Good practice for technology needs assessments

Background paper*

UNFCCC workshop on sharing good practices with conducting technology needs assessments
Bangkok, Thailand
27-29 June 2007

* This background paper was commissioned by the secretariat of the United Nations Framework Convention on Climate Change and was prepared by Ms. Ermira Fida (Albania) and Mr. Rasack Nayamuth (Mauritius)

CONTENTS

I. INTRODUCTION

A. Mandate

1. The Subsidiary Body for Scientific and Technological Advise (SBSTA), at its twenty fifth session requested the UNFCCC secretariat, in collaboration with the EGTT to prepare a paper on good practices with conducting technology needs assessment (TNAs).[1]

2. At the same session, the SBSTA requested the secretariat to organize a workshop to share good practices with non-Annex I Parties working on TNAs in collaboration with United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), Global Environment Facility (GEF), and Climate Technology Initiative (CTI). The workshop is scheduled to take place from 27 to 29 June 2007 in Bangkok, Thailand.

3. The SBSTA, at its twenty-sixth session, requested the secretariat to make available to Parties a paper on best practices in conducting TNAs based on outcomes of the above-mentioned workshop referred, the TNA synthesis report (FCCC/SBSTA/2006/INF.1), recently completed TNAs and other relevant documents. It also requested the secretariat to make available this paper for reference at the workshop organized by the secretariat on exchange of experiences and good practices among Parties not included in Annex I to the Convention in preparing national communications and on cross-cutting issues, to be held from 20 to 22 September 2007 in Cairo, Egypt and to SBSTA for consideration at its twenty-seventh session.

4. At the same session, the SBSTA endorsed the work program of the Expert Group on Technology Transfer (EGTT) for 2007 that includes an activity to finalize this paper taking into consideration feedback from the above-mentioned workshop on sharing good practices with non-Annex I Parties working on TNAs and make the paper available to Parties conducting TNAs.[2]

B. Objective of the background paper

5. The overall objective of the paper is:

(a) To compile and synthesize good practices from the TNAs completed so far by eligible Parties to perform such an analysis.

(b) To inspire the discussions and serve as source of information for the participants at the workshop.

(c) To help Parties find ways of encouraging technology transfer and ensure that lessons learned from the Parties that are more advanced with this process can be more widely shared.

6. The paper could be used to form the basis for preparing a technical paper on this matter at a later stage.

C. Scope of the paper

7. The paper provides an overview of the TNA process, the current status of its implementation and a review of guidance on conducting such studies and reporting their results. It addresses mainly the question “How”? did the countries carry out the TNA process. More specifically, the paper provides an overview of experiences, lessons learned and challenges that have emerged from the TNA process, specifically from conducting, reporting and implementation of the TNAs. Implementation related issues are analysed having in mind the follow-up activities to implement the results of TNA studies.

[1] FCCC/SBSTA/2006/11, paragraph 80 (a) (i)).
[2] FCCC/SBSTA/2007/L.9, Annex II.

8. The paper provides an overview of the steps in conducting the TNA process[3] taking into account commonalities and differences of the process for technologies to mitigate greenhouse gas (GHG) emissions and to adapt to climate change, with a view to identify barriers to conducting these steps and opportunities to overcome them (see Figure 1).

9. Based on the analysis of the above issues, taking into account current guidance for conducting and reporting TNAs as well as discussions and feedbacks from the workshop participants, the paper provides recommendations on the ways and means for improving the conducting and reporting of technology needs. It also provides case studies from those TNAs considered as a "good practice" in a specific step, issue area or sector.

10. The paper takes into consideration the previous work of the UNFCCC secretariat on this matter, including the relevant documents prepared by the secretariat, as well as national and regional experiences in TNA. It also takes into account the relevant actions on enhancing the implementation of the recommendations of the EGTT for enhancing the implementation of the technology transfer framework that were endorsed by SBSTA at its twenty-fourth session, the annual report of the EGTT for 2006 and the template on cross-cutting issues in national communications prepared by the Consultative Group of Experts on National Communication from Parties not included in Annex I to the Convention (CGE) in collaboration with EGTT (see annex I).

11. The paper compiles and synthesizes good practices from the stand-alone TNA reports of 34 non-Annex I Parties that have been considered eligible for funding from the GEF under the Additional Financing for Capacity Building in Priority Areas, referred to hereafter as Phase II and/or top-ups. Table 1 below shows the Parties and the TNA reports covered by this paper.

D. Targeted audience

12. The background paper will be distributed as a working document to the participants in the above-mentioned workshop. It aims to provide valuable information to non-Annex I national climate change teams that are /will be undertaking TNA studies either as a stand alone process or as part of their second national communication. The paper may be also useful for all stakeholders involved in the TNA process as well as to international organizations and/or donor countries that are interested in the process of technology transfer. Finally, as requested by SBSTA at its twenty sixth session, the paper will be used as a reference document for the above-mentioned workshop on exchange of experiences and good practices among non- Annex I Parties in preparing national communications and on cross-cutting issues.

[3] Selection of target area; initial review of sectors and options; setting of criteria; selection of key sectors; prioritization of technologies; identification of barriers; identification of measures to address barriers; identification of capacity-building needs; description of the role of stakeholder participation; identification of next steps; and development of project proposals.

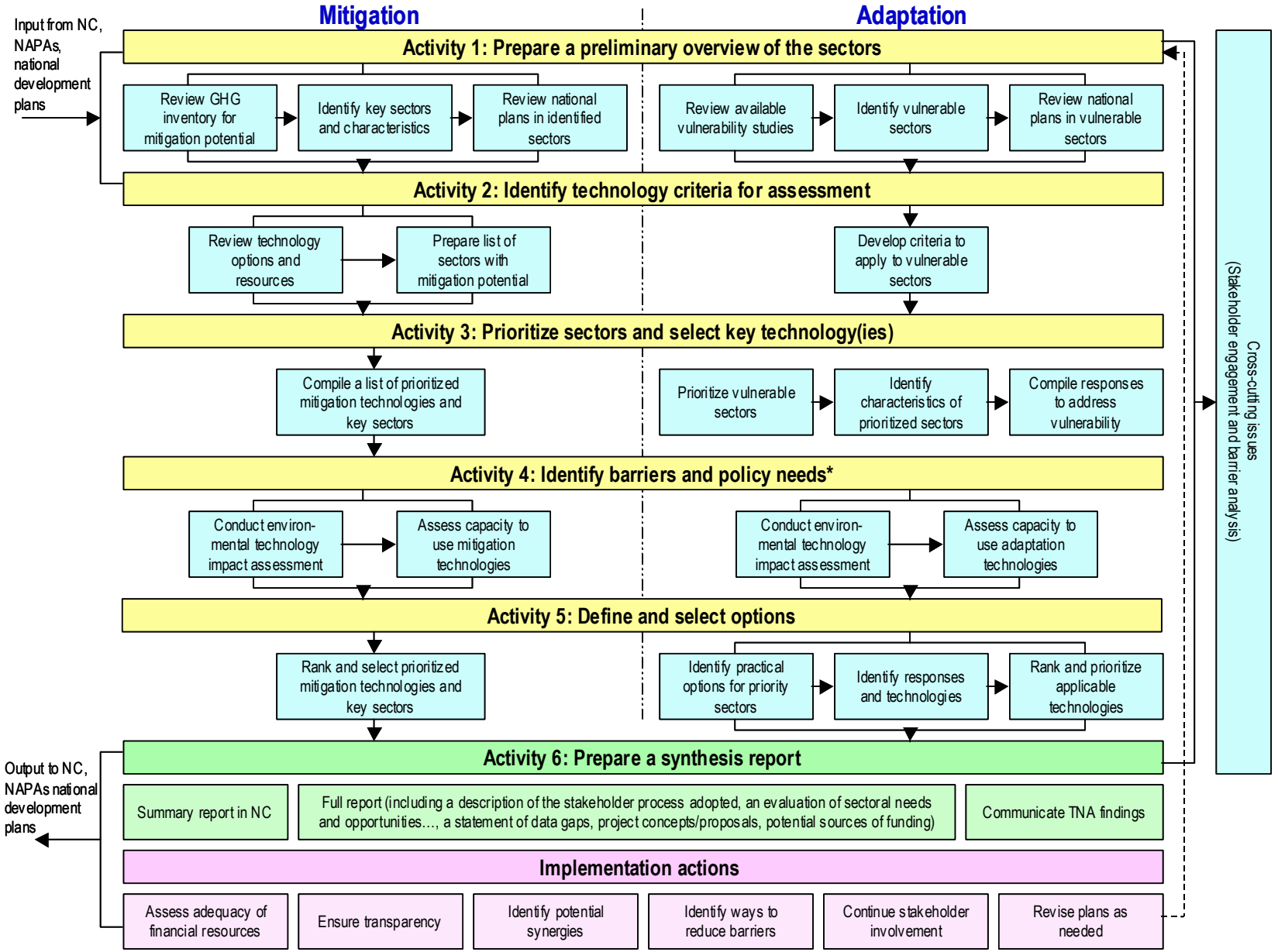


Figure 1. Simplified representation of the TNA process

E. Approach

13. While the background paper builds on previous work done on the issue of TNA it enhances previous information through a deep analysis of the 34 TNA reports that have been completed based on an agreed definition on "best / good practice" (see section F below).

14. The approach used to prepare the paper includes: (i) an in-desk review of the TNA reports, (ii) a synthesis of information from the workshop presentations on country experiences and lessons learned and of breakout sessions discussions and (iii) conducting a questionnaire survey on best/good practices in TNAs during the Bangkok workshop. The questionnaire includes a set of 48 questions aiming to further clarify issues that could not be clarified by the in-desk review of the TNA reports such as good practices for engaging stakeholders, most appropriate methods for prioritising technology needs, information to be included in the TNA report, and good practices for developing and implementing action plans: Interviews with coordinators of the TNA have been made either through direct meetings while attending the workshop or by phone, and follow ups have been made by e-mails. The paper will benefit also from comments and feedbacks on the draft paper from the participants of both workshops and from EGTT.

15. The paper is structured according to the main phases and steps of the TNA process **- conducting** this process and **reporting** and **implementing** its findings. Figure 1 below illustrates the main activities of this process for mitigation technologies and technologies for adaptation to climate change.

16. The sections of the paper that focus on key issues/steps involved in the TNA process include:

(a) A short overview of the issue/step under consideration taking into account the provisions of the TNA handbook;

(b) An analysis of how the issue was addressed by countries that have conducted TNAs and of the lessons learned;

(c) Identification of what could be considered as a good practice and provision of case studies;

(d) Summary of good practices for a proper consideration of the respective issue/step.

