### Executive summary of the third synthesis report on technology needs identified by Parties not included in Annex I to the Convention

# I. INTRODUCTION

#### A. Mandate

1. At its thirty-fifth session, the Subsidiary Body for Scientific and Technical Advice (SBSTA) requested the secretariat to prepare an updated technology needs assessment (TNA) synthesis report for SBSTA 37, including TNAs conducted by Parties not included in Annex I to the Convention (non-Annex I Parties) under the Poznan strategic programme on technology transfer.<sup>1</sup> By 31 July 2013, a total of 31 TNA reports were available and the information contained in these reports was synthesized into the "third synthesis report on technology needs identified by Parties not included in Annex I to the Convention" (third synthesis report on TNAs) to be presented to SBSTA 39.

#### **B.** Scope of the note

2. This note contains an executive summary of the third synthesis report on TNAs currently being prepared by the secretariat which will be submitted to SBSTA 39. It provides a summarized overview of the initial findings of this third synthesis report, which compiled and synthesized information contained in the reports of 31 Parties which participated in the current global TNA project.

### C. Background

3. The current global TNA project, or second round of TNAs, supported by the Global Environment Facility (GEF) under the Poznan strategic programme on technology transfer, had the objective of providing targeted financial and technical support to assist 36 non-Annex I Parties in developing or updating their TNAs and in preparing their Technology Action Plans (TAPs). As part of this support, the United Nations Development Programme (UNDP) prepared an updated TNA handbook in 2010 providing methodological guidance to Parties undertaking or updating their TNAs and TAPs.

4. In preparing their second round TNAs, Parties were encouraged to follow the guidance contained in the updated TNA handbook (UNDP, 2010) and related guidebooks and tools prepared by UNDP and the United Nations Environment Programme (UNEP) Risoe Centre.<sup>2</sup> A methodological structure for preparing a national TNA, as per the UNDP and UNEP guidebooks, may be found in Figure 1. To be consistent with the guidance provided, this executive summary presents its findings in a similar structure.



<sup>&</sup>lt;sup>1</sup> In light of the little number of new TNA reports available in the lead up to SBSTA 37, the preparation of the synthesis report was postponed until a representative number of TNAs would become available.

<sup>&</sup>lt;sup>2</sup> Available online at <tech-action.org/guidebooks.asp>

Figure 1. Proposed main country deliverables from the technology needs assessment project (source: UNEP Risoe)



5. This synthesis report covers TNA reports from 31 non-Annex I Parties that had submitted their reports as of 31 July 2013 (refer to Annex I for a list of these countries and also to Figure 2.). The regional distribution of the Parties is as follows:

- (a) Africa: 11 Parties;
- (b) Asia: 9 Parties;
- (c) Eastern Europe: 3 Parties;
- (d) Latin America and the Caribbean: 8 Parties.

# Figure 2. Overview of countries with TNA reports covered by the third synthesis report (source: http://tech-action.org)



## **II. NATIONAL CIRCUMSTANCES**

# A. General information, national circumstances and existing policies and measures

6. The majority of the Parties commenced their TNA reports with sections on the national greenhouse gas emission (GHG) profile (for mitigation reports) or the vulnerability of the country to climate change (for adaptation reports) and on general country information, national circumstances and existing national policies and measures.

7. In the TNAs for mitigation, most Parties (62 per cent) reported that the majority of country GHG emissions occur in the energy sector (including energy industry use and transport). Bhutan, Cambodia, Costa Rica, Côte d'Ivoire, Mali and Sudan reported that their highest GHG emissions were in the agricultural sector, while Bangladesh, Indonesia and Viet Nam reported highest GHG emissions in the agriculture, forestry and other land-use sector.

8. In the TNAs for adaptation, all Parties included a reference to their potential vulnerability to climate change. Parties noted that their country was vulnerable due to effects caused by temperature rise (mentioned by 84 per cent of Parties), drought (68 per cent), increased or decreased rainfall due to climate change (70 per cent), emerging diseases (65 per cent), flood risks or sea-level rise (both 58 per cent).

