



Technology Executive Committee

29 August 2017

Fifteenth meeting

Bonn, Germany, 12–15 September 2017

Updated paper on linkages between the TNA and NDC process

Background paper

I. Background

1. The COP-21 welcomed the interim report by the TEC on guidance on enhanced implementation of the results of TNAs.¹ In the interim report it was noted that the TAP Guidance was provided to describe the scope and rationale for the TAP, and that as a starting point, the TAP formulates and discusses the ambition for this technology implementation, which should be based on existing country development plans, as well as other processes under the Convention such as the development of intended nationally determined contributions (INDCs).

2. The TEC at its twelfth meeting included in its work plan for 2016-2018 the activity to analyse linkages between TNA process and Nationally Determined Contribution (NDC) process. A draft providing an overview of linkages between the technology needs assessment process and the nationally determined contribution process was discussed by the TEC at its thirteenth meeting. The TEC agreed to continue consideration of this issue in 2017.

II. Scope of the note

3. The draft paper provides an overview of linkages between the technology needs assessment process and the nationally determined contribution process, including an analysis of NDCs and TNAs, including 71 NDCs from a variety of countries, at different stages, and how concretely it relates to the TNA process and outcomes of the TNA reports.

4. The draft paper builds on work on the current state of play of the relevant decisions from COP-20 until COP-22, the TNA process including conducting and reporting of TNAs and TAPs, TNA background paper on linkages between TNAs and other climate policy making processes, the TEC brief on Possible integration of the TNA process with NAMA, NAP, and NC processes, the work plan of the TEC for 2016-2018 and its relevant activities, experiences and lessons learned from linking TNAs with NDCs, and other relevant documents and literature.

III. Expected action by the Technology Executive Committee

5. The TEC will be invited to take note of the information provided and provide further guidance on this work.

¹ FCCC/SB/2015/INF.3.

Contents

	<i>Paragraphs</i>	<i>Page</i>
Annex I		
Draft paper on Linkages between Technology Needs Assessments and National Determined Contributions		3
I. Introduction	1–11	3
A. Background.....	1–8	3
B. Objectives	9	4
C. Scope of the paper	10	4
D. Possible action by the TEC.....	11	5
II. TNA and NDC processes under the Convention.....	12–29	5
A. TNA process	14–21	6
B. NDC process.....	22–29	7
III. Linkages between the TNA and NDC processes.....	30–36	11
A. Commonalities and differences between the processes of TNAs and NDCs..	34–36	11
IV. Existing good practices on linking TNA and NDC processes.....	37–54	13
A. Prioritization of sectors, technologies and measures	40–41	14
B. Development of targets.....	42–44	14
C. Reporting on costs and finance	45–48	15
D. Capacity building.....	49–51	15
E. Focus on implementation.....	52–53	16
F. Examples	54	16
V. Possibilities of creating linkages on an institutional level.....	55–66	19
A. TNAs	56–58	19
B. NDCs	59–61	19
C. Enhancing linkages between TNAs and NDCs at an institutional level	62–66	20
VI. Way forward.....	67–70	20
VII. Summary and conclusions.....	71–72	21
Annex II		
Analysis of NDCs and TNAs (second generation)		23

Annex I

Draft paper on Linkages between Technology Needs Assessments and National Determined Contributions¹

I. Introduction

A. Background

1. The Conference of Parties, at its eighteenth session, welcomed the report on activities and performance of the Technology Executive Committee (TEC) for 2012.² This includes an activity on the review of technology needs from various sources, with a view to strengthening the understanding of technology needs, to complement the processes for nationally appropriate mitigation actions (NAMAs), national adaptation plans (NAPs), and national communications (NCs), and to support the TEC in preparing its recommendations on guidance on policies and programmes.

2. The TEC, in its report to the Conference of Parties (COP) 18, delivered the following key messages:³

(a) Development and implementation of Technology Needs Assessments (TNAs) should continue and become integrated with other UNFCCC related processes, including the preparation of NAMAs, NAPs and NCs;

(b) There is a need to engage the financial and business communities and funding sources under and outside the Convention to facilitate the implementation of the TNA outcomes.

3. The secretariat, in collaboration with the TEC, organized an in-session workshop on TNAs in conjunction with the seventh meeting of the TEC. The aims of the workshop were also to discuss linkages between the TNA process and other planning tools under the Convention, such as NAMAs, NAPs, and NCs. The workshop was attended by members of the TEC and the Advisory Board of the Climate Technology Centre and Network (CTCN), TNA country coordinators, NC country coordinators, NAMA and NAP practitioners. Taking into account the outcomes of the workshop, the TEC finalized two TEC briefs on TNAs.⁴

4. Building on the work that has been undertaken by the TEC in 2013, the TEC delivered in its report to COP-19 the following key messages:⁵

(a) Parties, when identifying and preparing mitigation and adaptation actions such as NAMAs and NAPs, could ensure coherence with the methodology and results of their TNA processes;

(b) The use of a road-mapping approach may help to improve planning processes, including technology action plans, NAMAs and NAPs, and may help parties to transform the results of their TNAs into actions;

(c) National Designated Entities (NDEs) have the potential to play a key role in establishing strong linkages and maintaining coherence at the national and regional levels between the different planning processes under the Convention, such as TNAs, NAMAs and NAPs.

5. The TEC at its eighth meeting included in its work plan for 2014-2015 the following activities:

¹ This paper was commissioned by the Technology Executive Committee (TEC) of the United Nations Framework Convention on Climate Change (UNFCCC) and was prepared by Sara Traerup, Skylar Bee, Sudhir Sharma, and Lindy Charlery.

² FCCC/SB/2012/2.

³ FCCC/SB/2012/2 paragraph 30.

⁴ http://unfccc.int/ttclear/pages/tec_home.html.

⁵ FCCC/SB/2013/1 paragraph 45.

(a) Further work on possible ways to establish linkages between TNAs and NAMAs, NAPs and NCs, and involve NDEs in the process;

(b) Deliver guidelines to assist parties in implementing the results of TNAs;

(c) Assist policymakers to integrate the TNA process with other processes under the Convention, and to enhance implementation of TNA results;

(d) Prepare recommendations to COP-20 on TNAs and the linkages between TNAs and NAMA, NAPs and national communications, based upon the above activities.

6. The COP-20 requested the TEC to provide guidance on how the results of the TNAs, in particular the Technology Action Plans (TAPs), can be developed into projects that can be implemented, and to provide an interim report on its preliminary findings to SB-43.

7. The COP-21 welcomed the interim report by the TEC on guidance on enhanced implementation of the results of TNAs.⁶ In the interim report it was noted that the TAP Guidance was provided to describe the scope and rationale for the TAP, and that as a starting point, the TAP formulates and discusses the ambition for this technology implementation, which should be based on existing country development plans, as well as other processes under the Convention such as the development of intended nationally determined contributions (INDCs).

8. The TEC at its twelfth meeting included in its work plan for 2016-2018 the following relevant activities:

(a) In collaboration with the Adaptation Committee (AC), the LCD Expert Group (LEG), and the CTCN, consider how parties could be helped to align their TNAs with the process to formulate and implement NAPs, drawing on the previous work, prepare an update to inform the TEC;

(b) Analyze linkages between TNA process and Nationally Determined Contribution (NDC) process.

B. Objectives

9. The objectives of this paper are to:

(a) Enhance understanding on linkages between TNAs and NDCs, and on how these could be achieved;

(b) Propose options to establish concrete linkages between TNAs and NDCs; and

(c) Assist the TEC in delivering relevant key messages and recommendations to parties through the COP-23.

C. Scope of the paper

10. This paper builds on work on the current state of play of:

(a) The relevant decisions from COP-20 until COP-22;

(b) The TNA process including conducting and reporting of TNAs and TAPs;

(c) TNA background paper on linkages between TNAs and other climate policy making processes;

(d) The TEC brief on Possible integration of the TNA process with NAMA, NAP, and NC processes;

(e) The work plan of the TEC for 2016-2018 and its relevant activities;

(f) Experiences and lessons learned from linking TNAs with NDCs;

(g) Other relevant documents and literature.

⁶ FCCC/SB/2015/INF.3.

D. Possible action by the TEC

11. The TEC may wish to consider the draft, and:

(a) Identify follow-up actions, including agreeing on a process for finalising the paper after TEC 13;

(b) Provide initial guidance to the task force on TNAs on possible elements of draft key messages/recommendations to the COP on this matter.