F. Definition of the good practice

17. While the concept of good practices has been used before, a definition of the good practice as part of the knowledge management system of the secretariat is missing. For example, the concept of the good practice has been previously discussed 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. The workshop report[4] indicates that countries may approach this concept from national and international perspectives and that participants agreed that "good practice" appeared more relevant in the international context while the "best practice" could be, to a large extent, country specific. This is because it was considered unlikely that best practices that are effective in one country may be effective in another one.

18. Consequently, the concept of the good practice seems to be more appropriate when analysing processes that are highly dependent on national circumstances and country needs such as technology needs assessments and this terminology will be used in the background paper. However, this could be revised based on the discussions during the Bangkok workshop and the analysis of the answers to the questionnaire survey.

19. Wikipedia – a web encyclopaedia, defined the best [good] practice as a management idea which asserts that there is a technique, method, process, activity, incentive or reward that is more effective at delivering a particular outcome than any other technique, method, process, etc. The idea is that with

[4] FCCC/SBSTA/2000/2.

proper processes, checks, and testing, a desired outcome can be delivered with fewer problems and unforeseen complications.

20. Good practices in the TNA process can also be defined as the most efficient (least amount of effort) and effective (best results) way 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 up front in the process. For example, establishing a common, agreed vision on the final TNA product.

21. Finally, another important element is a set of evaluation criteria. For the purpose of this analysis such a set of criteria has been identified for each step of the TNA process, in particular for the main stages considered in the paper: **conducting** the TNA and **reporting** and **implementation** of its findings. The criteria were chosen bearing in mind the issues that are considered as key to affect the above steps and will be evaluated and validated by the workshop participants as well as the feedback obtained from the proposed survey. For example, the following initial list of criteria has been recommended to be considered for an effective and successful TNA process:

(a) Adequacy of the approaches/methodologies/tools applied to the national circumstances;

(b) Priority areas and sectors covered;

(c) Links to sustainable development and other development goals;

(d) Level of stakeholder involvement;

(e) Barriers encountered;

(f) Level of reporting/comprehensiveness of the results

(g) Potential for follow-up (towards implementation of the results)

(h) Number of projects identified from the TNA process;

(i) Optimum use of resources and cost effectiveness;

(j) Replicability.

II. TECHNOLOGY NEEDS ASSESSMENTS IN THE CONTEXT OF THE UNFCCC

A. Background and related work

22. 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 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 responding to climate change through the diffusion and use of appropriate climate change mitigation technologies and technologies for adaptation to climate change.

23. As part of the technology transfer process, a framework for technology transfer was developed and adopted by all Parties at the seventh session of the Conference of Parties (COP) to the UNFCCC. Technology needs and needs assessments is one of the five key thematic areas of this framework.

24. The COP, by its decision 4/CP.7, established an Expert Group on Technology Transfer, with the objective of enhancing the implementation of Article 4, paragraph 5, of the Convention, including, inter alia, by analysing and identifying ways to facilitate and advance technology transfer activities and making recommendations to the SBSTA.

25. The COP, by its decision 4/CP.4, urges non-Annex 1 Parties to submit their prioritized 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 with this process of technology needs assessment.

26. In April 2002, under the guidance of the SBSTA Chair and in consultation with the EGTT the UNFCCC secretariat organized a meeting with representatives from governments, experts drawn from the UNFCCC roster of experts, and representatives from relevant international organizations, to identify methodologies to conduct TNAs and to generate and share information on experiences, special situations, needs of countries in different regions and possible next steps.

27. In May 2002, a workshop was convened jointly by UNDP and the UNFCCC secretariat in Seoul, Korea for country experts and multilateral organisations in order to discuss methodologies and issues related to the TNA process. A survey has been undertaken by the UNDP to the countries undertaking assessment of technology needs.

28. To facilitate the process of conducting TNAs, based upon the results of the survey and the Seoul workshop recommendations and conclusions, the UNDP developed a simplified, flexible and user-friendly handbook on *Conducting technology needs assessments for climate change* herein referred to as the TNA handbook, which provides a step by step guidance on the identification of needs for technologies for mitigation of and adaptation to climate change. The TNA handbook, produced in collaboration with CTI, the EGTT and the secretariat, was made available to Parties in 2004.

29. CTI, in collaboration with UNDP, organized three regional workshops[5] to field-test and further develop the TNA handbook. The workshops provided a good opportunity to discuss regional concerns and priorities in assessing technology needs and to further assist Parties in conducting TNAs. CTI also provided support to Bolivia, Ghana, Malawi and the Southern Africa region to carry out TNAs.

30. In October 2005, in consultation with EGTT, the UNFCCC secretariat, organized a workshop on innovative options for financing the results of TNAs which was held in Bonn, Germany. The workshop was focused on identifying innovative financing opportunities and strategies to reach financial closure of project financing proposals. Three of eight projects discussed at the workshop were drawn from TNAs. The workshop highlighted many practical aspects relating to implementation of the results of TNAs, including how to prepare project proposals that meet international standards.

31. UNDP conducted a preliminary analysis of 13 TNAs and UNEP conducted an initial analysis of 5 TNAs. The results of these analyses were presented at several meetings, including the seminar on the development and transfer of ESTs for adaptation to climate change, held in Tobago, Trinidad and Tobago, in June 2005; the above-mentioned workshop on innovative options for financing the results of TNAs; the eighth meeting of the EGTT, held in Montreal, Canada, in November 2005; and several other events.

32. As requested by the SBSTA at its twenty-first session, a synthesis report on TNA completed by non-Annex I Parties has been prepared (herein referred as synthesis report of the TNAs) as contained in document FCCC/SBSTA/2006/INF.1. This report presents information on technology needs for mitigation and adaptation to climate change contained in 23 technology needs assessments (TNAs) and 25 initial national communications submitted by non-Annex I Parties. It highlights priority technology needs identified in various sectors to reduce greenhouse gas emissions and facilitate adaptation to the adverse impacts of climate change. It draws attention to specific barriers to technology transfer and suggests measures to address them, including through capacity building. It also highlights ways used to

[5] In September 2002 in Beijing, China, for the Asia and the Pacific region; in December 2002 in Dakar, Senegal, for the Africa region; and in October 2003 in Trinidad, Trinidad and Tobago, for the Latin America and the Caribbean region.

involve stakeholders in a consultative process to conduct TNAs, including the methodologies and criteria used to prioritize technology needs.

33. 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. With regards to technology needs assessments, the EGTT finalized its recommendations, contained in document FCCC/SBSTA/2006/INF.4, that was endorsed during SBSTA 24. The recommendations relating to technology needs assessments were:

(a) To encourage non-Annex I Parties that have 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 UNFCCC technology information clearing house (TT: CLEAR);

(b) To encourage non-Annex I Parties to provide updated information on their technology needs in their second national communications and other national reports and to make them available to the secretariat;

(c) To request the secretariat to prepare a synthesis report(s) of the information mentioned in (a) and (b) above for consideration by the SBSTA;

(d) To request the GEF and its implementing agencies, other intergovernmental organizations (IGOs), international financial institutions (IFIs), CTI and Parties that are in a position to do so to provide capacity-building for non-Annex I Parties to conduct, report and use TNAs;

(e) Not later than 2009:

(i) The secretariat, in collaboration with the EGTT, UNDP, UNEP and CTI, update the handbook for conducting technology needs assessments before SBSTA 28, taking into account experience and lessons learned indicated in the synthesis report on technology needs prepared by the secretariat cross-referencing the work on innovative financing and technologies for adaptation, and widely disseminate the updated handbook to Parties through TT:CLEAR and other means in different United Nations official languages;

(ii) The EGTT, with the assistance of the secretariat, prepare a report on good practices for conducting TNAs in collaboration with UNDP, UNEP and CTI for consideration by the SBSTA, and disseminate it to relevant stakeholders and practitioners;

(iii) To make available the results of TNAs, related experience and lessons learned in the TNA process and sharing them at national and international levels through the network of technology information centres, including through the organization of workshops by the secretariat in collaboration with relevant international organizations and initiatives;

(f) The secretariat to provide regular updates on 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;

(g) To invite the EGTT to cooperate closely with the other expert groups constituted under the Convention, especially the CGE, with the aim of coordinating activities relating to TNAs and national communications.

34. TNA reports have so far been prepared under a stand alone process. However non-Annex I Parties, as stated in decision 17/CP.8, paragraph 42 that contains the latest UNFCCC guidelines for preparation of the National Communications from non-annex I Parties, are encouraged to provide

information on activities relating to technology transfer of, and access to, environmentally sound technologies and know–how, the development and enhancement of indigenous capacities, and measures relating to enhancing the enabling environment for development and transfer of technologies. In addition to other information related to the technology transfer, countries could provide information o their prioritized technology needs.

35. Given this, and aiming at improving the quality of reporting of the National Communications from non-Annex I Parties, CGE prepared in collaboration with EGTT a template for reporting on cross-cutting issues in their national communications. The template (see also annex I), was submitted for consideration to the Subsidiary Body for Implementation (SBI) at its twenty-sixth session[6] for use by non-Annex I Parties in reporting activities relating to technology transfer in their national communications. The SBI at that session, invited the NCSP, the UNDP and the UNEP and other international organizations to consider the template when providing assistance to the non-Annex I Parties in the process of preparation of National Communications.

B. Current status of the TNA process

36. In the response to the request of the COP 4 through its decision 2/CP.4 the GEF has provided assistance to 94 non-Annex I Parties through Additional Financing for Capacity Building in Priority Areas (also known as Phase II and/or top ups). Out of these, 80 are being implemented by United Nations Development Program (UNDP) and 14 by the United Nations Environment Programme (UNEP). Some 34 TNA reports are already available on the UNFCCC web site.

37. The TNAs span over a relatively long period of time with the first one dating far back to 1998 and the most recent ones submitted in 2007. Several Parties are presently undertaking their assessments. TNAs have been completed by Parties classified as LDCs, SIDS, developing countries and countries with economies in transition, from all geographical regions of the world. They thus provide a good insight of how Parties have dealt with this key theme of the technology transfer framework. Table 1 below indicates the Parties and the TNA reports covered by this paper.

[6] FCCC/SBI/2007/3.