9. Around half of the Parties referred to existing national policies and measures for mitigation and adaptation to climate change, such as low emission development, national green growth and climate resilient strategies, climate change response measures and climate change scenario documents. Some Parties also reported on the development of national adaptation programmes of action (NAPAs) (Bhutan and Rwanda). Finally, Parties also reported national policies and measures at the sectorial level that were used as references for the TNAs.

# **B.** Organization of the technology needs assessment process and involvement of stakeholders

10. Most Parties (77 per cent) reported that the coordination of the TNA process was carried out by a national ministry (e.g. ministry of environment). 95 per cent of Parties reported that a steering committee was established to provide final endorsement of the TNA results, with wider stakeholder groups being involved in several stages of the process. Commonly applied methods for stakeholder involvement included workshops, in-depth interviews, focus-group meetings and online surveys. Figure 3 illustrates the percentage of Parties that mentioned different methods of stakeholder involvement for both mitigation and adaptation.

11. Stakeholders commonly identified by Parties included national government representatives, the academica, private sector and independent consultants. Some Parties reported involving local governments, electric utility companies, news media and potential donors. Non-governmental organisations were reported to have been commonly involved in the TNA processes of the Eastern Europe, Asian and African Parties. However, less than 15 per cent of Parties reported involvement of stakeholders from the finance community or from in-country donor representatives.



Figure 3. Stakeholder involvement process (methods mentioned by percentage of Parties)

#### C. Development priorities

12. Many Parties (81 per cent) included in their TNA reports a section on their national development priorities. Most Parties derived these priorities from existing medium- or long-term development plans, policies or measures, while others decided upon them in a participatory manner as part of the TNA process.

13. Most Parties identified at least one social, one economic and one environmental development priority. Among the most identified development priorities were those of ensuring food security, reducing air pollution and developing infrastructure. Furthermore, some countries (Bangladesh, Cambodia and Indonesia) stated that they wanted to be 'part of the solution to global climate change'.

## III. TECHNOLOGY NEEDS: PRIORITIZATION OF SECTORS AND TECHNOLOGIES

#### A. Criteria for prioritizing sectors

14. The majority of the Parties, consistent with the guidance provided by UNEP, undertook, as a first step, the process of prioritizing certain sectors<sup>3</sup> in which national technology needs could be identified and analysed. For mitigation, most Parties prioritized sectors based on a consideration of the GHG emissions of the sector and the development priorities (social, economic and environmental) of the country. Similarly, for adaptation most Parties prioritized sectors based on the undertaken vulnerability analysis and the national development priorities.

#### B. Sectors prioritized for mitigation

15. The energy sector was clearly the most prioritized mitigation sector, prioritized by 90 per cent of the Parties (principally the energy industries and transport sub-sectors). The agriculture, forestry and other land use sector was prioritized by approximately one-third of the Parties. Around 20 per cent of the Parties prioritized the waste sector (see Figure 4 for a list of the sectors prioritized for mitigation). Within the energy sector, the most prioritized sub-sectors were energy industries (92 per cent of Parties that prioritized the energy sector) and transport (46 per cent).



Figure 4. Sectors prioritized for mitigation (percentage of Parties)

#### C. Sectors prioritized for adaptation

16. In the TNAs for adaptation, the most commonly prioritized sectors were agriculture (84 per cent), water resources (77 per cent) and infrastructure and settlements (including coastal zones) (32 per cent) (see Figure 5). In general, the prioritized sectors for adaptation

<sup>&</sup>lt;sup>3</sup> The classification of mitigation sectors is based on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories – Overview, page 6. The classification of adaptation sectors is based on the 2007 IPCC Synthesis Report on Climate Change, page 57.

were consistent with the identified sectors identified in Party national vulnerability analyses.



Figure 5. Sectors prioritized for adaptation (percentage of Parties)

#### D. Criteria and methods for prioritizing technologies

17. Following a prioritization of sectors for their TNAs, all Parties then prioritized technologies in these sectors, in this way identifying the most important national technology needs. Parties firstly identified a broad spectrum of possible technologies in the prioritized sector (a "long list" of technologies) and then prioritized certain technologies from this list based on specific criteria. Most Parties developed this criteria based on the estimated environmental, social and economic benefits of the technology as well as criteria related to the technology's costs and market potential. For mitigation technologies, 97 per cent of Parties also considered the GHG emissions reduction potential of the technology. For adaptation technologies, most countries (94 per cent) considered the potential contribution of the technology to the reduction of national vulnerability to climate change.