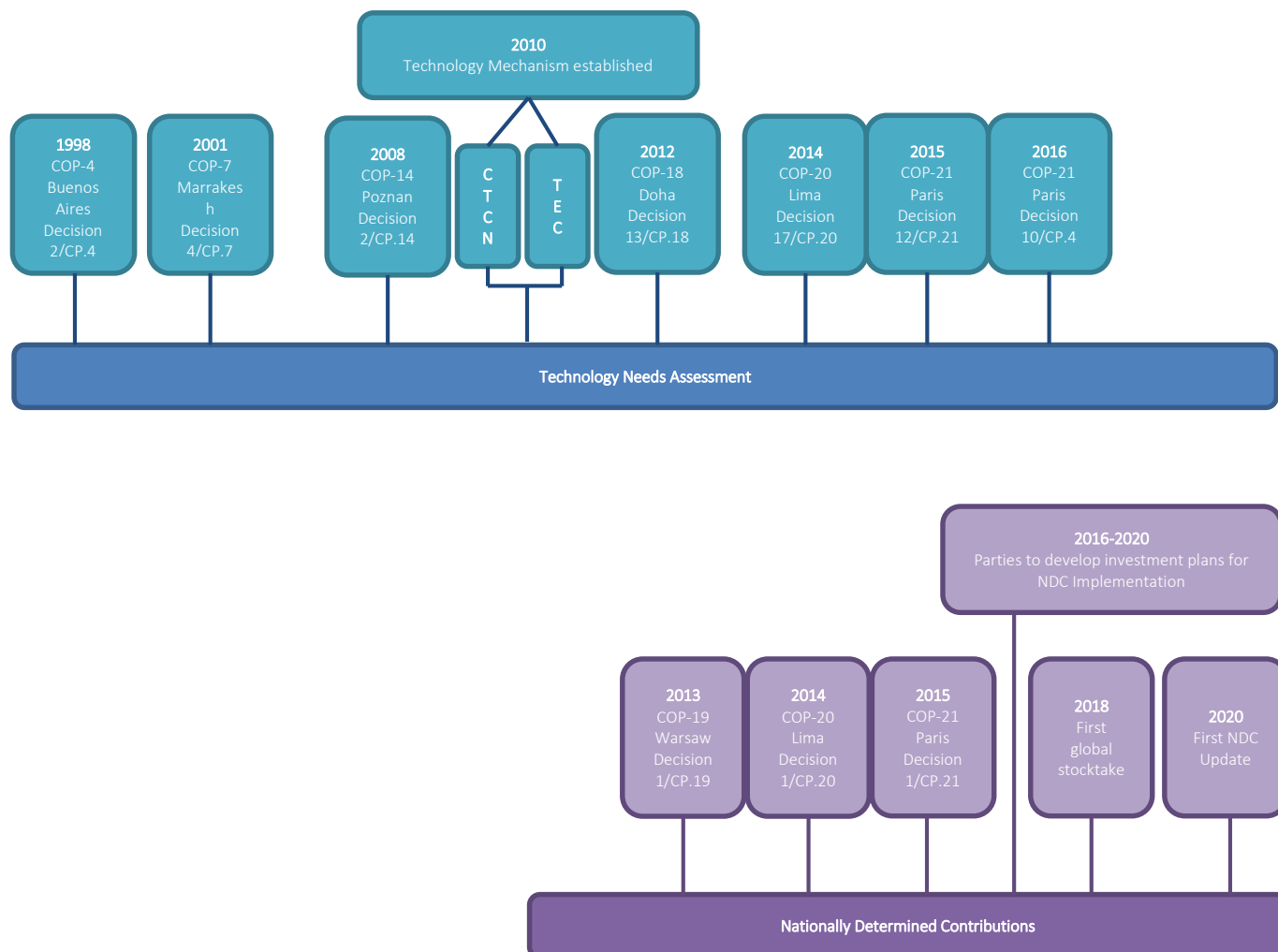
II. TNA and NDC processes under the Convention

12. Commitments to promote technology transfer to developing countries have been renewed at every COP to the Convention. In 2010, this level of commitment led to the establishment of the Technology Mechanism, which aims to ‘facilitate enhanced action’ on technology development and transfer to support progress on climate change mitigation and adaptation. Related to this are numerous on-going initiatives in developing countries, including TNAs, Low Carbon Development Strategies, NAPs and NAMAs, financed by bilateral and multilateral organisations as well as, in some cases, developing country budgets.

13. Intended Nationally Determined Contributions (INDCs) were introduced at COP-19, with the Convention inviting Parties to prepare their INDCs to address climate change. COP-20 further elaborated this decision, and in the lead-up to COP-21 Parties prepared their INDCs, outlining the post-2020 climate actions and agendas they intend to implement under the Paris Agreement. After the Paris Agreement is ratified by each party, INDCs become first NDCs, unless parties choose to submit a revised NDC along with ratification as the first NDC.

Figure 1

Development of TNA and NDC processes under the Convention



A. TNA process

14. In 1999, the Global Environment Facility (GEF) Council agreed that “some of the immediate capacity building priorities of non-Annex I Countries, identified in the COP decision 2/CP.4, may initially be met through additional funding under expedited procedures for enabling activities.” Based on the above COP Decision, the GEF identified a list of eligible activities for the top-up projects, including identification and submission of technology needs and capacity building to assess those needs. Consequently, the GEF funded the development of the first 69 TNA reports from 1999 until 2008.

15. TNAs were introduced under the Convention at COP-7, which defined TNAs as “a set of country-driven activities that identify and determine the mitigation and adaptation technology priorities of Parties” and “particularly developing Parties.”⁷

16. At COP-14 in 2008, TNA development was included in the Poznan Strategic Programme on Technology Transfer as a key component for “scaling up the level of investment in technology transfer in order to help developing countries address their needs for environmentally sound technologies.”⁸

17. COP-18 recognized that TNAs and their syntheses “are a key information source for the work of the Technology Executive Committee in prioritizing its activities under the Technology Mechanism, and could be a rich source of information for governments, relevant bodies under the Convention and other stakeholders.”⁹

18. COP-20 requested that the TEC provide guidance on how the results of the TNAs, in particular the TAPs, can be developed into projects that can be ultimately implemented. The COP-21 welcomed the interim report by the TEC on guidance on enhanced implementation of the results of TNAs.¹⁰

19. Based on a COP-21 mandate,¹¹ parties at SB-44 in May 2016 initiated the elaboration of the Technology Framework, which will further promote and facilitate enhanced actions on technology development and transfer. The TNA process will play a central role in the implementation of environmentally sound mitigation and adaptation technologies.

20. A TNA process usually takes between 18 and 24 months, and is organized around three main steps and deliverables (Figure 2), with three main objectives:

(a) To identify and prioritise mitigation and adaptation technologies for selected sectors;

(b) To identify, analyse and address barriers hindering the deployment and diffusion of the prioritised technologies including enabling the framework for the said technologies;

(c) To articulate, based on the inputs obtained from the two previous steps, a TAP, which is a medium/long term plan for increasing the uptake of identified technologies. The plan outlines actions to be undertaken to enhance the uptake, which are further elaborated as project concept notes.

21. In addition to these steps, a national organisational structure is set up for the TNA process. For each of the steps, guidance and methodologies are available.¹²

⁷ Decision 4/CP.7, pp. 22-30.

⁸ Decision 2/CP.14, FCCC/CP/2008/7/Add.1, para 1.

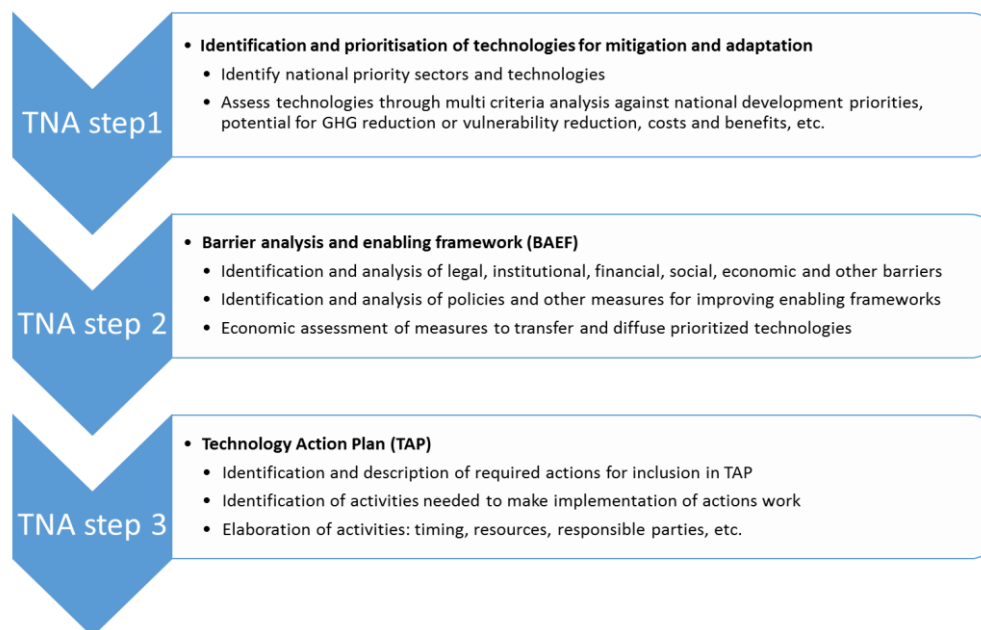
⁹ Decision 13/CP.18, FCCC/CP/2012/8/Add.2, para 10.