Table 1. Technology needs assessment reports covered by this paper

Country	Group[a]	Region	Support		Language[c]	Document	
			UNDP	UNEP		year	# pages
Albania	EIT	Europe	●		E	2004	187
Armenia	EIT	Europe	●		E	2003	101
Azerbaijan	EIT	Asia and the Pacific	●		E	2001	58
Bolivia		Latin America and the Caribbean	●		S	2002	200
Burundi	LDC	Africa	●		F	2002	31
Botswana		Africa	●		E	2004	112
Chile		Latin America and the Caribbean	●		S	2003	56
China		Asia and the Pacific	●		E	1998	29
Comores		Africa			F	2007	43
Congo DR	LDC	Africa	●		F	2004	51
Cote D'Ivoire		Africa			F	2002	82
Croatia	EIT	Europe	●		E	2005	94
Dominican Republic		Latin America and the Caribbean	●		S	2004	24
Ecuador		Latin America and the Caribbean	●		S	2002	37
Georgia	EIT	Europe	●		E	2002	208
Ghana		Africa	●		E	2003	110
Haiti	LDC,SIDS	Latin America and the Caribbean		●	F	2003	69
Indonesia		Asia and the Pacific	●		E	2001	299
Kenya		Africa		●	E	2005	231
Lebanon		Africa	●		E	2002	155
Lesotho	LDC	Africa		●	E	2005	66
Malawi	LDC	Africa	●		E	2003	105
Macedonia	EIT	Europe			E	2004	17
Mauritius	SIDS	Africa		●	E	2004	158
Republic of Moldova	EIT	Europe	●		E	2002	175
Niue	SIDS	Asia and the Pacific		●	E	2003	44
Paraguay		Latin America and the Caribbean	●		S	2004	61
Senegal		Africa		●	F	2007	136
Tajikistan	EIT	Asia and the Pacific	●		E	2003	36
Tanzania		Africa		●	E	2007	223
Turkmekistan	EIT	Asia and the Pacific		●	E	2007	112
Uzbekistan	EIT	Asia and the Pacific			E	2001	135
Viet Nam		Asia and the Pacific		●	E	2005	165
Zimbabwe		Africa		●	E	2004	92

[a] Source: United Nations list of country groupings and sub-groupings for analytical studies of the United Nations world economic survey and other reports <http://unpan1.un.org/intradoc/groups/public/documents/un/unpan008092.pdf>.
[b] E - English; F - French; S - Spanish.

III. SYNTHESIS OF GOOD PRACTICES BY STEPS IN THE TNA PROCESS

A. Conducting TNAs

1. Managing the TNA process

38. The institutional arrangements for conducting the TNA are an important element of the TNA process. However they were not always clear from the TNA reports. Only some reports mentioned scoping workshops and preparation of a terms of reference (TOR) for the teams undertaking the exercise. Proper managerial arrangements have shown to be a crucial factor towards a successful TNA. The majority of countries did not report on the institutional arrangements (procedures and arrangements) for conducting the TNAs.

39. In the majority of the cases, the impression is that TNA studies, specifically the focus and other considerations regarding key sectors and technologies have been chosen without a proper strategic approach. Thus it appears unusual that all Parties conducted some sort of overview of sectors as none covered all sectors extensively or that a LDC is prioritizing mitigation at the expense of adaptation, which should have been a priority for meeting the Millennium Development Goals (MDGs).

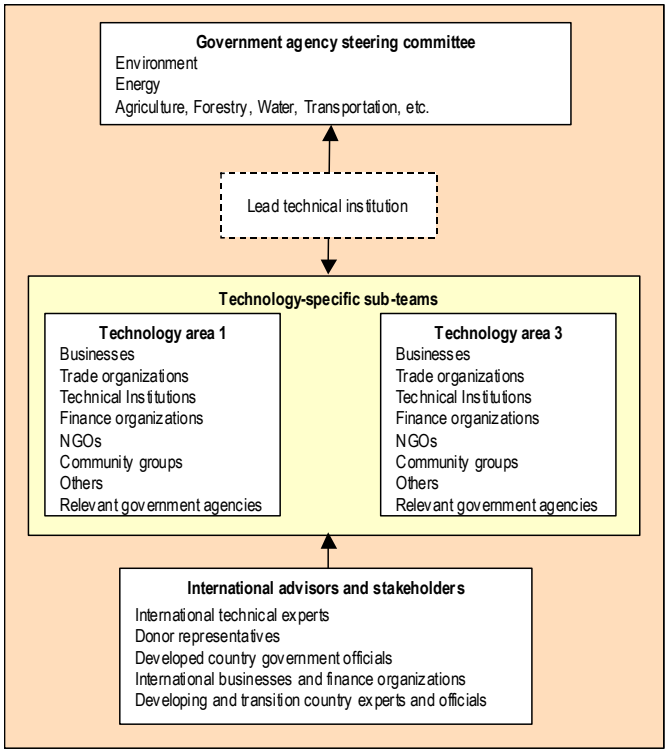
40. A good practice for the management of the TNA process is to assemble a knowledgeable team of experts, led by a knowledgeable coordinator. The coordinator must identify and decide upon the outputs

of the TNA process and activities. He/she must have, from the beginning of the process, a list of the stakeholders to be engaged and consulted in the process with their respective roles. Once all outputs are identified, the project coordinator can create the project timeline developed on the basis of the budget available. Two models to establish the technology cooperative team are suggested in Figure 2 below.

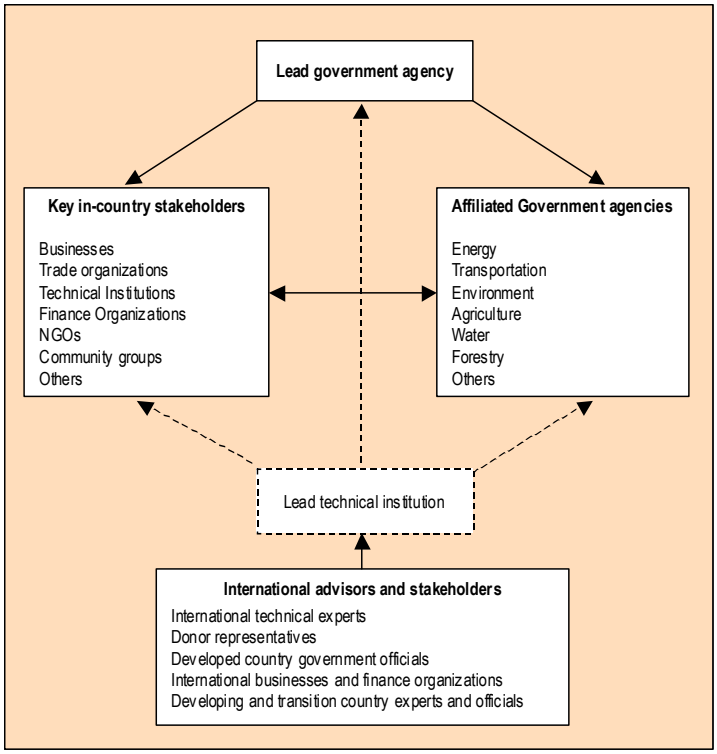
41. The work-plan and timeline should ideally be developed by the project coordinator, possibly in conjunction with the thematic team leaders, specifically GHG mitigation and Adaptation Team Leader and validated by the stakeholders who might be well represented in the Steering Committee set up as part of Enabling Activities. It is a **good practice** to **involve the team engaged under the National Communication** process as the TNA should consider the previous work done under the National Communication.

Figure 2. Possible models for establishing the technology transfer cooperative team

Model 1



Model 2



42. Another good practice is that the TNA conducting team be led by some rules and procedures that might be developed prior to starting the work. The rules and procedures may contain but are not limited to the following:

(a) Guidelines on the structure and contents of the report;

(b) Guidelines for referencing data sources, information sources etc. This is important for documentation purposes which in case of the update of the TNA report ensures quality, consistency and overall efficiency;

(c) Guidelines on archiving as the TNA report is supposed to be built upon data and information collection, generation, processing. A storing system is necessary.

43. Finally, it is a good practice to identify the various institutions that are the repositories of data and information. Collaborative arrangements with such institutions are highly important. The collaboration may be arranged under legal basis through Memorandums of understanding or contractual agreements. Data confidentiality issues may be considered as well. Part of an effective management process of the

TNA is the mechanism for capturing and disseminating the lessons learned during the TNA process. Utilization of communication and awareness raising tools aiming specially to the stakeholder involvement is highly recommended for an effective TNA process.

44. An inception workshop/meeting is needed for an effective and a good start of the TNA process, ideally after the identification of the team and the stakeholder group. The objectives of the workshop/meeting may include:

(a) To present the objectives of the TNA process/study;

(b) To explore linkages/synergies with other ongoing/finalized; activities/projects/programs and national strategies;

(c) To identify other stakeholders that were not initially included;

(d) To discuss a communication strategy and on communication and awareness raising tools;

(e) To discuss and reach consensus on a broad approach and method to suit both mitigation and adaptation for use by the sectoral teams.

(f) To review and validate the work-plan of activities;

(g) To review the existing guidance and relevant documents for conducting TNAs, including other countries experiences and lessons learned.

Box 1. Managing the TNA process

Good practice:

- Nominate the right person as coordinator of the TNA.
- Set up a national team of experts with people previously involved in the national communication process.
- Set up a stakeholders group with the involvement of high-level representatives from key relevant institutions.
- Develop a detailed work-plan with clear objectives, outputs and activities and deliverables and validate it with stakeholders of the team.
- Develop rules and procedures for write-ups and final deliverables.
- Hold an inception workshop to present the objectives and expected deliverables and refine any arrangements, as needed.

2. Methodological aspects in conducting TNAs

45. Many of the TNA studies (top-ups) were undertaken and completed before the completion and publication of the TNA handbook and thus they were conducted without methodological guidance and countries used improvised methods. However, the analysis of these reports shows that the TNA studies did, to a large extent, follow an assessment process similar to that outlined in the handbook**.**

46. The TNA process conducted by parties in most of the cases consisted of the following steps:

(a) Overview of sectors, including associated national institutional arrangements;

(b) Identification of criteria for assessment of technologies;

(c) Prioritization of key sectors, and selection of key technologies;

(d) Identify barriers and policy needs;

(e) Define and select options

47. In most of the cases stakeholders were involved, either through a national workshop at the beginning of the assessment process or through a questionnaire survey or interviews. In some cases, stakeholders were involved in every activity relating to the assessment. The similarities between the process followed by the majority of countries and the TNA handbook can be explained as follows:

(a) In the absence of methodological guidance, countries undertaking the TNA have been referring to approaches cited under the reports produced by different organizations such as UNEP Riso 1998, CTI 2000, IPCC 2000, although these reports have not been focused on the TNA itself. As a result many countries have been addressing technology transfer in general, including issues relevant to needs assessment.

