

UNFCCC workshop on technology needs assessments

Background Paper I

Good practices and lessons learned from conducting and reporting technology needs assessments

I. Objective of the paper

1. The overall objective of this paper is to compile and synthesise good practices with conducting technology needs assessments (TNAs) in order to ensure that lessons learned from completed TNAs can be widely shared with Parties that are in the process of conducting or updating TNAs.

II. Scope and approach of the paper

2. This background paper provides an overview of the history and the current status of the TNA process and the good practices and lessons learned from conducting TNAs by 68 non-Annex I Parties. It primarily addresses the questions of how through the work of these countries the TNA process has developed in terms of organisation, methodologies, practices and strategies. Based on the experiences, lessons learned and challenges that have emerged from the TNAs conducted thus far, it is assessed what can be considered good practices and lessons learned with conducting TNAs.

3. For this assessment, this background paper first describes the basic steps in the TNA process, in terms of organisation, data management and methodology applied, which is followed by the identification of good practices and lessons learned for each step of the TNA process. This assessment is provided for both thematic areas - climate change mitigation and adaptation.

4. This background paper compiles and synthesizes good practices in conducting TNAs on the basis of:

- a. Case studies from 68 completed TNAs,
- b. Report on the workshop on best practices in conducting technology needs assessments (FCCC/SBSTA/2007/11),
- c. The secretariat's background paper on good practice for TNAs prepared for the UNFCCC workshop on sharing good practices with conducting TNAs,
- d. Technical paper on best practices in technology needs assessment (FCCC/TP/2007/3),
- e. Synthesis report on technology needs identified by Parties not included in Annex I to the Convention (FCCC/SBSTA/2006/INF.1),
- f. Second synthesis report on technology needs identified by Parties not included in Annex I to the Convention (FCCC/SBSTA/2009/INF.1),
- g. The United Nations Environment Programme (UNEP) report on assistance to fourteen countries within the framework of the global environment facility (GEF) expedited financing for (interim) measures for capacity building in priority areas, and
- h. The United Nations Development Programme (UNDP) report on experiences and lessons learned from TNAs.
- i. The updated Handbook for Conducting Technology Needs Assessments for Climate Change.

5. At the workshop on best practices in policies and measures among Parties included in Annex I to the Convention held in Copenhagen, Denmark, in April 2000, participants agreed that the concept of ‘good practice’ appears to be more relevant in the international context than the concept of ‘best practice’, which could be, to a large extent, country specific. This is because it was considered unlikely that best practices for policies and measures that are effective in one country are as effective in another. Consequently, as the concept of good practice seems to be more appropriate when analysing processes that are highly dependent on national circumstances and country needs such as TNAs, this terminology will be used in this paper.

6. Good practices, as defined for the TNA process discussed in this paper, are therefore the most efficient (*i.e.* require the least amount of effort) and effective (*i.e.* achieve the best results) ways of conducting a TNA and reporting and implementing its results, based on repeatable procedures that have proved themselves over time for large numbers of users. A key element worth mentioning here is the concept of establishing clear objectives upfront in the process, *e.g.*, establishing a common, agreed vision on the final TNA product.

III. History and current status of the TNA process

A. Background of the TNAs

7. Article 4, paragraph 5, of the Convention states that developed countries “shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies (ESTs) and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention”. In this context, technology transfer is designed to assist developing countries in response to climate change through the diffusion and use of appropriate climate change mitigation technologies and technologies for adaptation to climate change.

8. The Conference of Parties (COP), by its decision 4/CP.4, urged non-Annex I Parties to submit their prioritised technology needs, especially those relating to key technologies to address climate change. The decision 2/CP.4 directed the GEF to provide funding to developing countries to assist the development of a TNA.

Box 1 – Provisions of the technology transfer framework on technology needs and needs assessments

The technology transfer framework defines 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 country Parties not included in Annex II, 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 framework, “the purpose of technology needs assessments is to assist in identifying and analysing priority technology needs, which can form the basis for a portfolio of 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”.

9. As part of the technology transfer process, the technology transfer framework was developed and adopted by the COP at its seventh session. Technology needs and needs assessments is one of the five thematic areas of this framework (see Box 1).

10. Since COP 7, developing country Parties have been assessing their technology needs in the areas of climate change mitigation and adaptation through an analysis that takes account of their development plans and strategies.

11. Through its interim financing for capacity-building in priority areas – enabling activities phase II (also known as “top-ups”) – the GEF has provided funding for 92 non-Annex I Parties to

conduct TNAs. Out of these, 78 TNAs have been supported by UNDP, and 14 by UNEP. Some 68 TNA reports have been submitted to the secretariat and are available on the UNFCCC website.

12. To assist Parties in undertaking TNAs, UNDP, in collaboration with the Climate Technology Initiative (CTI), the Expert Group on Technology Transfer (EGTT) and the secretariat, developed a simplified, user-friendly handbook entitled *Conducting Technology Needs Assessments for Climate Change*. This was designed to provide guidance on identification of needs for technologies for mitigation of, and adaptation to climate change. This handbook was made available to Parties in 2004.

13. CTI in collaboration with UNDP, UNEP and the secretariat organized three regional workshops to field-test and improve the TNA handbook. The workshops provided an opportunity for country experts to discuss regional concerns and priorities when assessing technology needs, and to further assist Parties in conducting TNAs. CTI also provided technical support to Bolivia, Ghana, Malawi and South Africa to carry out TNAs.

14. A workshop on best TNA practices held in Bangkok on 27-29 June 2007, enabled non-Annex I Parties in the process of conducting or updating TNAs to share lessons learned from conducting these assessments.¹ The aim of the workshop was to assist non-Annex I Parties to identify specific needs and practical actions that could assist Parties to complete TNAs and implement the results.

15. As requested by the Subsidiary Body for Scientific and Technological Advice (SBSTA) at its twenty-first session, the secretariat prepared a synthesis report on technology needs identified by non-Annex I Parties based on the TNAs available and on the technology needs identified by non-Annex I Parties in their National Communications (NCs).²

16. The GEF requested both UNDP and UNEP to share past experience of all TNAs supported through funding from the GEF Trust Fund, including a full account of all resources committed, allocated, and distributed. In addition, a description of all the results achieved, and a summary of all the lessons learned through the initial round of TNAs was requested.