¹⁰ FCCC/SB/2015/INF.3.

¹¹ Decision 1/CP.21, para 67.

¹² <http://www.tech-action.org/Publications/TNA-Guidebooks>.

Figure 2
Key steps and components of the TNA process



B. NDC process

22. INDCs were introduced at COP-19, where Parties decided ‘to invite all Parties to initiate or intensify domestic preparations for their intended nationally determined contributions,...’ while at the same time facilitating ‘**the clarity, transparency and understanding** of the intended contributions, without prejudice to the legal nature of the contributions’.¹³

23. In 2014, this decision was reiterated at COP-20.¹⁴ Parties also agreed that INDCs towards achieving the objective of the Convention should represent a progression beyond current mitigation efforts. Furthermore, parties agreed that in order to facilitate clarity, transparency and understanding, the information to be provided by Parties communicating their intended nationally determined contributions may include, as appropriate, inter alia, quantifiable information on the base year, timeframes and/or periods for implementation, scope and coverage, planning processes, assumptions and methodological approaches.

24. The Paris Agreement, agreed by Parties at COP-21, called upon each party to prepare, communicate and maintain their successive NDC.¹⁵ As part of the Paris Agreement and its adopting decision, the Adaptation Committee and Least Developed Countries Expert Group were requested to develop modalities for recognizing parties' adaptation efforts.

25. Implications from the Paris Agreement on NDCs include, but are not limited to:

- (a) Parties may update their NDCs any time and are required to do so at least every five years starting from 2020;
- (b) Parties are encouraged to submit an updated contribution upon ratification of the Agreement;
- (c) A global stocktake should monitor progress towards the long-term goals every 5 years, starting in 2023;

¹³ Decision 1/CP.19, p. 4.

¹⁴ Decision 1/CP.20, p. 3.

¹⁵ Decision 1/CP.21, p. 4.

(d) A facilitative implementation committee should monitor the progress of NDC implementation at the national level and every update must be at least as strong as the previous contribution;

(e) An international review process will provide each party with suggestions for increasing ambition.

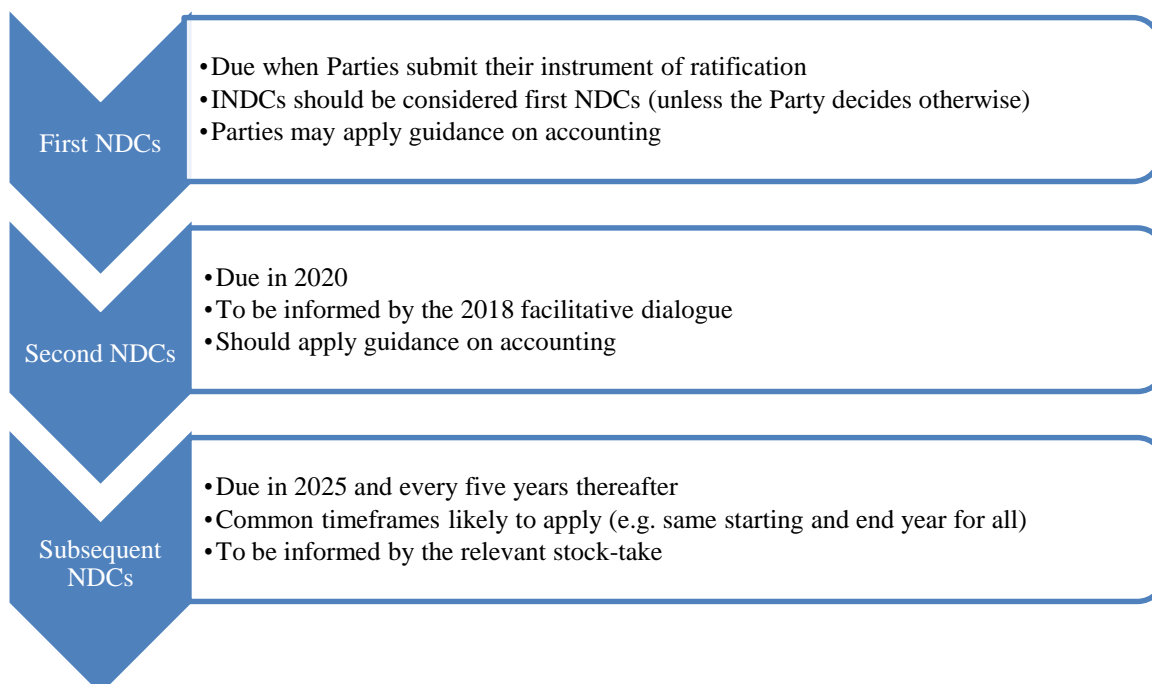
26. In terms of support, the Paris Agreement implies that resources (climate finance, technology transfer, knowledge sharing and capacity building, among others) should be provided to support Non-Annex I Parties with the implementation of NDCs in continuation of previous support. And Non-Annex I Parties should, through the period 2016 to 2020, develop thorough investment plans to increase readiness and to access support for NDC implementation.

27. Parties established institutional arrangements building on the existing climate change policy coordination arrangements in developing their INDCs. These were ad-hoc arrangements given the short time available for parties to develop their INDCs. Going forward parties will submit NDC every five years starting 2025. Thus an institutionalization of the NDC process is required to ensure continuity and consistency in parties' NDCs. Moreover, NDCs reflect national circumstances and henceforth the structure and content of NDCs vary between parties.

28. Parties have a commitment to communicate an NDC every five years taking into account information from the global stock take. The NDCs will be recorded in a public registry. Also, Article 4.10 foresees that Parties will be subject to common timeframes of their NDCs (e.g. equal starting and ending years). The NDC cycle is illustrated in the Figure 3 below. Decision 1/CP.21 provides further guidance for the first, second and subsequent contributions in view of the fact that the INDC process constituted an "anomaly" of the cycle. The decision also specifies that NDCs must be submitted 9-12 months prior to the relevant session of the CMA (e.g. the session which takes place in the year corresponding to the communication of NDCs), with a view to allowing enough time for the UNFCCC Secretariat to prepare a synthesis report.