#### E. Technologies prioritized for mitigation

18. For the energy sector, within the sub-sector of energy industries, solar photovoltaic technologies were most often prioritized (14 per cent), followed by wind turbines (9 per cent) and small scale hydro and combined heat and power (CHP) based on biomass and fossil fuels (both 7 per cent). Of the prioritized technologies for energy industries (not including waste-to-energy), 70 per cent were renewable energy-based technologies. The spread of prioritized technologies for the energy industry sub-sector may be observed in Figure 6. For the category of waste-to-energy, prioritized technologies included landfill methane recovery for energy use, municipal solid waste combustion for electricity and heating and biomass waste digestion.

19. For the energy sub-sector of transport, most prioritized technologies were in the category of modal shift, followed by fossil fuel switch technologies and infrastructure improvement technologies. Technologies prioritized for the industrial sector were principally in the categories of highly efficient electric motors and energy efficient brick production.





#### F. Technologies prioritized for adaptation

20. For technologies prioritized for adaptation, the highest number of technologies were prioritized in the agriculture (including forestry) sector (39 per cent of the adaptation technologies), followed by water resources (37 per cent) and infrastructure and settlement (including coastal zones) (18 per cent). This distribution is consistent with the sectors prioritized by Parties for adaptation.

21. In the agricultural sector, the large majority of the prioritized technologies were related to crops (90 per cent), with the remaining technologies in the categories of forestry, livestock and fisheries. A breakdown of the crop-related technologies found that 51 per cent of these technologies were targeting farmer behaviour, 30 per cent technological measures including biotechnology (hard technologies) and 19 per cent monitoring and institutional changes. This breakdown can be observed in Figure 7.

22. In the water resources sector, 93 per cent of the technologies in this sector can be categorised as supply side measures. Commonly identified technologies included rainwater harvesting, small reservoirs, sub-surface storage and irrigation. Within the infrastructure and settlement (including coastal zones) sector, most of the prioritized technologies (53 per cent) were related to coastal protection.



Figure 7. Prioritised technology categories in the agriculture sector.

### IV. BARRIER ANALYSIS AND ENABLING FRAMEWORK

23. As part of the TNA process, the majority of Parties, for each technology prioritized, undertook an analysis of the barriers to the development, transfer, deployment, dissemination and use of the technology, followed by an identification of the possible measures required to create enabling environments to overcome these barriers.<sup>4</sup>

24. For the most prioritized mitigation sector, the energy sector, economic and financial barriers were identified by all Parties. Within this barrier classification, the most commonly identified barriers were (i) the existence of inappropriate financial incentives and disincentives and (ii) a lack of or inadequate access to financial resources (both identified by more than 80 per cent of Parties, refer to Figure 8.1). The main non-financial barrier, also identified by all Parties, was an insufficient legal and regulatory framework within the barrier classification of policy, legal and regulatory framework barriers (refer to Figure 8.2). The most commonly identified enablers to address these barriers were to provide or expand financial incentives (80 per cent) and to strengthen the regulatory framework for the technology (also 80 per cent), both to attract investors to the market.

<sup>&</sup>lt;sup>4</sup> When assessing potential barriers for selected prioritized technologies within their prioritized sectors, Parties often followed the guidelines of the UNEP guidebook 'Overcoming Barriers to the Transfer and Diffusion of Climate Technologies' (UNEP, 2012). Consistent with this guidance, the majority of the identified barriers identified by Parties correspond, in terms of barrier classification, to those contained in Annex A of this handbook. Often, Parties also added other country-specific barriers that reflected their national circumstances.







25. For the most prioritized adaptation sector to climate change, the agriculture sector, the most commonly identified barriers were, similarly to those in the energy sector, (i) the lack or inadequate access to financial resources and (ii) an insufficient legal and regulatory framework (both identified by 96 per cent of Parties). Within the classification of financial and economic barriers, the barrier of lack of adequate access to financial resources was the most commonly identified barrier (89 per cent) (refer to Figure 9.1; for a breakdown of the policy, legal and regulatory barriers refer to Figure 9.2). The most commonly identified enablers to address these barriers in the agricultural sector were the creation of national financial mechanisms or policies (65 per cent) and the creation of an allowance in the national budget for this technology (including promotion of R&D) (50 per cent).