(b) The methods utilized and improvised by countries have served as a reference point for the compilation of the TNA handbook. The handbook was prepared drawing upon relevant sources (e.g., CTI, UNEP, and IPCC) and feedback received from countries undertaking top ups, and upon discussions, recommendations and country presentations made in relevant workshops organized to complement those reports and to deal with particular technologies and practices.

48. The TNA handbook has been designed to provide guidance on how to conduct the TNA on both areas: GHG mitigation and adaptation to adverse effects of climate change. It is a "how to" guidance, i.e deals with the manner in which the technology needs are assessed. The handbook lays out the key steps, decisions, methods and resources needed for TNA, taking into consideration the fact that country circumstances and needs are different. This approach ensures the flexible nature of the handbook.

49. In most cases stakeholders were involved, either through a national workshop at the beginning of the assessment process or through a questionnaire survey or interviews. In some cases, stakeholders were involved in every activity relating to the assessment.

50. In many cases it was very difficult to get information on the methodology/approach used by the countries to conduct the TNA from their reports. This is because the majority of the TNA reports do not contain a section on the methodological approach used and relatively few details are provided.

Box 2. Methodological approach to conducing TNAs

Good practice:

- Use the most current updated guidance as a methodological approach for conducting the TNA study
- Draw upon disseminated good practices and lessons learnt by other countries who conduced the TNA studies
- Adopt/accommodate the selected methodological guidance in accordance to the national circumstances. There is no "one –size- fits- all" type of guidance.

3. Areas and sectors covered

51. Defining areas and sectors to be considered in the TNA requires a preliminary assessment of the current status of sectors and of technology and resource options. The preliminary assessment process is a review and data gathering exercise that must be undertaken before carrying out a detailed technology evaluation. However, this stage should not become a long and complex task as it does not need to provide a very detailed picture of all technology options in all sectors. It should rather provide a broad overview of the sectors with the greatest scope for initial actions, where efforts will be most effective. An important step for such an assessment is the identification of sources of information. A very good source of information are National Communications, other vulnerability and adaptation assessments, mitigation studies, energy planning studies and national/sectoral development plans.

52. Undertaking such a preliminary assessment is considered a good practice as this allows countries to begin to assess what is likely to deliver maximum benefit at minimum cost in the short-term within

existing sectors. It also allows Parties to assess promising options for the longer-term or in emerging sectors. Involvement of the stakeholders in this preliminary assessment phase is of great importance as this will keep them informed and engaged for the rest of the process.

53. Countries experiences show that such a preliminary assessment reduce the risk of:

(a) Defining the wrong sectors and as a consequence the wrong technology needs and engaging the right stakeholders;

(b) Spending resources to data gathering for sectors without a clear understanding on their relevance and importance;

(c) Assessing technologies without a picture of how they fit the country needs.

54. The number of the sectors identified by countries depends on specific circumstances, however it is recommended that a prioritization of sectors be done to choose two- three of them.

55. The synthesis report of the TNAs highlights that the majority of Parties that conducted the TNA studies have passed through a preliminary assessment. All Parties focused their TNAs on sectors already identified under their First National Communications for their potential for GHG reduction and/or addressing vulnerability to climate change. All of them went through mitigation with focus on the energy sector (except Niue). The range of coverage of adaptation has not been the same as for mitigation. The national circumstances and findings from the National Communication as well as the availability of financial and technical resources have been highlighted as the reasons for focusing on mitigation and/or adaptation. Most of the studies are lacking explicit explanations as to why they focused on a certain targeted area and/or sector.

56. The Box 3 below illustrates the steps followed by the TNA team of Albania and Botswana to conduct the preliminary assessment of areas and sectors to be covered by their TNA.

Box 3. Preliminary overview of areas and sectors

ALBANIA

Albania's TNA study, following the guidance provided by the UNDP TNA handbook, focused on both areas: GHG mitigation and adaptation to climate change and included a preliminary overview. The options considered were assessed as follows:

Mitigation

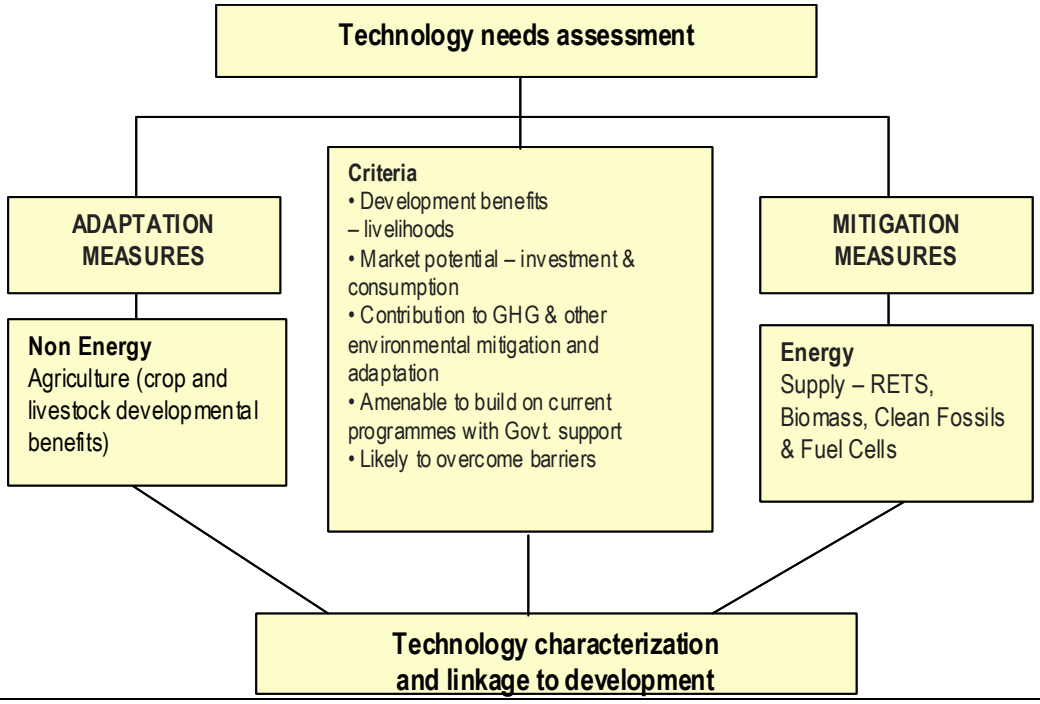
1. Overview of the sector:
   - Sector profile,
   - Legal framework;
   - Policy framework.
2. Overview of the work done under the Albania's FNC:
   - GHG inventory;
   - GHG mitigation.
3. Take the stock of the technologies currently in use
4. Overview of technology options

Adaptation

1. Profile of the targeted area (Coastal area):
   - Overview of the vulnerability studies in the targeted area
   - Overview of national plans/programs in the targeted area
2. Overview of the work done under the Albania's FNC with a focus on coastal area:
   - Vulnerability and adaptation section.
3. Take the stock of the technologies currently in use
4. Overview of technology options

In Albania, sectors with substantial GHG emissions potential were considered for mitigation, while the coastal zone was considered for adaptation due to its vulnerability with a focus on agriculture, forestry, water resources, health, tourism and settlements.

BOTSWANA



Box 4. Areas and sectors covered

Good practice:

- Conduct a preliminary assessment and prioritize sectors.
- Conduct an overview of data sources, information sources and data gaps
- Conduct a scoping exercise (it might be a workshop) to define the scope of work and design TORs for each sector in the light of available resources;
- Involve stakeholders from the inception phase of the TNA (scoping phase);
- Consider national circumstances and development needs in the prioritization of sectors.

4. Methodology for selection and prioritization of technology needs

57. Identifying priority sectors, technologies and actions requires an assessment of the contribution that new technologies in different sectors might have on:

(a) Development goals;

(b) Contribution to climate change (GHG mitigation and adaptation);

(c) Market potential.

58. Each criterion consists of a set of sub-criteria which depend on country specific circumstances and the sector under analysis. In most of the studies the above-mentioned general criteria were considered. A variety of sub-criteria were used in the TNA studies depending on country specific priorities and development needs. For example the contribution to development goals involved issues like food security, health, job creation for the poor, social acceptability, and local environment. In several TNA studies the criteria used are not indicated explicitly.

59. The lessons learned from TNAs considered as successful highlight the importance of compatibility of evaluation criteria with development goals. This is considered by Parties, as being of mutual benefits, as it contribute to integrating climate change concerns into national planning and policies.

60. In most TNAs technologies were identified on the basis of the above factors (development goals, contribution of climate change and market potential). A list of the preliminary technology options, for mitigation and/or adaptation, was developed taking into consideration a variety of factors depending on national circumstances manly based on expert judgment and stakeholder consultations.

61. Box 5 below shows the criteria used by China, Albania and Croatia for establishing their technology priorities.

Box 5. Examples of criteria used to select priority technologies

CHINA

Environmental concern: global and local
GHGs mitigation;
Improvement of local environmental quality

Technological concern
Mature degree of technologies;
Advancement degree of technologies;
Reliability of technologies;
Penetration of technology application; and
Easiness of wider use of technology.

Economic concern

- Internal Return Rate (IRR) and the effect of pricing and fiscal policies on the IRR
- Payback period

• Mitigation and adaptation costs Social concern • Social efficiency: necessity of T&T • Broader links with other sectors and groups • Employment and poverty alleviation
ALBANIA
Contribution to the achievement of most of the MDGs • Job & wealth creation for the poor • Food security • Health improvements • Capacity building (human, institutional, physical, environmental) • Ensure environmental sustainability • Economic and industrial efficiency improvement • Gender equality and empower woman Social acceptability and suitability for country conditions • Market potential • Capital and operating costs relative to alternatives • Commercial availability • Reliability and potential scale of utilization Contribution to Climate Change • GHG emissions reduction potential • Adaptation potential
CROATIA
Development benefits • Job creation • Capacity building (production, know-how) • Economic structure change according to croatia export orientation • Agriculture security **Implementation potential** • Marginal cost • Commercial readiness • Technology availability • Measure applicability **Contribution to climate change response goals** • GHG emission reduction potential / enhancement of CO2 sinks • Indirect effect on the other air pollutants emission reduction • Conservation of energy

62. The technology selection and prioritisation involves also weight and importance setting of each of these criteria. This process is partly a policy decision, affected by country priorities as well as by country circumstances; social, environmental and economic considerations. There is a significant need for opinions to feed into the weighting process from the following sources (facilitated by data and objective assessment) such as:

(a) Independent expert assessments/judgments;

(b) Government /policymaker assessments/judgments;

(c) Broader stakeholders group consultations/validation such as industry, private sector, NGOs, vulnerable communities, academia, etc.