Figure 3

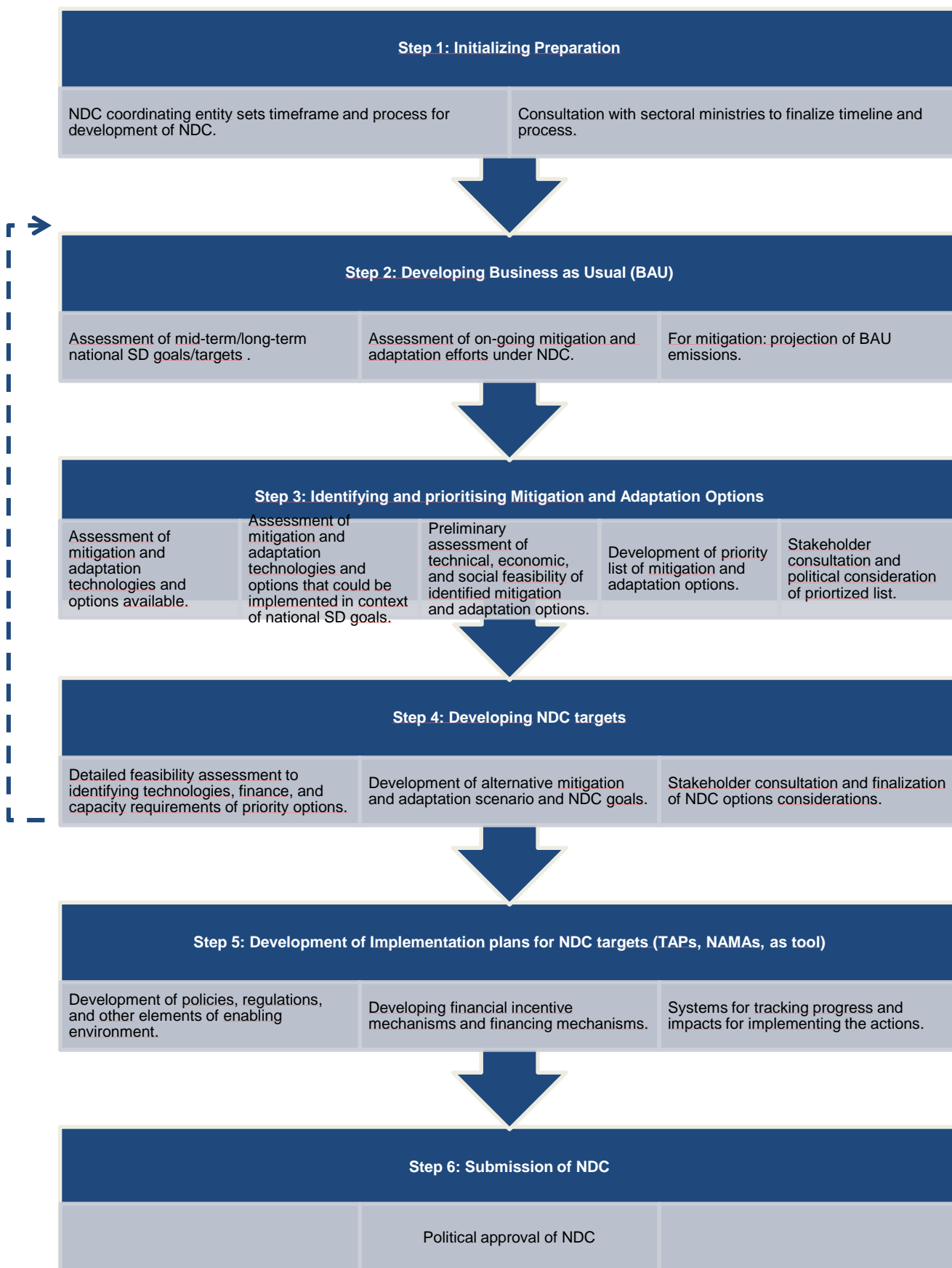
First, second and subsequent NDCs



29. Figure 4, below, illustrates a possible process for developing and updating NDCs and is based on the process followed by many Non-Annex I Parties in the preparation of their INDCs.¹⁶ In the current exercise of INDC development, given the short time, parties relied on existing analysis and information. Going forward one would envisage a detailed assessment of potential for climate change actions before political approval of the NDC. The NDC will be submitted five years in advance of the start of implementation period. For example, the NDC for period 2035 - 2040 is to be submitted by early 2030. Thus one anticipates that NDCs will be developed parallel to a detailed implementation plan for the previous period's NDC (in the case of above example this would be the NDC for period 2030 - 2035). The process, though depicted as linear in the figure, is not expected to be completely linear in reality. The steps 3, 4, and 5 potentially have feedback loops and result in some iteration before the final NDC is prepared and submitted to the UNFCCC. For NDC preparations, the process would be expected to follow the same sequencing.

¹⁶ Observation made by UNEP DTU in supporting development of INDCs in 31 parties through a UNEP-GEF INDC support project.

Figure 4
NDC development process



III. Linkages between the TNA and NDC processes

30. COP-18 agreed that ‘the technology needs assessment process should be integrated with other related processes under the Convention, including nationally appropriate mitigation actions, national adaptation plans and low-emission development strategies’.¹⁷ This is recognized in the work by the TEC and illustrated by the TEC brief on possible integration of the TNA process with NAMA and NAP processes.¹⁸ At the time NDC process was yet to be established and henceforth previous work did not include NDC efforts in its considerations. Thus there is a need to create coherence among climate policies and projects to realise these co-benefits.

31. National TNA processes take their starting point in the respective parties’ sustainable development objectives. The TNA process, therefore, not only maps out a party’s long-term development priorities, but also identifies technologies to realise these priorities while simultaneously reducing emissions and enhancing climate resilience.

32. COP-19 defined INDCs as contributions “towards achieving the objective of the Convention as set out in its Article 2.” Besides the contribution to the objective of stabilization of greenhouse gas (GHG) concentrations in the atmosphere, NDCs may also contribute to numerous domestic objectives associated with a shift to a low-carbon, climate resilient development path. This is underlined by the phrasing of “nationally determined” contributions, which emphasizes that contributions will be developed in accordance with national circumstances rather than determined top-down by the Parties.

33. Both processes use national development priorities as a starting point, and aim for integration of climate change into other national planning processes, with the overall objective of ensuring a low carbon, climate resilient sustainable development path. Achieving such an objective requires strong coordination and interlinkages between national planning efforts.

A. Commonalities and differences between the processes of TNAs and NDCs

34. An overview of envisaged commonalities and differences between TNA process and NDC process are presented in Table 1. For both planning tools, there is no process prescribed by the Convention. In the TNAs, through practice procedures, methodologies and tools have evolved over time to support the process. In the case of NDCs, these are still to develop with time.

Table 1

Overview of envisaged commonalities and similarities between TNA and NDC processes.

<i>Process area</i>	<i>Commonalities</i>	<i>Differences</i>
Identification of technologies and options	Based on national context, existing ongoing efforts, and national sustainable development priorities.	The TNA process developed through practice over the years has sector guidebooks for both mitigation and adaptation. Technologies are identified through national consultants in collaboration with sector experts. For NDCs, the process is developing and will be flexible to accommodate country circumstances. The focus in NDC

¹⁷ Decision 13/CP.18, FCCC/CP/2012/8/Add.2, para 12.

¹⁸ Available at

http://unfccc.int/ttclear/misc/_StaticFiles/gnwoerk_static/TEC_column_L/4f85c880f1b54a6bb1ed32a3b7e1bc94/7262a425eab84ac8a0ab4a5980d7e58d.pdf.

<i>Process area</i>	<i>Commonalities</i>	<i>Differences</i>
		is not technology per se but mitigation/adaptation actions and technology needs in that context.
Prioritization of sector technologies and options	Both processes take starting point in national sustainable development objectives.	The TNA process has a well-established methodology, while no common methodology exists for the NDC prioritization process.
Development of targets	Both processes identify targets.	Whereas NDCs focus mainly on identifying and establishing targets, TNAs focus largely on development of the pathways to reach the targets. TNA targets are often technology specific, while NDC targets are often of a more general nature, incorporating technology, capacity building, transparency, policy, etc. In NDCs, a target is presented as a (sector) collective target, while in TNAs it is established as a technology specific target.
National coordination	Both processes have a nationally nominated coordinator who sets up the national team.	The TNA process calls for a national steering committee.
Stakeholder involvement	Both processes provide opportunity for a stakeholder driven process, and by their nature involve line ministries.	Whereas TNAs calls for stakeholder involvement, NDCs are more flexible to which extent they require stakeholder engagement.
Implementation Planning	Both processes have a common focus on developing targets and plans to achieve the targets.	TNA process includes elaboration of project concept notes.

35. Some related issues include:

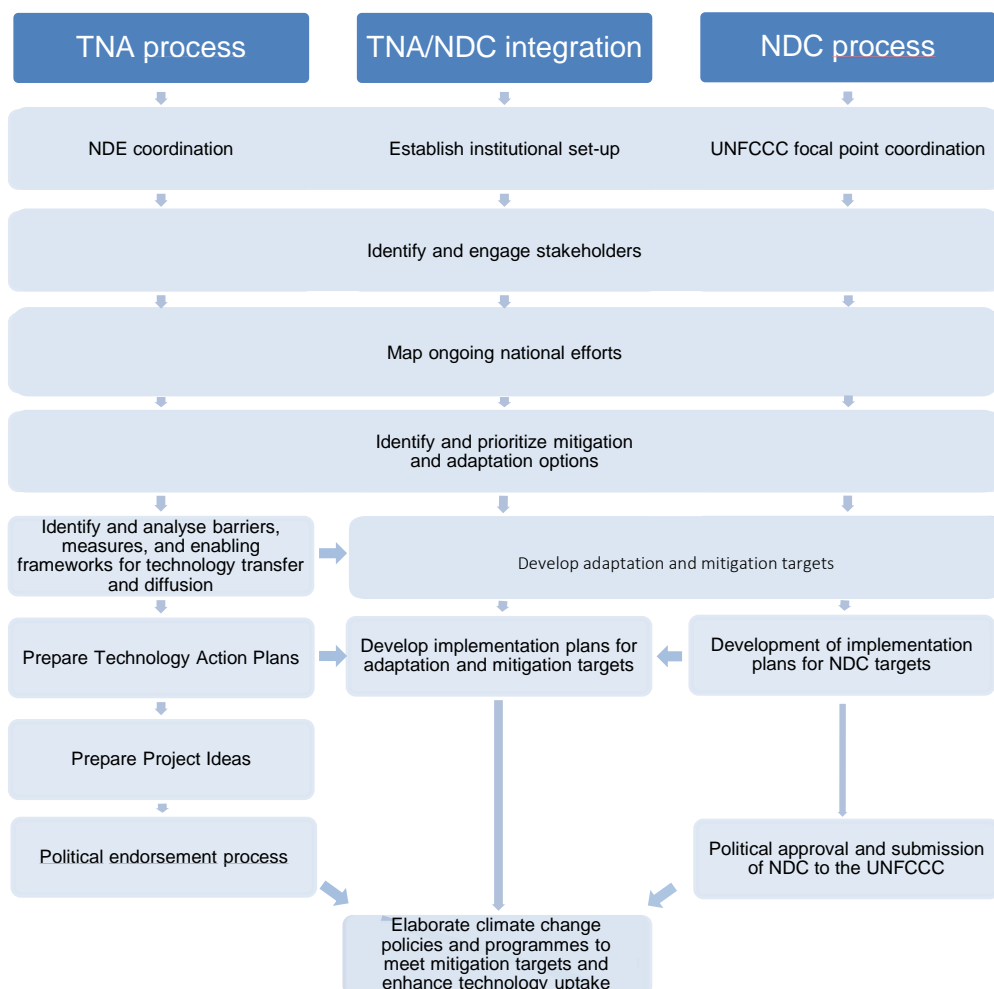
(a) Technologies are central to achieving NDC targets, thus the TNA becomes an integral part of the NDC process;

(b) NDCs require update every five years as per the Paris Agreement, whereas TNAs have no such specified periodicity in UNFCCC decisions;

(c) Whereas NDCs so far focus on targets and implementation plans, TNAs provide the opportunity for more in-depth, thorough analyses, including identification of barriers, measures, and enabling frameworks for technology development and transfer.