26. Capacity-building efforts and information awareness campaigns (including formal and informal means of education) were identified by a large majority of Parties as stringent measures to address barriers for all the mitigation and adaptation sectors and technologies.

### V. ACTION PLANS AND PROJECT IDEAS

# A. Compilation and synthesis of information included in the technology action plans

27. Parties, having identified measures (enablers) to address identified barriers, subsequently further elaborated these measures in technology action plans (TAPs). TAPs recommend an enabling framework for the development and transfer of prioritized technologies at the desired scale. Parties usually assume a scale for implementation of the options, such as:

(a) Implementation as a stand-alone project (e.g. a wind farm);

(b) Implementation of the technology within a sector (e.g. energy efficiency measures in a certain sector);

(c) Implementation at a national scale for reaching country goals or milestones (e.g. 30% share of renewable technologies in electricity production by 2025).

28. TAPs generally contain multiple actions for accelerating the development and transfer of a prioritised technology within the country. Most Parties grouped TAP actions in categories such as:

- (a) Policy and regulatory actions;
- (b) Economic and financial actions;
- (c) Infrastructure requirements;
- (d) Information campaigns and awareness building;
- (e) Skills training;
- (f) Capacity building activities;
- (g) International cooperation actions.

29. Over 90 per cent of Parties prepared TAPs for the technologies that they prioritized for mitigation and adaptation. However, the form of the TAPs differed from Party to Party. Some Parties (approximately 40 per cent) prepared as many TAPs as prioritized technologies for mitigation and adaptation. Other countries prepared overarching TAPs at the sectorial level, covering multiple technologies. Furthermore, some Parties prepared a detailed TAP for a selection of prioritized technologies within a sector. Some Parties prepared multiple TAPs for a prioritized technology.

30. Over 85 per cent of the TAPs included in the TNA reports contain information about targets, budget and actors responsible for the actions (both public and private actors). Approximately 65 per cent of the actions in TAPs contain descriptions of how an action should be implemented. Less frequently included in TAPs are information about ways to secure funding (around 45 per cent) and monitoring, reporting and verification requirements (around one-third of Parties).

31. Most actions are foreseen for implementation within a period of five years, while others have a five to ten year timeframe. Relatively few actions, specifically those that are

related to larger scale infrastructural investment or longer term sustainable agriculture measures, have time frames between 10 to 20 years.

32. For mitigation, over 60 per cent of Parties specified costs for their mitigation TAPs, with the sum of these totalling USD 5.2 billion. USD 2.8 billion was estimated for physical investments (i.e. infrastructure or pilots to support research and development), USD 1.4 billion for providing financial and economic support and incentives and USD 214 million for capacity-building measures. Of this total amount, USD 2.4 billion was identified for short term actions (to be undertaken within the next five years).

33. Similarly for adaptation, over 60 per cent of Parties specified costs for their adaptation TAPs, for a total amount of USD 2.4 billion. The costs are estimated for TAPs relating to physical investments (USD 934 million), financial and economic support and incentives (USD 866 million) and capacity-building action (USD 369 million). While some countries had elaborate budgets (Senegal, Mongolia and Ecuador), several Parties had a total budget that did not exceed USD 10 million.

34. With regards to a sectorial breakdown, for mitigation sectors by far the highest costs were estimated for the energy sector (USD 4.8 billion). Virtually the entire specified budget for adaptation was for actions in the water and agriculture sectors, respectively USD 1.17 billion (49%) and USD 1.13 billion (43%). Only 1 per cent of the costs specified for TAPs for adaptation was for the infrastructure and settlement (including coastal zones) sector.

# **B.** Compilation and synthesis of information included in the project ideas reports

35. In total, 87 per cent of Parties developed concrete ideas, proposals or concepts for projects or programmes based on their priority technology needs. Energy industries was clearly the mitigation sub-sector with the most identified project ideas. Other sectors or sub-sectors commonly identified included waste management, agriculture and transport. For adaptation, most of the project ideas were for technologies in the agriculture and water sectors and to a lesser extent the infrastructure and settlement (including coastal zones) sector.