63. A “good practice”, that is inclusive and results in effective and transparent assessment of the criteria and technologies, is to combine the recommendations received from the above listed stakeholders when establishing the weight and importance of criteria.

64. The assessment of priority sectors and key technologies, carried out after setting the weight of the agreed criteria, has to involve also a variety of approaches and tools. Many of them were already used by

countries in conducting their TNAs such as multi-criteria analysis; cost benefit analysis, risk benefit analysis, analytical hierarchy process, and decision analysis. All of them have weaknesses and strengths therefore one cannot advise on which is the best to be used. The synthesis report of TNAs and other countries experiences indicate however that tools commonly applied are:

(a) Multi-criteria analysis (e.g. Albania, Croatia, Burundi, Ghana, Malawi). In addition to the multi-criteria analysis, Croatia applies the sensitivity analysis in order to reduce the uncertainty of the assessment;

(b) Analytical hierarchy process (e.g China, Mauritius) The top ranked technologies were usually selected as priority technologies for implementation;

(c) Cost–Benefit and Risk–Benefit analyses (Indonesia. Macedonia) probabilistic simulation and dynamic programming through scenario combination (Republic of Moldova);

(d) Categorization of priority technologies in terms of "low", "medium" and "high" priority (Tajikistan);

(e) Questionnaire surveys, interviews and workshops with stakeholders and ranking based on the answers provided by stakeholders (e.g. Dominican Republic, Ecuador, Haiti, Niue).

65. In many cases, priority technologies were simply listed by sector and sub-sector without any explanation on "why" and "how" they have been selected (e.g. Azerbaijan, Turkmenistan, Bolivia, Ecuador, Kenya, Paraguay) or based on priorities established in national policies and programmes relating to energy and the environment (Lesotho). In general, the same methodology was applied for the assessment of both mitigation and adaptation technology options (e.g. Albania, Mauritius). In some Parties, the process of selection and prioritization of technologies and in-depth analysis was constrained due to lack of information, especially relating to cost of the technologies considered (e.g. Ghana)

66. Another important element of the assessment is the documentation and description of the steps of the assessment (from weight and importance setting of the criteria up to key technologies selected). Many Parties described in detail their methodologies for prioritizing technological options (e.g. Albania, Burundi, China, Croatia, Dominican Republic, Ghana, Haiti, Indonesia, Malawi, Mauritius, Vietnam). However, these methodologies were not always consistently applied to all sectors and/or comprehensively followed. For example, Indonesia and Republic of Moldova described their methodologies only for the energy sector, even though their TNAs also addressed non-energy sectors.

67. The following box provides the Croatia, China and Mauritius cases as examples of technology ranking processes on the basis of the criteria indicated under in Box 6.

Box 6. Technology selection process

Croatia

	MEASURE	CRITERIA											
		I category				II category			III category				TOTAL
		I1	I2	I3	I4	II1	II2	II3	III1	III2	III3	III4	
ENERGY SECTOR													
a) Power Generation Sector													
1	Savings in Power Transport and Distribution	1	1	2	1	3	4	4	2	2	2	1	2.00
2	Wind Power Plants	5	5	5	3	3	5	3	3	3	2	2	3.75
3	Small Hydro Power Plants	2	1	2	3	3	5	3	4	3	2.5	2	2.67
4	Biomass in Cogeneration Plants	4	3	3	3	3	5	3	4	3	4	2	3.38
b) Industry													
1	Motor Drives Regulation	1	1	1	3	3	4.5	4	2.5	2	2	2	2.23
2	Cogeneration Plants	2	1	2	4	3	5	4	3	3	2	2	2.73
3	Low-Temp. Heat Generation Efficiency Increase	2	2	4	2	3	3.5	3.5	2.5	2	2.5	2	2.63
4	High-Temp. Heat Generation Efficiency Increase	2	2	2	1	3	3.5	3.5	2.5	2	2	2	2.27
c) Transport													
1	Interurban Passenger Transport	1	1	1	3	2	4	4	2	2	2	1	2.00
2	Urban Passenger Transport	1	1	1	3	2.5	4	3	2	2	2	1	1.97
3	Freight Transport	1	1	1	3	2	5	4	2	2	2	1.5	2.11
4	Increase in Biodiesel Use	3	2	3	3	3	4.5	4	4	4	4	4	3.37
d) Services and Residential													
1	Demand Side Management (DSM) Measures	1	1	1	5	4	4.5	4.5	3	2	2	2	2.60
2	Solar Energy Use Increase	2	2	3	5	3	4	3	3.5	3	2	3	3.00
3	Geothermal Energy Use Increase	1	1	1	4	2	3	2	3	2	2	2	2.00
4	District Heating and Cogeneration Use Increase	2	2	2	4	3	5	3	3	3	2	2	2.77
5	Insulation Improvement and Energy Efficiency in Buildings and Construction	4	4	4	1	4	4	4	4	3	2	3	3.42
6	Biomass in Heating Plants	4	4	3	3	3	5	3	4	3	3.5	3	3.53
WASTE													
1	Thermal Processing of Waste with Energy Utilization	4	3	3	3	3	4	3	4	3	2	2	3.16
INDUSTRIAL PROCESSES													
a) Nitric Acid Production													
1	Non-Selective Catalytic Reduction	5	3	3	4	2	4	4	2	2	2	2	3.14
b) Cement Production													
1	Increase in Energy Efficiency of the Clinker Production Process	2	3	3	3	3	5	4	3	2	2	2	2.90
2	Switching to Fuel with Lower Carbon Content	3	3	3	3	2	5	3	2	1	2	2	2.70
3	Decrease of Clinker Percentage in Cement	3	3	3	3	2	3	3	2	1	2	2	2.54
4	Use of Waste as Alternative Fuel	3	3	3	3	3	4	4	3	2	2	2	2.95
AGRICULTURE													
1	Improvement in Application of Organic and Mineral Fertilizers Aimed at N_2O Emission Reduction	3	3	3	3	3	3	3	3	2	4	2	2.93
2	Reduction in CH_4 Emission by Decreased Fermentation	2	2	1	3	2	3	3	2	2	4	2	2.29
3	Anaerobic Fermentation Related to Decomposition of Organic Manure and Biogas Generation	3	4	3	3	2	3	3	3	2	4	2	2.96
4	Carbon Storage in Agricultural Soil	4	2	2	4	1	2	2	3	2	4	2	2.59
FORESTRY													
1	Reforestation of Productive Bare Forestland	4	2	1	4	3	5	4	3	2	3	2	2.99
2	Increase in Forestland Surface to be Cared by Thinning	3	2	1	3	3	5	4	2	2	3	2	2.68
3	Including of Complete Second Age Class Forests (all the forests 20-40 years of age) into the Thinning	3	2	1	3	3	5	4	2	2	3	2	2.68
4	Planting Pioneer Wood Species on the Degraded Forests	2	2	1	3	4	4	3	2	2	3	2	2.48
5	Improvement in Wood Utilization Efficiency and Increase in Harvesting	3	2	1	3	3	4	4	3	2	2	2	2.61

From the results of measures assessment the most significant measures that have been addressed and implemented are from Energy sector as presented in the table below:

1. Wind power plants
2. Biomass in heating plants
3. Insulation improvement and energy efficiency in buildings and construction
4. Biomass in cogeneration plants
5. Increase in biodiesel use

China case

Expert judgement was used to establish the following list of 19 technological options. The options were then validated with stakeholders:

1. High efficiency boilers
2. Large thermal power generation (300-600 MW)
3. Cogeneration
4. High efficiency electric motors
5. Green lighting
6. Energy saving buildings
7. Coal-bed methane recovery and utilization
8. Biomass gasification
9. Wind energy
10. Solar thermal heat
11. Biogas
12. Waste heat and energy recovery
13. Village hybrid renewable energy (wind & PV)
14. High efficiency cook stoves
15. Alternative fuel transportation for urban regions
16. Small-scale hydropower
17. Combined cycle natural gas power generation
18. Central heating
19. Waste gas recovery

A matrix containing technologies and the criteria (see the criteria selected in the Box 5) was distributed to domestic experts. They were asked to provide scores of each criterion of each technology. For simplicity, an equal weight was assigned to each criterion. About 20 experts responded to the questionnaire. Finally, a comprehensive statistical analysis was conducted, and the top five high scored technologies were identified as follows:

1. Thermal power generation,
2. High efficiency motors,
3. High efficiency boilers,
4. Wind energy and
5. Coal bed methane recovery.

MAURITIUS

Criteria	**Technology**										
	Introduce more performing systems	New agricultural techniques	Minimum/no tillage	Increase water use efficiency	Extend irrigation network	Rationalize fertilizer use	Composting	Green cane harvesting	Trash blanketing	Drought/heat tolerance	Land Use Change
Development benefits											
GDP growth	4	3	1	3	4	2	3	2	1	2	1
Wealth creation	4	3	1	3	4	2	3	2	1	2	2
Job creation	1	3	1	1	2	1	3	1	1	1	1
Social acceptance	4	3	3	2	2	3	4	4	4	4	2
Capacity building	1	4	2	4	3	2	3	1	1	2	1
Market potential											
Capital to finance	1	3	4	2	2	4	3	2	4	2	2
Affordability	1	2	4	2	2	3	3	2	4	2	2
Investment sustainability	4	3	3	4	4	3	4	2	4	3	3

Durability	5	3	3	3	4	2	4	3	4	3	3
Commercial availability	3	3	3	4	4	3	4	3	3	2	2
CC/environment protection											
Low GHG emissions	1	1	3	1	1	3	3	3	3	1	1
Minimal harm on environment	2	3	3	2	4	3	3	3	3	2	2
Waste resource recovery	2	1	2	1	4	1	3	3	3	1	1
Adaptation potential	4	4	2	4	3	1	2	1	2	3	2
Total	**37**	**39**	**35**	**36**	**45**	**34**	**45**	**32**	**38**	**30**	**25**

68. Once the priority sectors and technologies are identified technology options can be selected to address short-term and long-term needs. This process involves a further screening of candidate technologies based on the results of the barrier analysis. The barrier analysis, along with stakeholder consultation, is a crosscutting step/issue which will be elaborated in section D below.