17. In response to this request, the UNDP prepared a report to GEF on experiences and lessons learned from TNAs carried out by countries that received GEF funding for the expedited financing of climate change activities, Part II. The report covers the 35 TNAs completed to date. The report highlights good practices and problems faced by country-teams while preparing their inputs. The report also provides a comprehensive financial analysis of the funds disbursed.³

18. Following the same mandate, UNEP prepared a concise report on the processes from the 12 countries that submitted their TNAs. Included in the report was a synthesis of the gaps identified within the development and reporting of the TNAs.⁴

19. The COP, by its decision 3/CP.13, annex I, paragraph 8 (a), 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 transfer clearing house (TT:CLEAR). In addition, in annex I, paragraph 8 (b), of the same decision, the COP encouraged

¹ UNFCCC, 2007, *Report on the workshop on best practices in conducting technology needs Assessments*, Note by the secretariat, FCCC/SBSTA/2007/11, 21 September 2007 <<http://unfccc.int/resource/docs/2007/sbsta/eng/11.pdf>>

² UNFCCC, 2006, *Synthesis report on technology needs identified by Parties not included in Annex I to the Convention*, Note by the secretariat, FCCC/SBSTA/2006/INF.1, 21 April 2006 <<http://unfccc.int/resource/docs/2006/sbsta/eng/inf01.pdf>>

³ UNDP, 2010, *Experiences and lessons learned from technology needs assessments (TNAs)*, Report to the Global Environment Facility (GEF), 31 May 2008 <<http://unfccc.int/ttclear/pdf/TNA/UNDP/UNDP-TNA-Report.doc>>

⁴ UNEP, 2008, *Experiences and lessons learned from technology needs assessments (TNAs)* <<http://unfccc.int/ttclear/pdf/TNA/UNEP/UNEP-TNAREports.pdf>>

non-Annex I Parties to provide updated information on their technology needs in their second NCs and other national reports and to make them available to the secretariat.

20. Furthermore, the COP, by its decision 3/CP.13, annex I, paragraph 8 (c), requested the secretariat to prepare a synthesis report(s) of the information mentioned in paragraphs 8 (a) and 8 (b) above, for consideration by the SBSTA. In response to this request, the secretariat prepared the second synthesis report on the information on technology needs identified by Parties not included in Annex I to the Convention (non-Annex I Parties) in their TNAs, second NCs and other national reports for consideration by the SBSTA at its thirtieth session, in June 2009.⁵

B. Current status of the TNAs

21. Based on decision 4/CP.13, the GEF elaborated a strategic programme to scale up the level of investment for technology transfer to help developing countries to address their needs for environmentally sound technologies. Under this programme a funding window was proposed to support TNAs envisioning a global programme open to those countries that have prepared their TNAs but need to update them, as well as to those that have not yet received GEF funding to prepare a TNA.

22. The GEF-financed TNA project under the Poznan Strategic Programme on Technology Transfer will provide targeted financial and technical support to assist developing countries in carrying out improved TNAs within the framework of Article 4.5 of the UNFCCC and will support 35 to 45 developing countries in preparing (or updating) their TNAs and Technology Action Plans. Total GEF funding for this TNA project is US\$9 million. Implementation of the TNA project was launched by UNEP, as a GEF Agency to implement the project, in November 2009.

23. To help Parties conducting TNAs, UNDP, with collaboration of the secretariat, EGTT, and CTI, developed the updated Handbook for Conducting TNAs for Climate Change.⁶ It provides specific guidance on identifying technology needs for mitigation of and adaptation to climate change, including two innovative supporting tools:

- (a) The software tool TNAssess to support analyses, store data collected, and sector and technology prioritization processes, and
- (b) The ClimateTechWiki on-line database which provides basic information on ESTs with specific project examples.⁷

The updated TNA handbook was made available to Parties as an advanced document in June 2009 and the latest version was published in November 2010.

24. The updated TNA Handbook was earlier reviewed by a pool of experts from Non-Annex 1 Parties together with UNEP, UNDP, as well as representative of the World Bank. This forum enabled exchange of feedback obtained from Parties, who are at various stages of the TNA process, and suggestions made which were then fed into the updated TNA Handbook.

25. The UNEP TNA project under the Poznan Strategic Programme (see above) started in 2010 and included fifteen countries selected in the first round including Senegal, Kenya, Mali, Morocco and Cote d'Ivoire from Africa, Cambodia, Indonesia, Viet Nam, Bangladesh and Thailand from Asia, Costa Rica, Guatemala and Peru from Latin America and Georgia from the Commonwealth of Independent States (CIS).

26. Based on shortcomings identified in the first round of TNA, technical support activities were identified and realised. The updated TNA handbook is available to the countries as the base

⁵ UNFCCC, 2009, *Second synthesis report on technology needs identified by Parties not included in Annex I to the Convention*, Note by the secretariat, FCCC/SBSTA/2009/INF.1

<<http://unfccc.int/resource/docs/2009/sbsta/eng/inf01.pdf>>

⁶ <<http://unfccc.int/ttclear/pdf/TNA%20HANDBOOK%20EN%2020101115.pdf>>

⁷ <<http://climatetechwiki.org>>

methodology document. The support to countries has been provided based on the identified country requirements and gaps in the TNA handbook.

27. As the final output of the TNA project the countries will develop Technology Action Plans. Regional centres were established to support countries on demand including through help-desk facility. These include: ENDA in Dakar, Senegal, for assistance within both mitigation and adaptation; Fundación Bariloche from Buenos Aires, Argentina, for assistance for mitigation; Libélula, Lima, Peru, for adaptation; and AIT, Bangkok, Thailand, for support for Asian and CIS countries for both mitigation and adaptation. The regional centres will be available also for the second round of countries with ambition to be capable to support countries with similar activities also in future.

28. A summary of the main activities carried out under technology needs and needs assessments is provided in Box 2.

Box 2. Summary of the main activities carried out under the technology needs assessment theme of the technology transfer framework of the Climate Change Convention

April 2002: A meeting was held by the secretariat in consultation with the EGTT with representatives from governments, experts drawn from the UNFCCC roster of experts and representatives from relevant international organizations, to identify methodologies for conducting TNAs.

May 2002: A workshop was convened jointly by UNDP and the secretariat in Seoul, Republic of Korea, for country experts and multilateral organizations to discuss methodologies and issues related to the TNA process. A survey was conducted by UNDP with the countries undertaking TNAs.

September 2002–October 2003: The CTI, in collaboration with UNDP, organized three regional workshops to field-test and further develop the TNA handbook. The CTI also provided support to Bolivia, Ghana, Malawi and the Southern Africa region to carry out TNAs.

July 2004: Drawing on the results of the survey mentioned above, UNDP made available to Parties the TNA Handbook, produced in collaboration with the CTI, the EGTT and the secretariat.