36. The above points urge for an integrative planning approach linking TNA and NDC processes, rather than separate processes. Figure 5 shows how such an approach might be structured based on on-going work and experience from parties in integrating TNAs and NDCs.

Figure 5
TNA and NDC process interlinkages



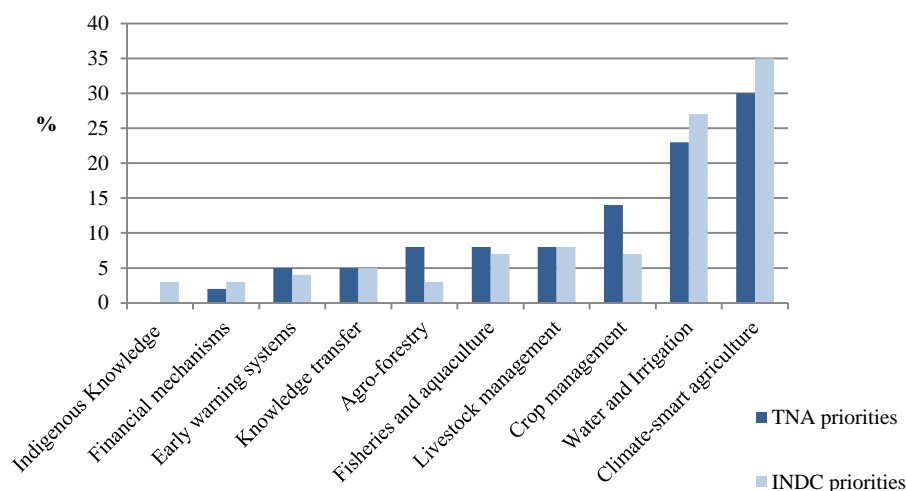
IV. Existing good practices on linking TNA and NDC processes

37. The majority of Parties noted, in their INDCs, the need for enhanced international support in the form of finance, technology transfer, knowledge sharing, market systems facilitation and capacity-building for the implementation of the INDCs and for enhancing ambition over time.¹⁹

38. The priorities of TNAs and INDCs show a common tendency of national priorities, as demonstrated in Figure 6, below.

¹⁹ FCCC/CP/2016/2, para. 185.

Figure 6
Adaptation priorities for agriculture sector in TNAs and Non-Annex I INDCs.²⁰



39. The inter-linkages between TNAs and NDCs are perhaps implicit as both processes develop and move forward. However, parties would benefit by making these inter-linkages explicit, and capitalising on the efficiencies that may be realised through commonalities between the two processes. Inter-linkages between the processes are explored further in the subsequent sections of the paper.

A. Prioritization of sectors, technologies and measures

40. In developing both their INDCs and TNAs, the majority of parties took a sectoral approach, identifying key priority sectors for both mitigation and adaptation that were in line with their national sustainable development priorities.

41. The existing TNA methodology includes detailed identification, prioritization, and assessment of sectors, technologies and implementation measures to overcome barriers for technology development and transfer. This could serve as a logical starting point for Parties that are preparing their NDC. Linking sectors, technologies, and implementation measures across TNAs and NDCs furthermore ensures that coherent climate targets and actions are mainstreamed and embedded in national policies and frameworks.

B. Development of targets

42. Within priority sectors, emissions reduction potential and vulnerability reduction potential were identified for both mitigation and adaptation, respectively; often with an emphasis on potential reduction strategies that offer co-benefits. Particularly for NDC development, realising where reduction potential lies is an important step for setting actionable targets addressing climate change, and it is important that NDCs take into consideration technologies that are relevant in reaching these targets.

43. Identifying reduction potential is directly in line with the TNA process, which assesses and estimates a technology's contribution to climate change mitigation and adaptation. TNAs identify both the gaps and barriers for prioritized technologies, as well as actions for

²⁰ On TNA priorities, analysis is based on data collected from 25 national TNA reports 2010–2012, all available at www.tech-action.org. On INDC priorities, analysis is based on data collection made by Richards, M.; Bruun, T.; Campbell, B.; Gregersen, L. E.; Huyer, S.; Kuntze, V.; Madsen, S.; Oldvig, M. AND Vasileiou, I. (2015) How countries plan to address agricultural adaptation and mitigation: An analysis of Intended Nationally Determined Contributions. CCAFS Info Note. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CAAFS).

overcoming them. Such actions can be directly translated or incorporated into potential targets to be included in an NDC and facilitate both development and technology transfer.

44. Moreover, given that TNAs will have already identified measures for implementing technologies, inclusion of TNAs in the NDCs can have an effect on Parties' ability to concretely realise targets and co-benefits (as well as measure distance from targets).

C. Reporting on costs and finance

45. A common challenge of NDCs is to identify and report on the costs of climate change adaptation and mitigation, as well as the sources of finance necessary to meet these costs. TNAs can act as a useful starting point for both cost estimates and the identification of funding sources, as these are both activities undertaken in the TNA process that can feed directly into NDC development.

46. TAPs estimate the costs and financing needs for the actions and activities prioritised within the TNA process. While doing this, it is recognized that the majority of Parties face budget constraints and it is important that cost-estimates are made based on available and reliable data so that potential financiers have the opportunity to make valid assessments and decisions. TAP cost estimates are broken down into both 'actions and activities aimed at preparing a full programme for the diffusion of a prioritised technology' (i.e. public domestic and public international finance) and 'actions and activities aimed at the implementation of a full programme for the diffusion of a prioritised technology' (i.e. public domestic and international, as well as private domestic and international finance).

47. Having identified the financial need (or cost), the TAP goes onto identify sources of finance that could fulfil such a need. This is done on multiple levels: small or large scale, market or nonmarket, mitigation or adaptation financing sources. Breaking down the financial needs on such levels then allows the TAP to target the most suitable types and sources of both public and private financing, such as grants, commercial loans, subsidies and revenue from goods and services.

48. This has direct implications for NDC development, as INDCs struggled to both estimate and ground valid cost estimates, and costs that were reported were of a highly preliminary nature.²¹ Drawing on the work already undertaken in TNAs could enhance the robustness of cost estimates as well as bring NDCs closer to identifying likely sources of finance.

D. Capacity building

49. Oftentimes Parties may lack the domestic resources to support climate projects or innovations that would lead to low carbon development and increase climate resilience. Capacity building is essential for advancing low carbon development and climate resilience and developing a strong NDC.

50. As part of the TNA process, Parties will already have undergone both regional and global capacity building events focused on identifying and assessing technology needs that they can draw upon for inclusion in their NDCs. These capacity building efforts include technical guidance and support, where exchanges of experience and information between Parties and stakeholders can establish the basis for cooperative arrangements. These capacity building events cover methodologies for technology prioritization, financial analysis models, stakeholder engagement, barrier analysis, including markets readiness and regulations and enabling environments.

51. The TNA process could be viewed as a facilitating process, providing in-depth analyses of technology development, market systems, regulations, and transfer paths

²¹ UNEP (2015). The adaptation finance gap update: with insights from the INDCs. Nairobi, Kenya.

elaborated materialized in TAPs and providing capacity building and knowledge sharing to national technology champions.

E. Focus on implementation

52. TNAs can play a unique role in the development of NDCs due to the information they offer on the implementation potential, ability and scale of technologies. TNA results can also be used to help report on and monitor progress towards achieving targets set in NDCs, and enhance understanding of how technologies can be applied or used within specific policies, programmes or projects.

53. If TNA outputs were considered as means to reach NDC targets, financing support allocated to NDC implementation would also, indirectly, support implementation of TNA results. Actions identified within TAPs highlights the required activities to facilitate robust market systems for technology diffusion and uptake, which would underpin longer-term activities elaborated in NDCs and NAMAs.

F. Examples

54. Annex I presents a summary of a review of 71 NDCs and their linkages to TNAs and TAPs. This reveals some trend in the existing linkages between the two processes as they are in practice. Some NDCs explicitly used the results of their TNAs to help prepare their NDCs, while for other NDCs the linkages are more implicit, or not made clear. Some additional examples to the analysis on the Annex are highlighted below.