69. In selecting priority areas countries may identify "win win" or "no-regret" options which are technologies that deliver both climate and other objectives, and are available at low costs. The reason for this is that there is a variety of technologies that offer lower costs, higher efficiency and better environmental performance than established alternatives but not widely adopted due to different barriers that inhibit the uptake of cost effective options. This is the case for countries like Albania, China, Macedonia and Mauritius. Win-win measures identified consist of end use domestic and industrial appliances, where energy efficiency can be improved considerably. Similarly waste water treatment and use of the water for certain purpose caters for reduction of GHGs as well as adaptation in the water resources sector and agriculture if lack of water is impacting on agricultural production.

70. It is a good practice to invest or plan investing on some resources for the development and/or demonstration of technologies that are not currently 'win-win' but offer particular promise for contributing to combat climate change and other goals in the longer term as at a later stage new options will become available. The relative merits and better economics of forthcoming technologies and developments in different sectors will definitely contribute to cope with climate change and its impacts.

Box 7. Methodologies for selection and prioritization

Good practice:

- Set clear criteria for selection which must be at least compatible with development objectives, contribute to climate change mitigation and have market potential.
- Apply an inclusive process for criteria setting by involving expert judgment, policy maker judgment, and stakeholder consultation.
- Decide on the tool of prioritization in accordance to the national circumstances.
- Use a wide range of criteria, identify a small number of key sectors.
- Build a ranking matrix to evaluate technologies.
- Conduct a barrier analysis for the selected/prioritized technologies.
- Make plans to revisit the selected technologies in the light of future development and change.

5. Identification of next steps

71. Next steps, as from the identification of technologies, were not always covered by Parties. Next steps reportedly varied among Parties. Those who reported thereon presented general actions such as improving access to information on these technologies, awareness raising and improving human capacity. Other Parties still proposed next steps for the respective technologies in the form of implementation plans, recommendations, plans and project proposals among others. In some reports, it was difficult to distinguish between barrier removal and next steps.

Box 8. Next steps

Good practice:

- Next steps could aim at analyzing successful implementation of the TNA results.
- Draw implementation plans to address the barriers identified. This could be done by formulating complete detailed project proposals for the transfer of the selected technologies.

6. Development of project proposals, ideas and/or project concepts

72. Only a restricted number of Parties developed and included project proposals in their TNAs. The proposals differed in quality in that all of them did not include the same information. Therefore, there is a need to define and agree on a common set of steps to be covered to ensure the completeness of a project and also to be certain that it meets all the criteria required by various stakeholders that could be possibly engaged in the implementation process. The *UNFCCC guidebook on preparing project proposals* would be a starting point for preparing detailed project proposals that meet the standards of international funding institutions. Table 2 below depicts the initial project information requirement to be reported in the TNA study. The remaining Parties presented project concepts or ideas only.

Table 2. Brief description of information for inclusion in project concepts/ proposals / documents

	Proposal content checklist (guidebook)	**Public sector funded (national communications)**	**Private sector funded (national communications)**
	Date		
What?	Name of project or enterprise		Project description (e.g., sector, technology/strategy, location);
Where	Location		
Who?	Champion's contact information		
What	Product or service		
What	Technology		
To whom	Customers / clients		
How	Current status		
How?	Project size, expected schedule and cost, divided between planning, construction or pre-operation and operation	Project cost	Project cost
		Options for co-financing	Options for co-financing
		Incremental or additional cost analysis (all adaptation projects; many mitigation projects will also need to perform an incremental or additional cost analysis)	
	Current needs and request	Conformity with country's overall policies	
		List of barriers that will be addressed	
	Market conditions		Brief summary of the market for the product
	Operating conditions		
Where	Regulatory conditions (including all required approvals)		
Who	Owners and sponsors	Type of implementing agency (e.g., public, private)	Type of implementing agency (e.g., public, private)
Who	Team		
Who	Stakeholders		Level of government ownership or involvement
	Governance and management structure		
	(Decision-making, authority and responsibility)		
How	Implementation steps and plan		
How	Cash flow and schedule details		
Why	Impacts and returns	Project's rate of return or cost-effectiveness ratio (mitigation projects)	Project rate's of return
What if	Sensitivity analysis		
What if?	Risks and measure to handle		
		Project objective(s)	
		Expected GHG reductions/sequestration (metric tonnes of carbon dioxide equivalent (CO_2 eq), mitigation projects)	Expected GHG emission reductions
		Sources for further information on the	Sources for further information on

		project	the project

Box 9. Develop project proposals

Good practices:

- Constitute multidisciplinary team to write up detailed project proposal.
- Project concepts must contain list of stakeholders, barriers to be overcome capacity-building needs, awareness programs and training; viability of the investment, IRR of investment, GHG reduction potential / adaptation capacity, technology supplier, beneficiaries, etc.
- Adopt the UNFCCC practitioner's guidebook

B. Reporting, analysing and synthesizing the results of TNAs and communicating their findings

73. All countries that conducted the TNA process have prepared a report although they lacked or had partial guidance on reporting from either the UNFCCC, GEF and its Implementing Agencies or from the TNA Handbook. In addition, the Operational Procedures on GEF Additional Financing for Capacity Building in Priority Areas, do consider the TNA reports as follow up activities of the National Communications but do not ask for an official submission of a TNA report to the UNFCCC secretariat. The TNA reports have been collected and analysed by Implementing agencies (e.g., UNDP and UNEP) and most of them are available at the NCSP and TT:CLEAR web pages.

74. Almost all the TNA reports contain a description of the needs assessment process as per steps undertaken as well as cross-cutting issues but the level of the details and the way information is provided differed. The size of the reports differed significantly as well. All countries used graphs, charts, matrices, maps to display the results. All TNAs provided information on their national circumstances and especially on the situation of the economic sectors for which technologies have been assessed and their contribution to GHG emissions. Countries made reference to GHG mitigation scenarios and climate scenarios as well as climate change. A majority of TNA reports lacked a section on institutional arrangements for conducting the TNA and reporting thereon as well as a section on the methods used for conducting the TNA, especially tools adopted for the prioritization of technologies. Some countries provided clear descriptions of the criteria used for sector and technology selection and even provided copies of the evaluation matrixes (e.g Albania, Croatia, Ghana, Mauritius, Botswana, Lebanon) but there are countries that did not even provide information on the criteria used or just mentioned them and/or applied them partially for one sector (e.g energy). Some countries did not explicitly describe the stakeholders and the way they were involved in the needs assessment process. The same situation prevailed for barrier analysis. Level and the way of reporting of barrier analysis differed. Some countries reported on sectorial barriers whereas some others disd so for barriers that may face the selected technologies or/and identified barriers at project level. Countries that covered both mitigation and adaptation reported them in two separate chapters.

75. The TNA report is a very important deliverable of the TNA process. So a carefully designed structure reflecting its contents, since the initial planning phase is, very important. It may be considered as a "good practice" to have such a report compiled in a comprehensive and effective manner in order to serve all stakeholders as a *road map* of an ongoing process, that must be integrated into a wider and further process, that of technology transfer and also climate change programming and integration into national planning.

Box 10. Content of the TNA report

Good practice:

It is recommended that the TNA report contains but is not limited to the following items:

- Objective of the TNA and its relevance to the national development priorities;
- Methodological approach for conducting the TNA;
- A description of the institutional arrangements made for the TNA and stakeholder involvement;
- An overview of sectors, including GHG emissions and the potential for their reduction and/or adaptation to the adverse effects of climate change;
- A preliminary summary of climate change technologies, broken down by sector where appropriate;
- A statement on data gaps and constraints, and measures adopted to correct them;
- Description of criteria and process for technology evaluation (to include development, climate change and market considerations as described above);
- An overview of the assessment of technologies according to the agreed priorities;
- List of priority sectors and key technologies for preliminary action;
- A review of key barriers and steps to overcome them, with reference to existing plans and programmes.
- A description of follow-up arrangements (in the form of an implementation plan if appropriate or project ideas/ notes/concepts/proposals);
- A list of stakeholders and a programme for continued stakeholder engagement. This may be as an annex;
- Matrices of evaluation. These may be attached as annexes

C. Implementing the findings of TNAs

76. The next step after selection of the most appropriate technology is implementation. It is the process of translating the TNA results and findings into application by identifying the steps to be followed for the successful transfer of the technology (hard or soft) from the source to the final recipient or practitioner if it is an idea, concept or practice.

77. Critical components of the process of implementation of technologies are the presence of appropriate and effective stakeholders within the framework for technology transfer. Other issues that have to be addressed by these stakeholders are the availability of adequate resources for acquiring the technology, especially hard options and an environment conducive to the smooth flow to the final recipients and users. While elaborating the different steps of the implementation plan for the transfer of the technology, Parties will be able to identify barriers to their realization and capacity building needs that will have to be overcome. The eventual outcome may be the preparation of a project document for funding purposes for technologies requiring heavy investments.

78. The synthesis of the TNAs submitted so far indicated that very few Parties elaborated comprehensive implementation plans with an extensive coverage of all these issues. However, almost all Parties identified barriers to technology transfer and measures to address them. Identification of barriers differed between Parties with some performing the exercise for the individual technologies prioritized as opposed to sectoral and national analysis in the other cases. Most Parties identified barriers of economic and market nature followed by information and awareness. Other barriers were policy related, technical, human capacity, regulatory and institutional among the most frequently identified ones.