October 2005: A workshop was held by the secretariat in Bonn, Germany, in consultation with the EGTT and the CTI, on innovative options for financing the results of TNAs.

May–December 2005: UNDP and UNEP presented results of their analysis of completed TNAs (13 TNAs analysed by UNDP, five TNAs analyzed by UNEP) at several meetings.

April 2006: A synthesis report was prepared on TNAs completed by non-Annex I Parties (synthesis report) (document FCCC/SBSTA/2006/INF.1), presenting information on technology needs for mitigation and adaptation to climate change contained in 23 TNAs and 25 initial NCs. It highlights priority technology needs identified in various sectors to reduce GHG emissions and facilitate adaptation to the adverse impacts of climate change.

May 2006: An analysis of the synthesis report and of progress achieved within the technology transfer framework led to the identification by the EGTT of a set of actions for enhancing the implementation process.

May 2008: UNDP reported to GEF on their past experience of TNA supported by the UNDP and analyzed the outcomes and the lessons of the TNA work in the report “Experiences and lessons learned from Technology Needs Assessments”

May 2008: UNEP prepared a report to GEF on their assistance to fourteen countries within the framework of the GEF expedited financing for (interim) measures for capacity building in priority areas.

November 2008: Poznan strategic programme was elaborated by the GEF to scale up the level of investment for technology transfer to help developing countries to address their needs for environmentally sound technologies. Under the programme a funding window of USD US\$9 million was proposed to support TNAs.

May 2009: The second synthesis report was prepared on TNAs completed by non-Annex I Parties (document FCCC/SBSTA/2009/INF.1), presenting information on technology needs for mitigation and adaptation to climate change contained in 69 TNAs and 39 national communications submitted to date. It highlights priority technology needs identified in various sectors to reduce greenhouse gas emissions and facilitate adaptation to the adverse impacts of climate change and also includes a regional analysis of the sectors covered and technologies addressed.

September 2008 - October 2010: Organization of the training of trainers and three regional workshops on preparing technology transfer projects for financing

February 2010: Technical Workshop on TNAs, organized by UNEP.

November 2010: Updated Handbook for Conducting Technology Needs Assessment for Climate Change was endorsed by EGTT and made available by UNDP and UNFCCC.

IV. Good practices and lessons learned from the TNA process

A. Examination of methodologies for the TNA process

29. The methodological approach for TNA consists of the set of activities and steps for conducting such assessment. Possible factors for selecting a methodology to conduct a TNA are:

- (a) The purpose of the assessment, *e.g.*, to develop technology projects, programmes or national strategy (input) on EST innovation, or whether to focus more on mitigation or adaptation,
- (b) The composition of the management team and involvement of stakeholders,
- (c) The management tools available,
- (d) Its ability to accommodate specific conditions, *e.g.*, large differences between regions within a country or a dominant sector in terms of GHG emissions, and
- (e) The availability of data, extend to which TNA work is aligned with work on NCs and information to be used prior to and within the assessment.

30. Some of the TNA reports followed a methodology and an assessment process very similar to that outlined in the initial TNA handbook, although they were conducted before its completion and publication in July 2004. Most of the methodologies used by Parties to conduct TNAs were previously used in other processes. However, further elaboration would be recommended for the technologies for adaptation steps to cater for uncertainties in climate change scenarios and sea level rise.

31. The updated TNA handbook contains a structured, step-wise process to carry out a TNA and supports countries in formulating an overall work plan. It takes countries' long term development objectives as a starting point from which development priorities are derived. These are then used as criteria for identifying strategic sectors or prioritized ESTs within those sectors. The process is concluded by the formulation of a national strategy for innovation of ESTs for mitigation and adaptation. The updated TNA handbook has been largely based on input provided by Parties on how to improve the quality of TNAs and how to link the TNA outcomes to countries' overall climate and sustainable development policy making.

32. The following main structure of steps in the TNA process is a compilation presented and described within the TNA handbooks:

- (a) Organization of process,
- (b) Determination of development priorities and derive criteria from those,
- (c) Prioritisation of strategic sectors and technologies within these sectors,
- (d) Acceleration of prioritised technologies through projects, programmes and strategies, and
- (e) Identification of next steps.



Figure 1. Key steps of the TNA process (source: updated TNA Handbook)

33. The steps presented above are the result of input and ideas provided by Parties in their 68 TNA reports and have been included in the updated TNA Handbook (see Figure 1). One of the objectives of the updated handbook was to organise the steps in a logical way with a clear stepwise structure but with sufficient flexibility for country teams to address specific country circumstances. The handbook provides detailed background information on each step, enhancing the TNA process and inspiring Parties with a new methodology when conducting their new or updated TNA reports. The updated handbook offers a close link with overall policy making in the country, with a view to both the short and medium to long term.

34. The TNA good practices encourage the most efficient and effective ways of conducting a TNA and reporting and implementing the results - with special attention given to the potential for replication.

35. To identify good practices a set of evaluation criteria were used by some Parties for each step of the TNA process. These include:

- (a) Adequacy and relevancy of the selected approaches and methodologies,
- (b) Links to national development plans or other development strategies and goals,
- (c) Level of stakeholders involvement,
- (d) Level and completeness of barrier analysis,
- (e) Level of comprehensiveness of reporting of the results,
- (f) Follow-up potential for implementation of the results,
- (g) Level of proposed projects and their costs, and

- (h) Number of projects implemented from the TNA process and their replication potential.

B. Identification of good practices in conducting TNAs.

36. TNAs follow a country-driven approach that brings together stakeholders to identify and prioritise mitigation and adaptation technologies needed for achieving development objectives. In the TNA process national strategies and action plans are conducted to accelerate the development and transfer of the prioritised technologies. Several good practices and lessons learned from the TNA process were reported by Parties in their assessments. In the following text they are organised according to the steps of the TNA process.

(a) Organisation of process

1. Decide on a structure of a national team

37. Setting up a national team is a key aspect of the TNA management process and is equally important for countries undertaking the TNA process for the first time as it is for those countries updating or improving their TNA. The TNA process should be planned and designed in a way that ensures optimal and efficient use of available human and financial resources.

38. Conducting a TNA involves a set of managerial tasks such as deciding on a structure of a national team and selection and organisation of stakeholders. One of the good practices presented, is the importance of nominating a knowledgeable project champion for the TNA project with strong coordinating skills. The TNA team should be made up of several experts who were previously involved in similar activities such as the NCs. Not only does this enable efficient use of NC data for the TNA, but it also enhances consistency between both processes.