1. Harmonising planning tools across ministries

Togo

- Togo presents a good example of the need to harmonise national planning processes internally, as they formed a National Committee of key decision makers on issues related to the management of project activities for both INDCs as well as the TNA.
- This committee includes representatives responsible for the implementation of policies from relevant ministries, and other officials familiar with national development objectives, sectoral policies, the science of climate change, and the potential impacts of climate change for the party and mitigation needs.

Seychelles

- The Seychelles also recognized the necessity of integrating UNFCCC-related initiatives (such as National Communications), Biennial Update Reports (BURs), National Adaptation Planning (NAP), NAMAs, and TNAs in order for their INDC to be successful.
- This is to be done through the newly redefined National Climate Change Committee (NCCC).

2. From TNA to NDC

The Gambia

- The Gambia is an example of a TNA report that actively tries to align with the targets developed in the INDCs.
- The Gambia's INDC identified and assigned emission reduction targets within the agriculture, energy, manufacturing, transport, waste, and household consumption sectors while concurrently underlining the critical role of technology transfer in the response to climate change, making recommendations for specific technology transfer requirements in the afore-mentioned sectors.
- Such an approach generates the continuity and value-addition required to consolidate gains for achieving national goals.

Swaziland

- Swaziland undertook development of their INDC and TNA process in tandem, using the same team of consultants for both, facilitating the interlinkages between the two planning tools.
- Priority sectors and targets were identified using the Third National Communication in order to be used in the INDC.
- After these had been identified for the INDC, Swaziland then undertook development of their TNA process, where they prioritized based on the technologies for the selected sectors.

Zambia

- Zambia writes in its INDC that it intends to reach INDC mitigation targets by implementing three programs driven by the party's Climate Response Strategy and supported by other national development policies. It further elaborates that 'these three programs have been developed based on Zambia's plans and actions and supported by various climate-related activities such as REDD+, NAMAs and Technology Needs Assessment (TNA)'.

Bangladesh

- In its TNA, Bangladesh express that 'in the country context, technology needs assessments (TNA) become an important management tool to formulate development strategies as well as to identify NAMAs'.²²
- Both the INDC and TNA processes were conducted using the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) as a reference for how the implementation should be carried forward. This also means that for Bangladesh, INDC implementation will be taken forward by existing governance arrangements under the BCCSAP and other key policies/plans.

Lebanon

- Lebanon built INDC efforts on previous and existing national processes, including the TNA process.
- For its INDC priority sectors, technologies identified and assessed through the TNA process were included. This allowed the INDC process in Lebanon to utilize further and build upon the existing assessment of barriers and enablers for these technologies, which had already been prioritized and assessed through a nationally driven participatory process.

Mali

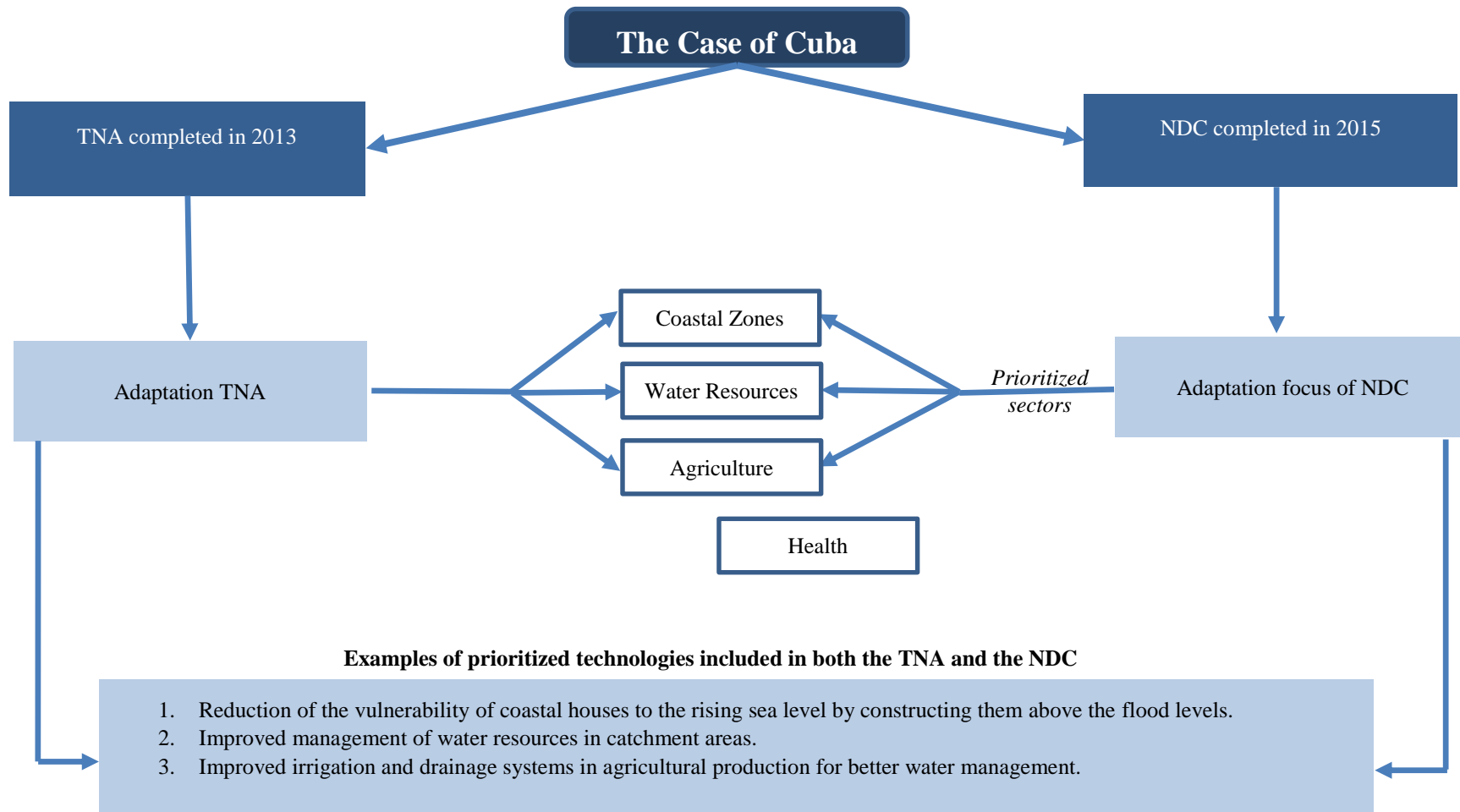
- Mali in part based the identification of the mitigation and adaptation needs in its INDC on its sustainable development objectives, including a focus on the implementation of the Technology Action Plan for adaptation and mitigation.
- For adaptation, the INDC included technologies related to the practice of forage crops, the development of land cultivation, agro-meteorological techniques, and improved crop varieties.
- For mitigation, the INDC included technologies on small water dams, the deepening of ponds and modern wells.

Cuba

- Cuba directly used the results and outcomes of its TNA process to contribute to the development of its NDC. This is illustrated in Figure 7.

²² Technology Needs Assessment and Technology Action Plans for Climate Change Mitigation. Ministry of Environment and Forests (MoEF), Government of the People's Republic of Bangladesh (2011).

Figure 7
TNA NDC linkages in the case of Cuba²⁴



²⁴ Source: Charlery, L. and S. Traerup (forthcoming) A global analysis of the TNA and NDC nexus.

V. Possibilities of creating linkages on an institutional level

55. Many Parties have well established institutional frameworks to support the coordination of climate change initiatives. These include national level inter-ministerial climate change coordination committees, technical working groups undertaking specific studies on inventories, mitigation, vulnerability and adaptation, and research centres coordinating national studies within the area of climate change. Coordination of these endeavours across all climate-related planning processes will ensure greater efficiency and policy coherence and support the enhancement of knowledge sharing.

A. TNAs

56. A TNA process is usually initiated through the UNFCCC focal point, which make recommendations on who should be the responsible government entity for the TNA process. In many cases, the NDE has been nominated as TNA coordinators, which is in line with their role as designated national technology champions.

57. Being designed as a country driven, participatory process, the institutional set up for a TNA process requires the involvement of a wide range of national stakeholders. The process is led by a national TNA coordinator, nominated by the responsible government entity. Information on national institutional arrangements to support the TNA process is available in a guidance note on institutional organization for conducting TNAs.²⁵

58. Most countries state in their TNA reports that they build the TNA process on pre-established institutional structures, i.e. the preparation of National Communications. For example, Lebanon notes in its TNA report that ‘the stakeholders were identified according to their expertise, decision making positions, involvement and knowledge of the selected sectors and capability to influence the implementation of the proposed TAP. Most of the stakeholders had already been involved in the National Communication processes, which created a common knowledge base and has built strong inter-institutional relations.’