36. The map shown on Figure 10 gives a visual representation of the estimated budgets for the project ideas of the Parties. Costa Rica and Peru are not displayed as these Parties did not specify the budgets for their project ideas. For Argentina, Bangladesh, Cuba, Mali, Mongolia and Morocco the project idea budgets amount to more than USD 1 billion. Except for Mali and Morocco, these Parties have allocated more than 99 per cent of their budget for projects for mitigation.

37. Most of the project ideas (46 per cent) were developed as a comprehensive project or programme including steps or areas on: research, capacity building, financial schemes, pilot projects and technology demonstration. 19 per cent of the projects were specifically focused on capacity building and training, while 17 per cent of the projects ideas focused on research of the technology.

38. The total estimated budget required for the 257 project ideas identified by Parties amounted to more than USD 24.7 billion. USD 12.5 billion was estimated to be required for project ideas related to mitigation and 12.2 billion for adaptation.

39. Most of the mitigation budget is estimated to be required for the energy sub-sectors: energy industries (27 per cent of the total budget) and transport (20 per cent). This may imply that other sectors with a significant number of project ideas, such as industry and agriculture and forestry, are estimated to require relatively small budgets.

40. The sectors for adaptation which are estimated to require most of the budget are water (35 per cent) and agriculture (14 per cent). For project ideas in other sectors, budget requirements are overall insignificant.



Figure 10. World map with Parties' budgets for project ideas.

### VI. CROSS-CUTTING ELEMENTS

# A. Linkages between technology needs assessments and other processes under the Convention

41. Over half of the TNA reports analysed in this synthesis report included consideration of possible interlinkages between TNAs and other climate and development-related domestic processes and other processes under the Convention. A few Parties made reference to how the Technology Mechanism of the Convention could support the implementation of TNA results (Argentina and Georgia).

42. Approximately half of the Parties which considered possible interlinkages noted that their TNAs were based on completed work on nationally appropriate mitigation actions (NAMAs) and NAPAs, or considered how the TNA could provide inputs to these processes.

43. Parties, in their TNA reports, frequently referred to the first and second national communications to the United Nations Framework Convention on Climate Change as an important basis for the TNA process. Many Parties reported that they derived development priorities, climate goals, sectorial GHG emissions or information on vulnerability assessments from these documents. 25 per cent of all Parties identified TNA outputs as inputs for work on national communications, NAMAs or national adaptation plans (NAPs).

44. Parties seldom saw the TNA as a stand-alone process. Instead, TNAs were often seen as complementing national policies and plans in mitigating GHG emissions and adapting to climate change.

#### **B.** Regional analysis

45. A regional analysis of the TNA reports found that there were often many similarities in the elements reported by Parties of the same region. With regards to mitigation, the energy sector amounted to 50 per cent of the prioritized mitigation sectors for Parties from the African and Eastern European regions. For Parties from the region of Latin America and the Caribbean there was a relatively strong focus on transport and agriculture. For the Asian Parties there was more diversity in the prioritized sectors than in the other regions.

46. In the energy sector, Parties from Latin America and the Caribbean had a strong focus on biomass-related technologies, while other regions more commonly prioritized wind energy. Technologies related to solar power were prioritized by almost all African Parties.

47. For adaptation, in all regions the agriculture and water sectors were dominant, but there are significant regional differences. In Africa, these sectors amounted to 95 per cent of the chosen sectors, while in Latin America and the Caribbean only 47 per cent of the chosen sectors was either agriculture or water.

48. Coastal protection technologies are prevalent in Latin America and the Caribbean as well as in Asia. In the agricultural sector, the African Parties focused strongly on conservation agriculture. African and Asian Parties also prioritized technologies for the development of new crop varieties.

#### VII. KEY FINDINGS

49. Important initial findings from the synthesis of TNAs include the following:

(a) A total of **29 Parties** prepared TNA reports on mitigation and adaptation, while **two Parties** prepared TNA reports on adaptation only;

(b) Most Parties (77 per cent) reported that the coordination of the TNA process was carried out by a national ministry and **all Parties mentioned involving stakeholders** in the TNA process, particularly through workshops and expert consultation. However, **only 15 per cent of Parties** reported involvement of stakeholders **from the finance community** or from in-country donor representatives.