39. Another good practice presented in some of the TNA reports was to identify various institutions that are repositories of data and information. Collaborative arrangements between the lead institution (in majority of cases the Ministry or any other relevant body of national government) and information institutions are most important. An inception workshop was used by Parties in many cases and proved to be a useful and effective tool for fostering a good start of the TNA process.

2. Organize stakeholder involvement

40. Adequate institutional arrangements for technology transfer involve relevant stakeholders and are well integrated into the national climate change structures. The TNA process is an evolving process and should be viewed as a component of the total activities addressing climate change carried out by countries and not as a separate work stream. This should be reflected on when deciding on and selecting stakeholders (see Box 3 for an overview of potential stakeholders to engage in a TNA).

41. Stakeholders were in many cases involved early in the consultative process when conducting a TNA. To cover all the steps of the TNA process, the key stakeholders, in most TNAs to-date, included policymakers, technocrats, NGOs, academic and sectoral experts, the private sector and civil society representatives.

42. In some cases, stakeholders also contributed to securing political endorsement of the TNA process, provision of incentives, information gaining and sharing, and ownership of the process including appraisal of performance.

43. Several Parties reported that the stakeholders were involved in every activity relating to the assessment, and only some Parties involved different stakeholders for each of the sectors addressed.

Box 3. Potential stakeholders to engage in a TNA

- Governmental departments with responsibility for policy formulation and regulation (*e.g.* power supply) and vulnerable sectors (*e.g.* agriculture);
- Private and public sector industries, associations, and distributors that are involved in the provision of GHG-emitting services or are vulnerable to climate change impacts
- Electric utilities and regulators;
- Within the private sector, technology users and/or suppliers who could play a key local role in developing/adapting technologies in the country;
- Organizations involved in the manufacture, import and sale of technologies for mitigation and adaptation;
- The finance community, which will likely provide the majority of capital required for technology project development and implementation;
- Households, communities, small businesses and farmers that are or will be using the technologies and who would experience the effects of climate change;
- NGOs involved with the promotion of environmental and social objectives
- Institutions that provide technical support to both governments and industry (*e.g.*, universities, industry R&D, think tanks, and consultants);
- Labour unions, consumer groups, and media;
- Country divisions of international companies responsible for investments important to climate policy (*e.g.*, agriculture and forestry); and
- International organizations/donors.

Source: Updated TNA Handbook

44. In most cases, stakeholders were involved from the beginning of the assessment process, either through a national special purpose meeting or workshop, or through existing cooperative links with national and regional governments and governmental agencies, or through a questionnaire survey or targeted interviews. However, not in all of the TNA reports Parties described their arrangements for conducting the TNA, such as holding scoping workshops, preparing the terms of reference for the teams undertaking the TNA or drawing up lists of the stakeholders involved.

45. Some good practices would be to set up a mechanism to ensure adequate and effective stakeholder involvement and consultation from the very beginning of the process. One way would be to identify two groups of stakeholders: a core group to deal with substantial issues and a wider group to deal with validation of findings and other TNA deliverables through workshops, consultations and brainstorming sessions, questionnaire surveys, *etc.* The groups would need to convene regular meetings to identify a large group of stakeholders, and design a communications and outreach framework for a wider involvement of stakeholders.

3. Development of a work plan

46. The TNA process commonly includes the development of a detailed work plan with clear objectives, outputs and activities, and deliverables that can be validated and verified by the selected stakeholders at a later stage.

47. To develop a work plan it may be considered a good practice to involve the team engaged under the similar processes (such as NCs), as the TNA should consider and partly also build on the previous similar work done.

48. An example of a work plan is shown in Annex I. In this example, a timetable has been prepared (in this case, for the duration of 15 months) showing when the step of the TNA process should be conducted and what specific activities should be performed in each step (with references to corresponding TNA Handbook chapters). Furthermore, this work plan example defines the roles of stakeholders and TNA team. Additional information that could be added to such a work plan is an estimation of data and financial resources for each activity.

(b) Determine development priorities and derive criteria from those

1. Decide and cluster country development priorities

49. A natural starting point for a TNA is to understand and identify for a country which development needs are already formulated in national development strategies, as reflected in documents such as 5-year National Plans, sector policies, countries' NCs to the UNFCCC, and country profiles prepared in co-operation with UNDP and the World Bank. Based on these official publications a list of development priorities can be generated which are considered most applicable to the country's sustainable development, both with a view to the short and longer term.

50. The main objective in this respect is that the process keeps a clear eye on the long term development perspective in the country in light of a changing climate, and social and economic changes. These may include increased industrialisation and increased urbanisation, as these trends will have an impact on the eventual technology choices.

51. The development priorities thus identified can be used in the TNA process as criteria for identifying strategic sectors and assessing the contribution of technologies to long term sustainable development and reduction of GHG emissions and vulnerability. To facilitate these steps development priorities, where possible, should be grouped. Examples of such groupings might include economic, environmental and social priorities. These groups of priorities could later be clustered in a way that users can identify a group to which a particular priority belongs. When prioritising and clustering particular attention should be given to the updated TNA Handbook. The above-mentioned tool TNAssess helps TNA teams to collect the criteria identified under clusters, so that they will be automatically generated as possible criteria for next steps.

2. Set criteria for prioritization and selection of sectors and technologies

52. A review of the 68 TNA reports shows that some countries decided to focus on all sectors for GHG mitigation technologies rather than select key areas. Countries which are highly vulnerable to climate change sometimes decided to focus on the thematic area of mitigation, when adaptation should have been defined as a priority for achieving the Millennium Development Goals (MDGs).

53. Although many of criteria were country specific, most of the criteria related to development priorities, the size of production and GHG emissions of sectors, the acceptability and affordability of technologies, and the environmental, social and economic diffusion potentials of technologies.

54. Some of the TNAs lacked explicit explanations that defined the criteria which the Party focused on when selecting a particular target area or sector. In some cases, the TNA reports stated restricted financial resources and/or available capacities as the main reasons for limiting the focus of the report.

55. Good practices when selecting sectors include conducting a preliminary assessment and an overview to prioritise sectors, building on national circumstances and development needs and previous, relevant climate change studies.

56. Parties often began the TNA process by conducting an overview of the sectors, including associated national institutional arrangements. This was followed by a selection of key sectors, identification of criteria for assessment of technologies, and selection and prioritisation of key technologies.