B. NDCs

59. For NDCs, most parties are yet to formalize institutional structures for coordination and implementation. In line with the TNA process, INDC efforts were typically coordinated by the UNFCCC focal point.

60. Some experiences on institutional structures can be derived from INDCs, though at the time where INDCs were prepared, there was some uncertainty on the future regularity, procedures and requirements of NDC updates. For example, Bhutan notes in its INDC that ‘...the priority mitigation and adaptation actions within this INDC will be considered and integrated in the preparation of the 12th Five Year Development Plan (2018-2023) and also subsequent five year plan periods. The cycles of the national five-year development plan process along with the cycles of the INDCs, yet to be determined under the new climate agreement, will form the basis for the national process to review progress in actions and support received.’²⁶

61. Experience from the INDC process shows that many Parties took a combined stakeholder and expert driven approach. For example, Bangladesh notes in its INDC that, ‘This INDC has been prepared through consultation and dialogue with the Government’s Advisory and Technical Committees, which include a range of stakeholders including line

²⁵ UNEP DTU Partnership (2014) Organising the National Technology Needs Assessment (TNA) Process: An Explanatory Note.

²⁶ National Environment Commission, Royal Government of Bhutan (2015) INDC of the Kingdom of Bhutan. Available at: <http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Bhutan/1/Bhutan-INDC-20150930.pdf>.

ministries, Planning Commission, technical departments, professionals, experts, and the private sector.²⁷

C. Enhancing linkages between TNAs and NDCs at an institutional level

62. To enhance linkages between the two processes, the existing structures with institutions and arrangements, including existing strategies, planning tools, assessment frameworks, research and development programmes, technologies, networks and working groups could be utilized. By bringing together the institutional arrangements, it would enhance the exchange of relevant ideas, guidance, stakeholders, information and resources.

63. Already in many countries there is some streamlining of involvement of stakeholders, for example, the existence of a national climate change steering committee typically composed of members responsible for policy making from all relevant ministries, as well as key stakeholders from the private sector. The role of the steering committee is to support strong linkages between both processes and sector activities. However, both processes must make a concerted effort to ensure a diversity of stakeholders are consulted and remain involved in the implementation process, in particular climate-vulnerable groups and representative community-based organizations, for whom adaptation plans and co-benefit projects are vital.

64. Another means to ensure coordination and alignment of processes is for Parties to establish and promote local champions to lead processes and ensure the exchange of good practices and information, including institutional arrangements. These national champions could be additional to the United Nations Framework Convention on Climate Change (UNFCCC) focal point.

65. Establishment of national and international systems for monitoring and evaluation of processes and the implementation of their results could be another way of supporting the streamlining of processes. By utilizing information generated through such systems, the resources and information provided for the national processes could be better targeted and used more efficiently.

66. Regular monitoring and reporting of progress on the national processes would allow consistently documented experience sharing and review of the processes, as well as the institutional organization of these, and offer the opportunity for targeting support to parties through information generated from the monitoring system.

VI. Way forward

67. Based on the above analysis of linkages between TNA and NDC processes, this section suggests ways forward towards improved alignment of the processes, with a view to maximize benefits from these processes towards a low carbon, climate resilient sustainable development path.

68. The TNA process provides a methodology for considering and integrating technologies in national planning processes and initiatives to reach national sustainable development objectives, including climate change related goals. Likewise, TNAs can be seen as a national planning tool for identifying current and future technology needs for sustainable development, in combination with achieving mitigation and adaptation benefits.

69. To utilize the synergies between the processes of TNAs and NDCs, the methodology of TNAs provide a sound basis for identifying pathways for parties to reach their NDC targets (as well as NAMAs and NAPs). With that in mind, an integrated approach by parties towards TNAs and NDCs could possibly support a post-2020 climate policy framework by means of:

²⁷ Ministry of Environment and Forests (MOEF), Government of the People's Republic of Bangladesh (2015) Intended Nationally Determined Contributions (INDC). Available at: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Bangladesh/1/INDC_2015_of_Bangladesh.pdf.

- The TNA process should work in sync with the NDC process by prioritization of technologies in line with NDC targets and sectors, and align targets set in technology action plans to achieve the targets set in NDCs.

70. When NDC targets have been identified, parties could utilize the TNA process to identify, prioritize, and assess which technologies, and measures for their transfer, development and diffusion, are needed for parties to meet these targets. The TNA process could be viewed as a planning support tool to formulate strategies on how to reach targets set in NDCs.

- TNAs are often perceived by Parties as a project, not a process. The NDC process is established by the Paris Agreement as a five year process. Establishing TNAs as a regular process for updating technology needs and technology action plans for development and transfer of technologies to address climate change would enhance the effectiveness of the NDC process. It would also enable TNAs and related TAPs to be more responsive to dynamic implementation contexts, which may change as a consequence of climate variations. The NDC process also provides the channel for implementing some TNA outcomes.
- The existing TNA process could serve as a logical starting point for parties that are developing their NDC. Linking sectors, technologies, and implementation measures across TNAs and NDCs furthermore ensures that coherent climate targets and actions are mainstreamed and embedded in national policies and frameworks.
- Monitoring of progress in achieving NDC targets should integrate monitoring of the implementation and impacts of TNA results.
- If TNA outputs were considered as means to reach NDC targets, financial support allocated to NDC implementation could also, indirectly, support implementation of TNA results.
- Harmonizing the institutional structure for TNA and NDC processes as well as for NAPs and NAMAs would increase the alignment of processes, avoid duplications, and improve efficiency towards reaching joint objectives. Such harmonization efforts would require further exploration, and need to take into account any existing climate change policy coordination arrangements.
- TNA and NDC processes are not identical, though there are numerous similarities between them. Incorporating lessons learned from TNA process into the NDC process could prove beneficial for future work on NDCs.

VII. Summary and conclusions

71. Having reviewed the commonalities and differences between the TNA and NDC processes, this paper has suggested a series of recommendations and options for encouraging stronger inter-linkages between them:

- NDCs will define the five year goals of a Party to address climate change pursuant to Paris Agreement and, hence, other national process under the UNFCCC should be guided by it and should be in support of both the development and implementation of NDCs. Thus, the TNA process should be guided by, and an integral part of, the NDC process.
- TNA outputs can serve as inputs for developing NDCs, as the technology identification process in the TNAs, in context of sustainable development and mitigation/adaptation opportunities, is aligned with the process of NDC development. Furthermore, technology action plans (TAPs) developed as part of the TNA process provide a platform for NDC implementation plan preparation and implementation.
- The approach of the NDC and TNA process is grounded in the sustainable development plans and strategies, climate change policies, low carbon resilient development strategies, and on-going programmes and plans to address sustainable development and climate change. This provides a natural synergy between the two processes. Harmonizing approaches across the two processes and learning from the TNA experience and practices thus provides a foundation for utilizing party capacities for NDC process.

- Interlinking the two planning tools should help to eliminate duplication and allow party resources to be used more effectively and efficiently. Institutional and process linkages of NDCs and TNAs are important for achieving this objective.

72. However, in order to achieve the above recommendations, a level of integration will need to be undertaken between both planning tools. This paper lays out a potential pathway for achieving this (see Figure 4), but in order to be successful, the following considerations must be taken into account when undertaking an integrative planning process:

- Identify and develop institutional arrangements, which integrate the responsibilities of TNA and NDC coordination across sectors and ministries.
- Parties should support strong linkages between both processes and sector activities and ensure the exchange of good practices and information, including institutional arrangements between relevant stakeholders.
- Parties should also clearly define processes for adaptation and mitigation, as well as related actions and the multiple roles of different stakeholders in these processes, in order to ensure greater alignment between planning tools.
- Stakeholder participation by nongovernmental organizations (NGOs), private and public sector industries, vulnerable groups, university representatives and others, is an important means of ensuring continuity of climate change activities.

Annex II

The table below provides an analysis of NDCs and TNAs (second generation). The analysis includes 71 NDCs from a variety of countries, at different stages as it relates to the TNA process, including:

- (a) 30 NDCs from countries who have completed and submitted their TNAs and TAPs;
- (b) 7 NDCs from countries who are in the process of completing their TNAs and TAPs;
- (c) 18 NDCs from countries to participate in the next round of TNAs (expected 2017 – 2020);
- (d) 16 NDCs from countries which have not yet conducted a TNA and are not listed as part of any planned TNA project.