(c) For mitigation, the most prioritized sector was the energy sector which was prioritized by over 90 per cent of Parties. The prioritized sub-sectors of the energy sector were energy industries (92 per cent of Parties that prioritized the energy sector) and transport (46 per cent). For adaptation, the agriculture (84 per cent) and water sectors (77 per cent) were the most prioritized.

(d) Within the energy sub-sector of energy industries, solar photovoltaic technologies were most often prioritized (14 per cent). Of the prioritized technologies for energy industries (not including waste-to-energy), 70 per cent were renewable energy-based technologies. In the agricultural sector, the large majority of the prioritized technologies in this sector were related to crops (90 per cent). In the water resources sector, 93 per cent of the technologies in this sector were supply side measures.

(e) The most commonly reported barriers to technology transfer were economic and financial barriers. For mitigation, the most commonly identified barriers of this kind were the existence of inappropriate financial incentives and disincentives (89 per cent). For adaptation, the barrier of lack of adequate access to financial resources was the most commonly identified barrier (90 per cent).

(f) **Over 90 per cent of the Parties prepared TAPs** for the technologies that they prioritized for mitigation and adaptation. Over 60 per cent of Parties specified costs for the implementation of their TAPs, with the **sum totalling USD 5.2 billion for mitigation and USD 2.4 billion for adaptation**.

(g) In total, **87 per cent of Parties developed concrete ideas, proposals or concepts for projects or programmes** based on their priority technology needs. USD 12.5 billion was estimated by Parties to be required for project ideas related to mitigation and 12.2 billion for adaptation.

(h) **Approximately half of the Parties** which considered possible interlinkages noted that their TNAs were based on completed work on **NAMAs and NAPAs**, or considered how the TNA could provide inputs to these processes.

(i) Parties seldom saw the TNA as a stand-alone process. Instead, **TNAs were** often seen as complementing national policies and plans in mitigating GHG emissions and adapting to climate change. 25 per cent of all Parties identified TNA outputs as inputs for work on national communications, NAMAs or NAPs.

# Annex I – List of the Parties included in the third synthesis report on technology needs assessments of non-Annex I Parties

	Party	Region	TNA Language	Mitigation report	Adaptation Report
1	Argentina	Latin America and the Caribbean	Spanish	Yes	Yes
2	Azerbaijan	Eastern Europe	English	Yes	Yes
3	Bangladesh	Asia	English	Yes	Yes
4	Bhutan	Asia	English	Yes	Yes
5	Cambodia	Asia	English	Yes	Yes
6	Colombia	Latin America and the Caribbean	Spanish	Yes	Yes
7	Costa Rica	Latin America and the Caribbean	Spanish	Yes	Yes
8	Cote d'Ivoire	Africa	French	Yes	Yes
9	Cuba	Latin America and the Caribbean	Spanish	Yes	Yes
10	Dominican Republic	Latin America and the Caribbean	Spanish	Yes	Yes
11	Ecuador	Latin America and the Caribbean	Spanish	Yes	Yes
12	El Salvador	Latin America and the Caribbean	Spanish	No	Yes
13	Georgia	Eastern Europe	English	Yes	Yes
14	Ghana	Africa	English	No	Yes
15	Indonesia	Asia	English	Yes	Yes
16	Kenya	Africa	English	Yes	Yes
17	Laos	Asia	English	Yes	Yes
18	Lebanon	Africa	English	Yes	Yes
19	Mali	Africa	French	Yes	Yes
20	Mauritius	Africa	English	Yes	Yes
21	Mongolia	Asia	English	Yes	Yes
22	Morocco	Africa	French	Yes	Yes
23	Peru	Latin America and the Caribbean	Spanish	Yes	Yes
24	Republic of Moldova	Eastern Europe	English	Yes	Yes
25	Rwanda	Africa	English	Yes	Yes
26	Senegal	Africa	French	Yes	Yes
27	Sri Lanka	Asia	English	Yes	Yes
28	Sudan	Africa	English	Yes	Yes
29	Thailand	Asia	English	Yes	Yes
30	Vietnam	Asia	English	Yes	Yes
31	Zambia	Africa	English	Yes	Yes