57. The technology prioritisation and selection process involves the thematic areas and sectors identified as having the most potential for mitigation and/or adaptation, the technology options and resources available and policies in place to support their adoption. Technology options identified in key sectors were often prioritised according to the following general criteria:

- (a) Contribution to achieving development goals (job creation, the cost of living, improvement of health care, improving access to education, and alleviating poverty),

- (b) Contribution to GHG mitigation and/or climate change adaptation, and
- (c) Market potential (access to finance, availability of state of art technologies, potential for replicability).

(c) Prioritise strategic sectors and technologies within these sectors

58. Prioritisation of technologies was, in many cases, based on the above mentioned criteria. In other cases, technologies were simply listed by each sector, missing any explanation on the reasons for their selection.

59. During the selection and prioritisation process, weights and importance factors were in some cases assigned to these criteria as well as country-specific sub-criteria. It is considered good practice that this process involves stakeholder participation at all stages. The process can be supported by contributions from expert assessments and judgments, government and policymaker assessments.

60. The analysis of the TNA reports found that a variety of methods and tools have been used by countries in the technology prioritisation process. Each of these methods and tools has strengths and weaknesses and, therefore, the selection of the best tool is country specific. The TNA reports suggest that in the majority of cases, the tools are used to help in the decision-making process rather than drive it.

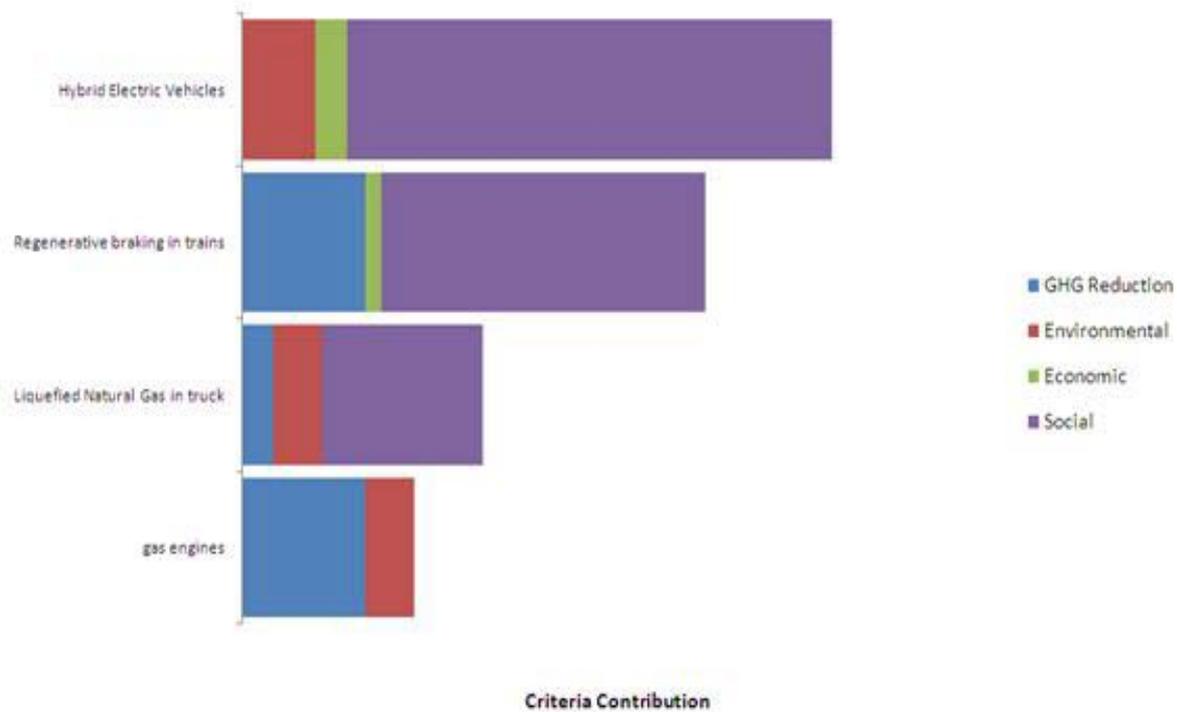


Figure 2. Example of TNA development and climate benefit assessment for technologies (source: TNAssess)

This graph shows how different technologies within a (sub)sector (in this example, transport) are expected to contribute to the country’s environmental, economic, and social sustainable development as well as to GHG emission reduction. The graph also shows the distribution of these benefits. The conclusion could be that the technology with the highest overall score (i.e., longest bar) is preferred, but stakeholders could also prefer a technology with a more equal distribution of benefits.

61. The initial TNA handbook recommends a simple review of a range of options to prioritise sectors where more detailed work will be undertaken. This may include the current circumstances of key sectors, GHG emissions, potential to reduce emissions and/or enhance adaptive capacity, as well as a brief review of climate-friendly technology options (technologies for mitigation and adaptation) and resources available.

62. The methods and tools commonly applied by countries include, but are not limited to, the multi-criteria analysis, analytical hierarchy process, cost–benefit and risk–benefit analyses, categorisation of priority technologies in terms of “low”, “medium” and “high” priority, questionnaire surveys, interviews and workshops with stakeholders.

63. Although the decision on the selection and application of the technology prioritisation methodology remains with the country, the updated TNA handbook explains a method based on multi-criteria decision analysis (see Figure 2 for an example) as this offers the flexibility in terms of details to be covered and has a strong sensitivity analysis component. The latter enables country groups to change scores and weights in multiple rounds so the eventual decision on technologies can be considered robust. Such robustness is considered an important element of good practice when prioritising technologies.

64. Once the priority sectors and technologies have been identified, technology options can be selected to address short- and long-term needs for development, mitigation and adaptation. This process involves a further screening of candidate technologies based on the results of barrier analysis.

(d) Accelerate prioritised technologies through projects, programmes and strategies

1. Identify barriers and measures to address barriers

65. The majority of TNA reports identify barriers to technology transfer and measures to address them. Some parties identified barriers in a general matter rather than identifying sector or technology specific barriers. The main cross-cutting barriers identified referred to lack human capacity and clear financing pathways.

66. Barriers to technology transfer reported by Parties in their TNAs included economic and market barriers, which were the most frequently identified barrier including limited access to finance and lack of financial resources. They were followed by lack of capacity building, lack of institutional capacity, limited access to information, unsystematic regulation of energy prices, insufficient policy on technology development, lack of expertise with and confidence in some of the new technologies, insufficient support of research and development, missing transport infrastructure, and also poor quality of soil.

67. The measures identified by Parties to address these barriers were, inter alia: national involvement to attract foreign investments, increased participation of the private sector in technology transfer, removal of subsidies and price distortions, improvement of collaborative research and development of ESTs, and increased public awareness.

