stakeholders in the implementation plan will be done in this section.

F. Identification of key stakeholders for implementation of the technology action plan: who?

24. In this section, key stakeholders will be identified for:

- (a) Planning and implementation of the overall TAP (such as a coordinating role);
- (b) Implementation of each action in the TAP (including actions to be developed as project ideas).

25. This section will describe the division of tasks among stakeholders in the light of the timing of actions in section 5 above, including those stakeholders who will see to the completion of the actions. If possible, the management and expected hands-on implementation team will be described in this section.

26. The selection and participation of stakeholders are essential at all stages of the TAP process. Key stakeholders must be involved at the TAP formulation and implementation stages, taking into account gender and ethnic groups' considerations. In some cases they will be the same people, while in other cases stakeholders with different skills and interests (e.g. programme or project implementation or provision of resources such as capital or knowledge) will be required and will have greater responsibilities at different stages.

G. Budget and finance assistance needed to implement the technology action plan: how much?

27. In the TNA phase of barrier analysis and enabling framework, countries will have made a cost estimate of each measure to address barriers (part of the report "Barrier

³ See *Identification and Engagement of Stakeholders in the TNA Process: A Guide for National TNA Teams*. Available at <<http://www.tech-action.org/Publications/TNA-Guidebooks>>.

analysis and enabling framework”, TNA deliverable II). In this section, these cost figures are collected and presented systematically so that a total cost figure for the TAP can be derived to determine funding needs (see table 6 below for an example).

28. For each action, this section will provide an indication of how these costs could be financed:⁴

- (a) Funding opportunities for actions which will be further developed as project ideas;
- (b) Funding opportunities for actions which will not be developed as project ideas, such as governmental incentive schemes, should be identified as part of the TAP, for example, a subsidy scheme established by the national government to help a technology to diffuse in the market towards commercial feasibility or a research and development supporting programme for modifying a technology so that it can function within the country’s (climatic) circumstances;
- (c) Where appropriate, the ease or difficulty of obtaining the required funding should be noted.

Table 6

Example of reporting on costs for actions in technology action plans

<i>Action in technology action plan</i>	<i>Preparation costs for action</i>	<i>Investment costs and requirements for action</i>	<i>Operational costs for action</i>	<i>Total costs of action</i>
Training programme to enhance capacity for operating and maintaining technology				
Subsidy scheme supporting technology diffusion				
Action X, etc.				
Total costs for technology action plan				

H. Capacity-building and technical assistance needs

29. In this section, specific technical assistance and capacity-building needs will be identified for each action. This identification will take into account gender considerations, and local knowledge of these needs and options for improvement. Specific attention could be paid to capacity support and technical assistance that could be requested from the Climate Technology Centre and Network.

⁴ Countries can make use of the UNEP DTU Partnership guidebooks on accessing international financing for climate change (see footnotes 5 and 6 to this document above), which have been developed for the global TNA project.

I. Reporting on technology action plan results, risk management and contingency plans: what if?

30. This section of the guidance supports the evaluation of impacts from the implementation of the TAP, supported by monitoring and reporting, including identification of potential risks and uncertainties related to TAP implementation. The guidance will support the development of a risk management and management reporting plan. The following items will be covered in this section of the TAP guidance:

- (a) Measurement of the economic, social and environmental impacts of TAP implementation, including impacts on technology development, deployment and diffusion;
- (b) Comparison of actual against intended outputs and impacts;
- (c) Addressing time schedule disruptions;
- (d) Dealing with cost overruns;
- (e) Addressing problems with the delivery of the planned results of the actions in a TAP;
- (f) Coping with political, social or disaster events which affect TAP actions.

31. An overview of an outline for the technology action plan report is shown in table 7. This outline assumes a TAP containing actions identified for wider-scale implementation of one technology. In case a TAP is based on a group of the same types of technology for which largely similar actions apply (e.g. a set of renewables-based technologies), then each section addresses the actions as in the outline below, with, where needed, specific reference to one or more of the technologies covered by the TAP.

Table 7

Overview: outline for the technology action plan report

<i>Outline for the technology action plan report</i>		<i>Refer to earlier TNA stages</i>
1	Introduction, including a short description of the sector or other context for the TAP	
2	Ambition for the TAP	
2.1	Desired scale for technology implementation	
2.2	Type of technology transfer suitable for technology	
2.3	Describe geographical and sectoral context for technology and actions	
2.4	Organize TAP preparation process: stakeholders, support and consultation	
3	Actions included in the TAP	
3.1	Selection of actions (from measures identified to address barriers), including tools for facilitating participatory decision-making	
3.2	Explanation action 1	
3.3	Explanation action 2	
3.n	Explanation action n	

Outline for the technology action plan report
*Refer to
earlier TNA
stages*

- 4 Timing of actions in the TAP
 - 4.1 Implementation plan for action 1 included in the TAP
 - 4.2 Implementation plan for action 2 included in the TAP
 - 4.n Implementation plan for action n included in the TAP
 - 4.n+1 Cross-cutting aspects
- 5 Identify key stakeholders for implementation of the TAP
 - 5.1 Key stakeholders for action 1 included in the TAP
 - 5.2 Key stakeholders for action 2 included in the TAP
 - 5.n Key stakeholders for action included in the TAP
 - 5.n+1 Cross-cutting aspects
- 6 Budget and finance assistance needed to implement the TAP
 - 6.1 Costs and funding needs for TAP action 1
 - 6.2 Costs and funding needs for TAP action 2
 - 6.n Costs and funding needs for TAP action n
 - 6.n+1 Cost overview for the TAP
- 7 Capacity-building and technical assistance needs for
implementation of the TAP
 - 7.1 Capacity-building needs for TAP action 1
 - 7.2 Capacity-building needs for TAP action 2
 - 7.n Capacity-building needs for TAP action n
 - 7.n+1 Cross-cutting overview of capacity-building needs for the TAP
- 8 Reporting, risk management and contingency plan for the TAP
 - 8.1 Reporting, risk management and contingency plan for TAP
action 1
 - 8.2 Reporting, risk management and contingency plan for TAP
action 2
 - 8.n Reporting, risk management and contingency plan for TAP
action n
 - 8.n+1 Cross-cutting risk management and contingency aspects for the
TAP

(Executive) Summary

Abbreviations: TNA = technology needs assessment, TAP = technology action plan.