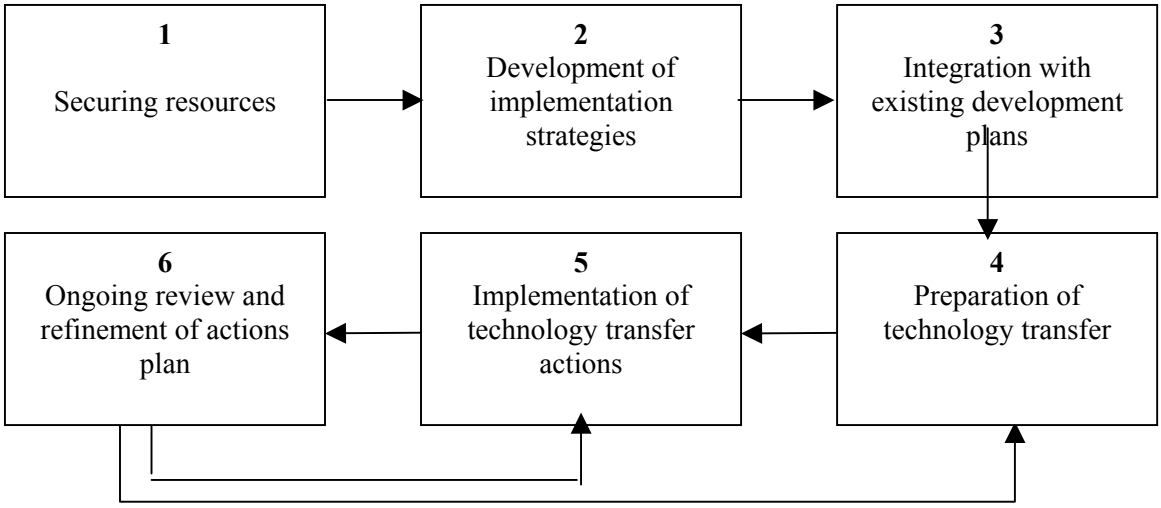
79. Technology implementation plans for mitigation and adaptation may vary significantly. Whereas mitigation technologies mostly concern hard technologies that are more easily transferred once the major stumbling block of funding is resolved, it is much more difficult to draw implementation plans for soft technologies for adaptation. This stems from the fact that mitigation technologies are usually related to the services sector, which is relatively well regulated as opposed to adaptation technologies. Moreover,

very often the end users of adaptation technologies are the general public and the poorest communities who posses lower and less reliable repayment capacities, which are strong deterrents to financiers. Additionally, recipients of adaptation technologies have limited absorption capacity very frequently. Due consideration has got to be given to this issue when dealing with implementation plans for adaptation.

80. Because of the above and the fact that no single recipe exists for transferring different technologies, it would be advisable to draw an implementation plan to accommodate all technologies prioritized while paying due attention to the specific nature of the respective options. Such an action will lead to the identification of more precise steps, barriers, capacity-building needs as well as other activities such as awareness raising and information communication.

81. The flow chart for preparing and implementing technology transfer plans is given in figure 1. Each step of the procedure comprises a series of non-exhaustive activities given below, in an attempt at identifying good practices for enhancing this process.

Figure 3. Flowchart for preparing and implementing technology transfer plans



82. *Securing resources*: securing resources demands for working sessions with donor organizations, the private sector and means of raising new resources within the country. Some potential stakeholders are local financing agencies such as banks and national private companies, and relevant international donor/lending agencies including the World Bank, UNDP, EU, USAID, etc. Organizing brainstorming session with all stakeholders concerned to seek for the means of capturing the required financial resources have proved to be an effective approach towards securing resources. A comprehensive list of funding sources based on the priorities identified is part of this step.

83. The conclusions of the two workshops on options for innovative financing of technology transfer (Montreal, 2004 and Bonn 2005) underlined an increased engagement of the private sector in the implementation of the TNA findings. The lessons learned included (i) finance is available - there is not a shortage of money; (ii) some projects are not at all suitable for private sector financing; (iii) there are many projects that could however access financing with the right guidance and structuring; (iv) there is a shortage of good financing/project proposals that meet the standards and criteria of private sector financing communities; (v) early stage filter mechanism during TNA process would be beneficial to sort projects into broad financing groups: private sector / private and public sectors / public sector.

84. In this context, private financial assistance networks may play an important role to bridge the needs of technologies with the supply on environmentally sound technologies. An example of such network is the CTI Private Financial Advisory Network (PFAN). For more information on PFAN see Box 11 below.

Box 11. Role of financial advisory networks

PFAN

PFAN is an informal network of private sector companies and individuals providing finance and financing services to climate friendly projects. It offers a free consulting service to project sponsors and developers to help them raise international private finance. It aims to: knowledge and know how transfer; technical assistance; provide an interface between public sector policy goals and private sector commercial reality; and increase the number of bankable renewable energy / climate friendly projects and help get them to financial close.
 	
PFAN offers the following services:
• Pilot Phase - learning how and where it can add value
• Advice and guidance
  ○ Overall project commercial structure and design
  ○ Financing structure
  ○ Sourcing & procurement of financing
  ○ Technical & engineering advice
  ○ Achievement of conditions precedent
  ○ Trouble shooting
• Technical assistance - contribution to costs of technical studies etc
• Contact broking and introductions
• Money / financing – directly from PFAN Members

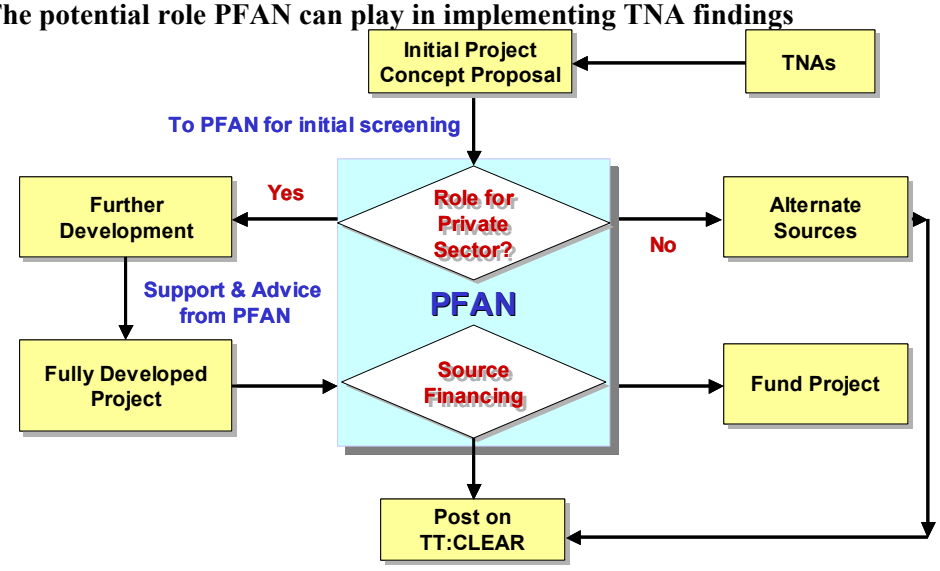
85. *Development of implementation strategies*: during the development of the implementation strategy, the principal activities would consist as follows:

(a) Identifying barriers and constraints, their analysis and identification of measures to remove them to facilitate technology transfer.

(b) Identifying the widest group of possible stakeholders who have a role to play in the transfer channel, from source of technology to end user and involve them in the consultation process.

(c) Identify the barriers and agree on actions to be undertaken to remove them with the possible assignment of the role of responsible institutions to deal with barrier removal.

Figure 4. The potential role PFAN can play in implementing TNA findings



86. Possible stakeholders may be Government officials, funding agencies, international institutions, and donors, promoters of technologies, owners of propriety rights, suppliers, users, community groups and NGOs. Possible barriers to consider may be economic context, market penetration potential, awareness, policy options, regulatory mechanisms, institutional capacity, human capacity, technical capacity, infrastructure, culture, distorted trade regimes and political stability among others.

87. Figure 4 above shows the potential role private financing networks such as PFAN in identifying and enhancing the quality of project proposals resulting from TNAs and securing financing for them.

88. *Integration with existing development programs*: Implementation plans need to be integrated within existing national and international programs to gain in effectiveness. This will guarantee the back-up from government and avoid duplications with the overlapping objectives of MEAs, since activities under one program can partially cater for another. For example, improving irrigation efficiency through the shift to more performing systems to reduce energy use and GHG emissions will take care of adaptation to scarce water resources. Prepare the implementation plans in line with development plans and in synergy with MEAs.

89. *Preparation of technology transfer plans*. The technology transfer plan proper may take different forms depending on the technology, the promoters and the beneficiaries. It may be in the form of projects or simply a set of actions for soft technologies such as transfer of research findings or practices for adaptation purposes. It is thus critical to embark the most appropriate and effective institutions in the process. Project writing up, especially for bankable ones will require a multidisciplinary team to produce documents sound enough to be submitted to funding agencies (see table 2). Parties lacking capacity to produce project proposals may resort to the services of PFAN on top of using the UNFCCC Practitioner's Guide.

90. Implementation of technology transfer actions and ongoing review and refinement of actions: This phase consists of the effective physical implementation of projects or activities to promote adoption of ideas/practices. As activities are undertaken, follow-up and monitoring have to be made to ensure that they are done according to the plans. There may be a need at this stage to set up a monitoring committee to monitor and evaluate progress. The plan must have clear activities, within a set timeframe, milestones, indicators and clear responsibilities of stakeholders involved. Concurrently, refinements may be implemented and new actions developed to take care of unforeseen problems cropping up and ensure successful transfer. Identification of stakeholders concerned and setting up of a committee for follow-up to ensure that original objectives are being met is recommended.

91. Access to information on successful implementation of technologies prioritized in TNAs may prove useful to Parties in streamlining their actions and in helping Parties, yet to produce their TNAs to build upon. Ways and means of improving this issue has to be identified. This information may be provided by Parties for inclusion in a databank or through the setting up of regional and international networks for sharing same.

Box 12. Implementing the TNA

Good practice:

- An effective implementation plan is critical to the implementation of recommendations of the TNA;
- Develop a comprehensive list of potential donors;
- Develop a plan with activities, timeframe, milestones, and responsible persons;
- Draw on synergies with relevant ongoing programs;
- Remove barriers;
- Keep stakeholders engaged;
- Revise the plan accordingly.

Box 13. Examples of implemented mitigation and adaptation projects prioritized in TNA of Mauritius.