68. Some of the TNA reports underlined the role of governments in helping to remove barriers to the transfer of ESTs through the formulation of effective policies, regulations, standards, codes and other measures. Although, in some cases, strategies for the implementation of the results of the TNAs were presented, there was very little information provided on governmental actions taken so far. Some Parties described the government’s role in facilitating partnerships and creating favourable conditions for the participation of stakeholders.

69. At the TNA workshop in Bangkok in 2007, some solutions to overcome barriers were suggested including policy, advocacy, stakeholder engagement, cost–benefit analysis, improved legal frameworks, and risk assessment. Capacity-building needs for absorbing the technologies transferred and adapting them to local conditions should be, according to some Parties, identified by technology and by sector, at the systemic, institutional and human capacity levels.

70. Good practices in barrier analysis include identification of barriers during each stage of the TNA process with a focus on the priority sectors and technologies, identification of barriers by considering the experience of other countries and validation and adoption of those barriers by consultation with stakeholders and experts, taking into account that some barriers are generic, some technology-specific and others country-specific. It is also important to consider that technologies can be in different stages of development (R&D, deployment and diffusion).

71. In the updated TNA handbook it is considered good practice to first map a 'market' for technologies or describes the system for development and transfer of a prioritized technology. This provides a picture of the market or system to see where barriers exist and how these block technology development and transfer. Subsequently, measures can be identified to overcome barriers and solve system inefficiencies. These could then be group under common elements as input for a national strategy for technology innovation.

2. Identify capacity-building needs

72. Insufficient capacity proved to be a serious barrier to the TNA process and hence need to be addressed at the appropriate time to ensure successful technology transfer. It would be advisable for Parties to clearly identify capacity-building needs for the different steps of the TNA process and also come with proposals measures for addressing them.

73. In most of the TNA reports, the need for capacity-building was identified and expressed in rather general terms. Capacity-building needs vary among Parties but are principally related to human resources.

74. Good practices include identification of capacity building needs for each stage of the TNA to ensure a smooth and successful assessment. One of the measures can be to share feedback comments on the draft versions TNA reports. This can be done on personal basis through exchange visits with other national teams, ideally within the same geographical region, or through electronic exchange of information and reports (the low cost measure).

75. Challenges faced by project developers in developing countries when moving from project ideas identified in TNAs towards financing of these projects, include the need for capacity-building when preparing and presenting project proposals.

76. In the updated TNA handbook, the measures identified for acceleration of development and transfer of prioritised ESTs are incorporated in a national strategy for technology innovation, which is accompanied by an action plan for strategy implementation. This action plan should specify for each measure (or group of measures) the time frame for taking it, the resources required, who will be responsible for implementation, and required monitoring and verification to guarantee success of the measures.

3. Development of projects and programmes including prioritised technologies

77. Activities of the TNA process can provide input for the development of an overall technology strategy which can be either sector or technology-specific or common across sectors and technologies at the system or national level.

78. The main output of a TNA is a series of platforms of prioritised technologies in key sectors, as well as technology strategies and action plans to overcome barriers and improve the system as a whole in the country concerned.

79. Stand alone projects demonstrating technologies, sector programmes for short term prioritised technologies in the country, national and local policies and strategies supporting prioritised technologies were in several cases also identified within the analysis.

80. Preliminary analysis undertaken by the secretariat has found that in the 68 TNA reports, Parties have identified 264 project proposals with potential financing needs totalling over US\$11 billion.

81. The project proposals developed and included in the TNA reports vary in quality and content. Not all of them include the same level of information. The majority consist of project concepts or ideas rather than full proposals and missing important elements of successful proposals such as concrete information on location, required input and deliverables, finance flows, financiers and the preferred or expected timing of implementation.

82. There has been no template available to countries for defining the set of issues to be considered as a project concept or idea. Therefore, countries have often designed for themselves the layout of a project concept template for inclusion in the TNA report. The UNFCCC guidebook on preparing project proposals may be a starting point for preparing detailed project proposals that meet the standards of international funding institutions.

(e) Identify next steps

83. Around 70% of the Parties that conducted TNAs also identified next steps in relation to disseminating information and raising awareness, implementation policies, programmes and regulations, and technology implementation plans. In some reports, it was difficult to distinguish between barrier removal and next steps.

84. The next steps varied among Parties. Some countries reported next steps for the respective technologies in the form of implementation plans or programmes for technology transfer, or improving of access to information on technologies, information on existing financial resources, capacity building schemes and communicating the TNA findings to appropriate communities.

85. Good practices in identifying next steps include development and implementation of a plan to communicate findings of the TNA, ensure adequate human, financial and technical resources for the implementation of project proposals, special attention dedicated to the financial and economic aspects of projects such as financial analysis, and risk structuring.

C. Lessons learned from conducting TNAs

(a) Organisation of process

1. Decide on a structure of a national team

86. National capacity to conduct TNA played a significant role in the process of conducting TNAs. This includes not only the technical skills needed to carry out the assessments but also the capacity required to prioritise technologies and bring the relevant stakeholders into the TNA process more effectively. Strengthening national capacity should therefore be one of the key priorities for future work on technology transfer activities.

2. Organize stakeholder involvement

87. Stakeholder involvement is very important in all stages of the TNA process, especially within the selection and prioritization of sectors and technologies. To ensure adequate and effective stakeholder involvement a mechanism of systematic consultations from the very beginning of the process may be considered. One way would be to identify two groups of stakeholders: a core group to deal with substantial issues and a wider group to deal with validation of findings and other TNA deliverables through workshops, consultations and brainstorming sessions, questionnaire surveys, *etc.* The groups would need to convene regular meetings to identify a large group of stakeholders, and design a communications and outreach framework for a wider involvement of stakeholders.

3. Development of a work plan

88. The work-plan and timeline may be ideally developed by the project coordinator, possibly in conjunction with the sector-specific team leaders, possibly GHG mitigation and adaptation team leader and validated by the stakeholders within in the process. Once drafted, the workplan can be discussed with stakeholders at a national workshop to start the TNA process.

(b) Determine development priorities and derive criteria from those

1. Decide on and cluster country development priorities

89. The country development priorities were in some cases reported to be easier inserted into the national policies when formulated with reference to long term economic, environmental and social trends in the countries, such as an increased industrialisation, increased urbanisation, increased waste production, or land use change as these trends had an impact on the technology choices.

2. Set criteria for prioritization and selection of sectors and technologies

90. Many Parties indicated that to select key sectors and sub-sectors for consideration in the assessment they used relevant information from their NCs, and only a few of them also incorporated information from their national adaptation programmes of action (NAPAs).

91. The criteria-related information used from the NCs and NAPAs was considered by Parties to be useful. In particular information relating to national GHG inventories, mitigation, adaptation, financial and technological needs, and research and systematic observation were helpful in determining criteria. In some cases, national circumstances and findings from the NCs have been highlighted as the main driving element for Parties to focus more on either mitigation or adaptation.

(c) Prioritise strategic sectors and technologies within these sectors

92. Prioritisation of technologies may be considered to be based on criteria relevant to the national strategic plans. In some cases, Parties used numerous criteria to prioritise and select sectors and technologies. However, contribution to achieving development goals, contribution to climate change mitigation and adaptation, and market potential related criteria prevailed.

93. The selection of priority sectors was in some TNAs based on the sectoral contributions to the total national CO₂ equivalent GHG emissions by sources which indicated the levels of emissions from various sectors (energy, industrial processes, agriculture, land use change and forestry, waste, *etc*).

(d) Accelerate prioritised technologies through projects, programmes and strategies

1. Identify barriers and measures to address barriers

94. Many parties identified barriers during each stage of the TNA process with a focus on the priority sectors and technologies. Some Parties also considered the experience of other countries when identifying barriers and validated and optionally adopted similar barriers by consultation with stakeholders and experts. Barriers proved to be generic, some sector, technology and also country specific.

Some of the TNA reports underlined the role of governments in helping to remove barriers to the transfer of ESTs through the formulation of effective policies, regulations, standards, codes and other measures. Although, in some cases, strategies for the implementation of the results of the TNAs were presented, there was very little information provided on governmental actions taken so far. Some Parties described the government's role in facilitating partnerships and creating favourable conditions for the participation of stakeholders.

2. Identify capacity-building needs

95. Capacity-building needs for absorbing the technologies transferred and adapting them to local conditions should be identified by technology and by sector, at the institutional and human capacity levels.

96. The TNA process was less focused on methods of identification of capacity building needs and development of project proposals. Attention should be also given to the language gap between

project developers and potential financiers. This would avoid the drafting proposals that are incomplete, imbalanced or misdirected or that receive no response.

3. Development of projects and programmes including prioritized technologies

97. The majority of the 264 reported projects and programme ideas, policies and strategies lack information about important elements of successful proposals such as concrete information on location, required input and deliverables, finance flows, financiers and the preferred or expected timing of implementation.

(e) Identify next steps

1. From identified technology needs to technology actions

98. Many non-Annex I Party TNAs provide comprehensive information which could facilitate concrete action on mitigation and adaptation. The implementation potential may improve over time as the TNA reports are considered to be living documents due to the fact that the national markets and environments are permanently facing new challenges and hence change.

Currently, there are no clear pathways to finance all the implementable results of the TNA which would incentivise Parties to be more robust in identifying potential implementation projects and programmes.

D. Identification of stakeholders

1. Involvement of public sector stakeholders

99. Further work is needed to integrate and mainstream TNAs into governmental sectoral and national policies on sustainable development and poverty reduction. Therefore, in the context of the TNA process, one of the preliminary roles of governments should be to define and clearly inform on their national and local development plans including set objectives. Hence, the government is in the position to play a central role in co-ordinating and focusing the TNA national team's activities towards the achievement of national development and economic goals.

100. One of the good practices is that governments should be deeply involved in composition of the TNA working team possibly via a steering committee with representatives of each related sector. Members of the steering committee representatives on energy, environment, agriculture, forestry, water, and transportation should be nominated by a relevant government departments or agencies. Their main role is to be in charge of intra-governmental co-ordination, provision of advice and secure a parallel work stream from the national development plans with the aim of delivering complementary objectives. Government and policymaker assessments and judgments are also vital when selecting and prioritising technology needs.

101. In some cases, the role of Government was also to assess the adequacy of, prioritise, organise, and provide clarity and focus on various technologies defined in TNAs, assess market needs, promote partnerships, and increase public awareness.

2. Involvement of private sector stakeholders

102. In the context of the TNA process, the role of the private sector was mainly to be involved in the stakeholder team and provide advice on complementarities of needs assessment and existing supportive tools on a national level and within international markets. In some cases, a working session was organised between stakeholders and the representatives from funding organisations.

103. Private sector stakeholders in the process included local financing agencies such as banks and private companies. There is a large potential for the private sector to be engaged in capacity building on how to prepare financeable mitigation and adaptation project proposals. Financial advisory networks such as PFAN can play an important role enhancing the implementation of TNA findings.

V. Reporting and communicating the results of TNAs

104. Compiling the TNA country report is an important part of the TNA process. The main objective is to communicate detailed information on the data used for the TNA, their sources, the methodology adopted, and the findings from the various steps of the process. The report may also include information on arrangements made for undertaking the TNA, gaps in data, barriers to or constraints on conducting such as assessment, and uncertainties, if applicable.

105. TNA awareness-raising and communication activities are important and need to be seen as the beginning of an ongoing process. Reporting on these activities should be carefully considered from the initial planning phase of the TNA. It may serve as a road map of an ongoing process that must be integrated into wider strategies for furthering the process, such as technology transfer and also integration of climate change issues into national planning.

106. A good TNA country report can serve as a means to efficiently document the knowledge associated with conducting a TNA. When developed for the first time it can serve as reference material to be used for a future update of the TNA.

107. All countries that have carried out a TNA have prepared a country report, despite having little or no guidance on reporting. Reporting has been guided either by the secretariat, the GEF and its implementing agencies or by the TNA handbook or some other available guidance materials. Furthermore, according to the operational procedures for the GEF Additional Financing for Capacity-building in Priority Areas, TNA reports were in most cases considered as follow-up activities of NCs, thus not requiring the official submission of the TNA report to the secretariat. Despite this, the TNA reports have been collected and analysed by implementing agencies (*e.g.*, UNDP and UNEP) and most of them are available on the website of the NCs Support Programme (NCSP) of the GEF, UNDP and UNEP and on TT:CLEAR web site.

108. Almost all of the TNA country reports reviewed describe the assessment process by step or activity, followed by addressing cross-cutting issues. However, the level of detail, the way that information is provided and the length of the reports all vary. Nevertheless, most of the countries used graphs, charts, matrices and/or maps to display the results. Also, most of the TNA reports provide information on national circumstances, especially on the status of the economic sectors for which technologies have been assessed and their contribution to GHG emissions reduction and/or adaptation to the adverse effects of climate change evaluated. In many cases, the countries made reference to GHG mitigation scenarios and climate scenarios in support of climate change.