Bagasse-coal electricity co-generation plant of 86 MW (CT Sav, Mauritius)	**Extension of irrigation facilities (Northern Plains Phase II)**
• Mitigation option identified in NCCAP in 1998 • Integrated in energy policies including IPPs • RFPs requested to meet medium term energy	• Adaptation measure identified in NCCAP in 1998 • Major barrier of water unavailability

demands • PPA signed • Proposal developed and funding sourced • Replacement of inefficient obsolete technology with the latest performing ones to increase conversion efficiency of sugarcane biomass (bagasse) • Concurrently equipments in the industrial process of sugar manufacture upgraded to lower energy consumption, thus increasing the share being exported to the grid • Funding: equity shared by local private corporate company and loans from international banks • CERs traded through the PCF • Project operational June 2007	• Government commissioned a Midlands Dam in 2003 • Project concept developed in stages to alleviate financial burden • Government funded the major step of bringing water from the dam to the perimeter • Stakeholder consultations with the small growers • Project developed and funding sourced • Rainfed sugarcane over about 100 ha to be irrigated • The increased productivity will result in more biomass being burnt for electricity generation thereby displacing the use of fossil fuel • Funding under bilateral agreements with government taking the contingency • Growers pay a water dues to Government for refunding loan • Project commissioned in 2006

D. Cross-cutting issues in TNAs

1. Stakeholder consultations

92. TNA is targeted as a country driven exercise to be done in transparency that dictates for the involvement of the widest possible groups of stakeholders for in-depth consultations. Securing adequate stakeholder participation requires a clear, structured and ongoing framework that involves all relevant parties at an early stage, makes the impacts upon them and their responsibilities clear, and continues to engage with all stakeholders throughout the assessment and implementation process. Effective TNA, technology transfer and development activities will be more successful if, as far as is possible, stakeholders are engaged and involved. Failure to engage with stakeholders can result in a number of problems such as a loss of the insights that stakeholders often provide, and as a result:

(a) A failure to consider the full range options;

(b) Misrepresentation or omission of some sectors, options and opportunities;

(c) Difficulties in undertaking TNA (for example through lack of specialist knowledge);

(d) Difficulties in implementing TNA recommendations, as stakeholders required for implementation may misunderstand or object to proposed actions;

(e) A lack of feedback during implementation, which in turn will bring a little learning from the efforts, and a little improvement as experience grows.

93. It is important to note that in many instances there is likely to be both a *core group* of direct participants and a *wider group* of affected and interested parties. It is therefore important to distinguish between activities that will require direct and detailed input from these two groups:

(a) *The core group* deals with the most substantive issues of the TNA process such as management, resource assessment, technology costing, preparation of reports and other materials. It may prove effective if, following preliminary consultations, sub-teams or sectoral working groups are formed to push ahead in specific areas.

(b) *The wider group of affected and interested parties* would participate in stakeholder consultation and engagement activities, such as workshops, public hearings, consultation papers.

94. Most TNA reports mentioned stakeholder involvement but their involvement in the process was very often unclear as it was not explicitly reported. In most of the cases the stakeholders have been involved though the inception workshop and/or final TNA report presentation workshop or through a questionnaire. In most cases a list of stakeholders who have participated in the exercise is given. Consultation with stakeholders at the grassroots level is barely reported, even if the transfer of selected technologies concerns them directly as recipients.

95. Involvement of stakeholders, especially those who will be the beneficiaries or end user is essential to ensure that ill-suited technologies are not prioritized. Thus, in-depth involvement of all stakeholder groups, identified to have a role in any of the steps of the technology transfer channel, would be recommendable. Such an approach will enable the identification of the most appropriate technology, the barriers to its successful transfer and possible actions to overcome these for inclusion in the implementation plan.

[Insert a case study here]

Box 13. Stakeholder engagement

Good practice:

- Identify stakeholder groups;
- Consult key agencies;
- Set up a core group of stakeholders dealing with substantial issues and identify the lead agency;
- Convene meetings to identify a wider group of stakeholders and define clear objectives at an early stage;
- Keep stakeholders involved at all stages and ongoing;
- Design a communication and outreaching framework with a wide involvement of stakeholders.

2. Barrier analysis

96. Barriers exist at each step of the TNA. Identifying and understanding them and the ways they can be effectively addressed is key to undertaking an effective TNA process. For example, barriers exist at various levels and relate to policies, regulations, financial availability, market, education and awareness, institutional technical and human among others and can only be identified by the stakeholder who may have to support it. Identification of barriers in implementing the different steps of the technology transfer framework, specifically in conducting the assessment, reporting on the results and implementing these and their removal are fundamental for the success of the process.

97. Parties in their TNAs have not brought forward barriers, for successfully conducting the technology assessment, and their removal. Though most Parties identified barriers to technology transfer and measures to address these, the information was very often not clearly reported to facilitate follow-up actions. Some Parties identified barriers in a general manner as opposed to the transfer of individual technologies selected. While some barriers may apply across the board, a minimum fine-tuning is essential to address specific barriers that can hinder the successful transfer of certain technologies.

98. Some barriers, especially those encountered when conducting the TNA has to be removed to ensure selection of the most appropriate technology for further action while removal of barriers to a clear reporting of the results can only enhance the crucial step of final successful transfer.

[Add a case study here]

Box 14. Barrier analysis

Good practice:

- Identify barriers during each step of the TNA process with the involvement of the

widest group of stakeholders;
- Analyze the barriers and look for measures to remove them;
- Stakeholder engagement is critical and contribute to a more robust understanding of key barriers.

3. Technology information

99. Adequate information on technologies available on the market is a strong prerequisite for its proper needs assessment and successful technology transfer. The successful transfer of a technology is strongly related to the country's context and circumstances and only detailed information on available technologies would enable the assessment team to determine its suitability and eventual adoption.

100. Interested countries on technology transfer do need accurate and regular information on climate change response technologies as well as a mechanism for its dissemination on a regular basis to the stakeholders engaged.

101. Some of the basic information required on technologies are initial investment costs, market potential, degree of maturity for the local context, technical characteristics in relation to capabilities of end-users and maintenance requirements among others. Concerning soft technologies for adaptation mainly it is of vital importance to have information on whether the concept or practice is not too complicated for the lower segments of the population to master and apply.

102. A majority of the TNA reports did not mention the sources of information on the technologies that the have listed for assessment.

Box 15. Technology information

Good practice:
- Collect information extensively on each technology to be considered;
- Make the information available to stakeholders

4. Public awareness

103. Public awareness if not available throughout the process may be a serious obstacle to the transfer of certain technologies. This is characteristic of soft technologies and products of direct consumption where the public is the user.

104. A majority of the TNA reports highlight the need for enhanced activities towards raising awareness of different segments of the population.

105. Raising awareness on climate change issues may be reconciled with the technology to be transferred to boost effectiveness. Better awareness would prove useful for transfer of technologies such as energy efficient appliances and even much more for better management practices in agriculture, forestry, land use and livestock sectors. Awareness campaigns may particularly aim the stakeholders who have got restricted access to education and information to be more effective.

Box 13. Public awareness

Good practice:
- Identify public awareness needs along the technology transfer channel.
- Organize awareness campaigns for the stakeholder groups identified.

5. Capacity building

106. It is primordial for the core team undertaking the TNA as well as sectoral teams to assess whether adequate capacity exists along the different stages of the technology transfer channel.

107. The need for capacity-building was identified and expressed by most Parties rather generally. Capacity-building needs varied among Parties and were of human nature principally. Otherwise lack of capacity was identified in relation to finance, market, information and awareness, policies, regulations, institutional and technical among others.

108. Insufficient capacity may prove to be a serious barrier to the process and 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 propose measures for addressing them.

Box 16. Capacity building

Good practice:

- Identify capacity-building needs explicitly for the different steps of the TNA exercise.
- Revise them where possible to ensure a smooth and successful assessment.
- Identify and propose measures to enhance of capacity for the other steps of the process, namely the implementation plan for each individual technology.

6. Research and development

109. Research and development is a vital component for successful technology transfer as very often technologies have to be modified or updated prior to diffusion to render them suitable to the country's context. For certain sectors, such as agriculture and livestock where improved adapted crop varieties or animals were the priority technology option, research and development is imperative for this option to be successful. Moreover, research can contribute to the development of new technologies more apt to meet the local needs.

Box 17. Research and Development

Good practice:

- Identify research and development needs along with technologies prioritized.
- Work out a research and development program.
- Submit to the relevant authorities for implementation.
- Promote participatory research to enhance the flow of technologies.

7. Information sharing and networking

110. Access to information can only be beneficial to the implementation of the technology transfer framework. Existing useful technologies may not be always known to promoters, potential beneficiaries and recipients. Ways and means of enhancing the flow of information has to be sought. Networking is presently proving very useful but further success rests upon the ability and capacity of stakeholders at the bottom end of the chain in non-Annex I Parties to connect to the system. Information sharing may have to be linked to awareness programs to be effective and to have information eventually reach the targeted people.

111. TT: CLEAR, the technology information clearing house of the UNFCCC already constitutes a vast source of information on the technology transfer framework. Information is also shared through CD-ROMs and various other means by the UNFCCC. Results of a survey (FCCC/SBSTA/2004/INF.8) conducted by the secretariat indicated that the majority of the respondents found the web site useful and relevant to their work. Most respondents also found that the information is of good to excellent quality and well organized.

112. The process of technology transfer has been significantly advanced and now that 34 Parties have completed their TNAs, it would be recommendable to organize all available information in a one stop shop for all stakeholders concerned with the framework. Availability of information, especially on the status of implementation and the success of technologies transferred, could prove very helpful in further enhancing the process. Project developers, financiers, policy-makers and planners may also find such information useful in their activities, thus promoting the implementation of the framework for technology transfer. Moreover Parties in the process on undertaking their TNA or to do, may build upon this information to enhance their work.

Box:18. Information sharing and networking

Good practice:

- Analyze existing information sharing systems and networks that concerned stakeholders can access.
- Identify gaps and constraints to effective information sharing.
- Propose measures to enhance access to, and sharing of, information.

IV. STRATEGY FOR IMPROVEMENT

113. [This section will be completed after the workshop taking into account the presentations made and the discussions that took place]

Annex I

Template for reporting activities relating to technology transfer in national communications

Key considerations[a]	Information
Brief description of existing or planned national policies, legal and institutional framework(s) to facilitate the implementation of decision 4/CP.7 in areas such as: technology needs and needs assessments; technology information; enabling environments; capacity-building; and mechanisms for technology transfer.	
Brief description of identified priority activities related to capacity-building, enabling environments, investment, technology assessments and any other relevant information to advance the implementation of Article 4, paragraph 5, of the Convention at the local, national and regional levels.	
Brief summary of the process, key outcomes and funding of the technology needs assessment conducted.	
Brief description of pilot programmes, if any, on technology transfer relating to climate change, including an estimation of required external funding, and modalities to obtain such funds. What are the lessons learned in implementing these pilot programmes?	
Brief description of existing and planned climate-related technology transfer programmes/projects supported by bilateral and multilateral agencies, and international organizations.	
Brief description of the role of the various stakeholders, particularly the private sector and research and development institutions, in the process of technology transfer.	
Brief description of the success/failure of technology transfer, including possible hindrances that limit such transfer, citing examples and lessons learned.	
Brief description of the technology and technology enabling activities that have been identified through the national adaptation programmes of action process as necessary to facilitate immediate adaptation.	
Briefly describe linkages between technology transfer activities, programmes and projects with national development planning processes.	

[a] For further information, see FCCC/SBI/2007/3.