109. The majority of the TNA country reports lack a section on institutional arrangements for conducting the TNA and reporting thereon as well as a section on the methodological approach used for conducting the TNA and the tools used for the prioritisation of technologies.

110. Some countries provide clear descriptions of the criteria used for sector and technology selection and have even attached copies of the evaluation matrices within the report or provided these as annexes. Other countries that provide information on the criteria used do so sparingly or only mention them (and/or applied them) in one sector (*e.g.*, energy).

111. Some countries do not explicitly provide a description of the stakeholders or their involvement in the TNA process. In those reports where barrier analysis is discussed, the level and method of reporting barrier analysis varies.

112. Some countries have reported on sectoral barriers whereas others have reported on barriers pertaining to the selected technologies and/or barriers at project level. All countries that covered technology needs for both mitigation and adaptation reported them in two separate paragraphs or even chapters. Good practices in compiling TNA reports are summarised in Box 4.

Box 4. Good practices in the compilation of technology needs assessment reports

- Take note of the experiences and lessons learned from countries that have completed their TNA process and submitted their report;
- Disseminate the TNA report and/or its executive summary to interested stakeholders and Parties;
- Document and archive the data and information collected, processed and synthesized for the TNA report; and
- Share the TNA report for comments and feedback from relevant stakeholders and experts.

VI. Key findings on good practices and lessons learned from conducting and reporting TNAs.

113. Based on an analysis of submitted TNA country reports the following can be considered good practices for conducting and reporting TNAs.

114. **Organising the TNA process:** Setting up a national team is a key aspect of the TNA management process. Good practice from conducted TNAs is the nomination of a knowledgeable project champion for the TNA project with strong co-ordinating skills. Another good practice presented in some of the TNA reports was to identify various institutions that are repositories of data and information.

115. **Stakeholder involvement:** It is good practice to set up a mechanism to ensure adequate and effective stakeholder involvement and consultation from the very beginning of the process. For example, stakeholders could contribute to securing political endorsement of the TNA process, provision of incentives, information gaining and sharing, and ownership of the process including appraisal of performance.

116. **Development priorities as TNA starting point:** A natural starting point for a TNA is to understand and identify for a country which development needs are already formulated in national development strategies. From these a list of development priorities can be generated which are considered most applicable to the country's sustainable development, both with a view to the short and long term.

117. **Prioritising sectors and technologies:** The development priorities thus identified can be used in the TNA process as criteria for identifying strategic sectors and prioritising technologies. In some TNA cases, Parties used numerous criteria to prioritise and select sectors and technologies, but the contribution to achieving development and climate goals, and market potential related criteria prevailed in most TNAs. Some TNAs selected sectors based on sectoral contributions to the total national GHG emissions.

118. **Identifying and addressing technology barriers:** Many parties identified barriers during each stage of the TNA process with a focus on the priority sectors and technologies. Barriers proved to be generic, some sector, technology and also country specific. Some TNA reports underlined the role of governments in helping to remove barriers to the transfer of ESTs through the formulation of effective policies, regulations, standards, codes and other measures. However, little information was provided about governmental actions taken so far.

119. **Steps towards implementing TNA results:** Many non-Annex I Party TNAs have provided information about how to facilitate concrete action on prioritised technologies. It has also been noted that the implementation potential may improve over time as the TNA reports are being updated. However, clear pathways to finance all the implementable results of the TNA were generally lacking in the reports.

120. **Public sector stakeholders** are in the position to play a central role in co-ordinating and focusing the TNA process. It has been considered good practice that governments should be deeply

involved in composition of the TNA working team possibly via a steering committee with representatives of each related sector..

121. In TNAs, **private sector stakeholders** provide advice on complementarities of needs assessment and existing supportive tools on a national level and within international markets. Private sector stakeholders in TNAs conducted included local financing agencies such as banks and private companies. There is a large potential for the private sector to be engaged in capacity building on how to prepare financeable mitigation and adaptation project proposals.

122. **Reporting and communication:** It is considered good practice to learn from other countries' TNAs and to invite feedback from stakeholders, experts and other TNA country teams on a conducted TNA. It is also considered good practice to archive and document the information collected, processed and synthesized for the TNA, as it will help to improve the quality of future results and reports over time. This practice has drawn on experience from the NC process, especially the GHG inventory exercise.

Annex I

Example of a work plan for a technology needs assessment.

Month	Ch (§)	Activity	Who	Deliverables
1, 2	2	Scope of study Identify stakeholders	National Team and decision makers	Initial scope of the study Lists of stakeholders Coordinator appointed
2	2	Convene opening national workshop	National Team	Agreed work plan and time table for tasks
2, 3	3	Data collection Identify development priorities under climate change	National Team and stakeholders	Overview of data available Input to TNAssess Clear identification of country's development
3, 4	4	Identify priority (sub)sectors	National Team and stakeholders	Ranking of priority of (sub)sectors for mitigation and adaptation
4	5.1	List of technologies for (sub)sectors	National Team	Preparation of list of technologies
4	5.1	Familiarization process for the technologies	National Team, stakeholders	Stakeholders will have become familiar with the full range of technologies and have sufficient knowledge of technologies
5	5.1	Discussions to finalize list of technologies	National Team and stakeholders	A long list of categorized technologies has been prepared for further assessment
5-7	5.2	Discussion meetings for technology prioritization	National Team and stakeholders	Portfolios of prioritized technologies Through sensitivity analysis, uncertainties are explored and robust results obtained
8	5.3	Discussion of implications of benefit-to-cost ratios for final agreement on prioritization of technologies	National Team and stakeholders	Final decisions can be agreed for the prioritization of the technologies
10	6.1	Decision on objectives of analysis, stakeholder groups and type of transfer	National Team and stakeholders	Aspirational milestones established at (sub)sector and national level, as well as at technology level
11	6.2	Explore gap between existing and desired situation for technology transfer and identify measures to close gap	National Team and stakeholders	Characterization of the environment for each priority technology analyzed Initial lists of measures for accelerating technology innovation

12-13	6.3	Aggregation of measures across sectors to national level for a national action plan	National Team and stakeholders	Prioritized measures aggregated at sector and national level and characterized
13	6.3	Incorporate technology costs and benefits	National Team and stakeholders	National strategy with technology acceleration and action plan
13-14	6.3	Finalize national strategy	National Team and stakeholders	A strategy with concrete action plans for its successful implementation
15	7	Writing of final report	National Team	Final report prepared and endorsed