#	Country	TNA completion year	Extent to which "Technology issues" or TNAs and TAPs are addressed in the NDC.
Latin American and Caribbean Countries			
1	Antigua & Barbuda	2017-2020	The country has not yet conducted a TNA, however the NDC highlights the general need for "technology transfer" (as well as financial support and capacity building) to help meet their conditional targets. The NDC specifies that 'Conducting a TNA can help elaborate on what technological assistance is needed and how it can be implemented in the country.'
2	Argentina	2013	The NDC has incorporated some of the actions described in the TAP (part of the TNA), specifically relating to mitigating the effects of climate change mainly in the energy and transport sectors, (and to a lesser extent in the Agricultural, land use change and silvicultural sectors) in establishing targets.
3	Bahamas	N/A	A TNA has not yet been undertaken in The Bahamas. The NDC sets out conditional targets, which rely on support from international cooperation, in the form of finance, technology development and transfer, and capacity building. The exact types/forms of technology are not specified.
4	Barbados	N/A	Having not yet conducted a TNA, Barbados's NDC makes reference to the need for "technology transfer" (in a general sense), as one of the forms of support from the international community, to help meet the conditional targets.
5	Belize	2017	The country is currently undertaking the TNA process, but this is not referred to in the NDC. The NDC highlights the need for technology development and transfer to address the technological limitations facing the country.
6	Bolivia	N/A	A TNA has not yet been completed in the country and no reference is made to the TNA process in the NDC.
7	Brazil	N/A	Brazil has not yet undertaken a TNA. Nonetheless, the NDC recognises the need for technology development, specifically in the case of efforts towards adaptation to climate change. This draws from their National Adaptation Plan (NAP) which identifies various sectors where technology will play a key role.
8	Chile	N/A	Chile has not yet undertaken a TNA. Unlike other NDCs (& other national planning documents) which are divided into measures of adaptation and mitigation to climate change, Chile's NDC highlights five divisions; i) Mitigation, ii) Adaptation, iii) Capacity building and strengthening, iv) Financing, and v) Technology development and transfer. The NDC identifies the need for a TNA (or a similar instrument), to be developed by 2018.

#	Country	TNA completion year	Extent to which "Technology issues" or TNAs and TAPs are addressed in the NDC.
9	Colombia	2013	A TNA process has been undertaken in the country. Although the NDC includes brief and general mention of the need for the transfer of knowledge and technology (as well as the development of technology in relation to dealing with the impacts of Climate change), this is not related or linked to the actions proposed in the TAPs from the TNA process.
10	Costa Rica	2011	A TNA has been undertaken in the country and the NDC makes clear and direct reference to the results and outcomes of the TNA as part of its planning process. It references to the sectors prioritised in the TNAs (i.e. Transport, Energy, watershed management and Agricultural production).
11	Cuba	2013	A TNA process has been undertaken in the country. Although there is not a direct mention of the TNA in the NDC, some of the elements described and analysed in the TNAs were incorporated in the NDC report. Notably, in Section 4 (which describes the specific elements of the NDC), the division of elements based on adaptation measures and mitigation measures match the elements prioritized in the TNA.
12	Dominica	2017-2020	A TNA has not yet been undertaken in Dominica. Nonetheless, the NDC clearly highlights the need for new and improved technologies to help meet its mitigation and adaptation targets.
13	Dominican Republic	2012	The NDC makes clear reference to the TNA, which identifies measures and technologies for implementation that is compatible with the National Development Strategy and other national plans of the country. However, the NDC does not draw on the results or analyses of the TNAs in explaining how the targets will be met.
14	Ecuador	2013	A TNA has been undertaken in the country, however, it is very specific to the "technical management of water for irrigation in the agricultural sector", giving it a very limited focus. There is no specific reference to the TNA and its results in the NDC (although water resource management is addresses in a general context). The need for technology and knowledge is highlighted in the NDC, but in the general context of improving productivity in the agricultural sector to allow adaptation to the impacts of climate change.
15	El Salvador	2013	Although a TNA has been undertaken in the country, the NDC does not make specific reference to the result of the process. However, some of the activities identified for meeting its targets (in the agricultural sector) are very related to the TAPs of the TNA process. In a general sense, the NDC identifies the need for access to more efficient and cost effective technologies that contribute to achieving its targets.
16	Grenada	2017	Grenada is currently in the process of conducting its TNA and the sectors prioritized are Water, Agriculture and Tourism. However, the NDC identified the key sectors for emission reduction as being that of Energy (i.e. electricity), Transport, Waste and Forestry. Nonetheless, the NDC recognises the need for the results of the TNA to feed into its resilience building activities.
17	Guatemala	N/A	A TNA has not yet been undertaken for the country. The NDC recognises the need for "access to more efficient and cost effective technologies" to help achieve its targets. Barriers in areas such as technology and financing are highlighted in the NDC as factors affecting the achievement of its targets.
18	Guyana	2017	The country is currently in the process of undertaking the TNA process. The NDC makes very little reference to the need for improved technologies, except in the mining sector (responsible for 89% of the deforestation in the country).

#	Country	TNA completion year	Extent to which "Technology issues" or TNAs and TAPs are addressed in the NDC.
19	Haiti	2017-2020	A TNA has not yet been undertaken in Haiti. The NDC highlights the lack of technological resources in the country, along with the need for international assistance in the form of technical and technological support, among others, to meet their mitigation and adaptation goals. The NDC makes direct reference to the need to undergo a TNA process in the country, to help identify avenues for technology transfer to help achieve its targets.
20	Honduras	2017	Honduras was in the process of undertaking its TNA when the NDC was prepared. The NDC makes no other reference to the importance of technology (or technology transfer) in meeting its targets, however, it recognises the importance of the TAPs which will be developed from the TNA process, in helping achieve its targets.
21	Jamaica	2017-2020	A TNA has not yet been carried out for Jamaica. The NDC is primarily dedicated to emission reduction based on changes in the Energy sector (which includes the transportation sector). There is no direct reference to the need for improved technologies, or technology transfer in meeting the targets of the NDC.
22	Mexico	N/A	Mexico has not yet undertaken a TNA. The NDC recognises the need for international support in the development and transfer of technology (amongst other forms of support) to enable them to achieve their adaptation and mitigation objectives in response to climate change.
23	Panama	2017	Panama is in the process of undertaking its TNA. The NDC highlights the need for the transfer of new technologies to help meet its outlined objectives.
24	Paraguay	N/A	A TNA has not yet been undertaken for Paraguay. The NDC makes direct reference to the need for technology transfer, as a form of international assistance (along with financing and capacity building) to help successfully achieve its mitigation and adaptation targets.
25	Peru	2012	The country has undertaken a TNA; however, it is not referenced in the NDC. The NDC addresses technology needs only in the context of the need for international support.
26	St. Kitts & Nevis	N/A	A TNA has not yet been undertaken for the country. The NDC recognises the need for "technology transfer" as a form of assistance from international partners/donors. The NDC also recognises the need for developing an implementation plan in which certain sectors and technologies will be prioritized for meeting the target.
27	St. Lucia	N/A	A TNA has not yet been undertaken in the country. The NDC recognises the need for technology transfer as a form of assistance from international partners/donors to help achieve its targets.
28	St. Vincent & Grenadines	N/A	A TNA has not yet been undertaken for the country. The NDC recognises the role that international support, in the form of finance and technology transfer (generally), can play in helping to further reduce emissions.
29	Suriname	2017-2020	A TNA has not yet been undertaken for the country. The NDC does not explain the specific role of technology transfer in achieving its targets, however, it does highlight the need for international assistance (meeting the costs) in moving towards newer, environment friendly technologies.

#	Country	TNA completion year	Extent to which "Technology issues" or TNAs and TAPs are addressed in the NDC.
30	Trinidad & Tobago	2017-2020	A TNA has not yet been undertaken for the country. The NDC is focused on the prioritized sectors of "power generation, transportation & industry", and it highlights the role of technology transfer in achieving its targets.
31	Uruguay	2017	The country is in the process of preparing a TNA. The NDC does not mention the development of the national TNAs (this could be because the TNA reports were submitted after the NDC was developed) however, some of the components of the TNAs are directly mentioned as "actions required under adaptation and mitigation efforts" to meet the targets of the NDC.
32	Venezuela	N/A	Venezuela has not yet undertaken a TNA. The NDC highlights the need for improved technologies in the various actions aimed at mitigating and adapting to the effects of Climate Change. The NDC also notes that the transfer of technology should be oriented towards the development and improvement of the endogenous capacities and technologies of the developing countries/region.
African & Middle East Countries			
33	Central African Republic	N/A	A TNA has not yet been undertaken in the country. The NDC calls for a TNA to be carried out to assist with facilitating technology transfer needed for achieving its goals. Although a TNA has not yet been carried out the NDC provides a general list of key sectors and technologies that will contribute to helping achieve the set targets.
34	Chad	2017-2020	A TNA has not yet been undertaken in the country. The NDC highlights broadly the need for greater technology transfer from the international community to help achieve its targets.
35	Cote d'Ivoire	2013	The NDC includes focus on a wider range of sectors than the TNA, and the sectors prioritized in the TNA are all included in the NDC. It also highlights a general need for technology transfer, without making any direct reference to the TNA.
36	Djibouti	2017-2020	A TNA has not yet been undertaken in the country. Nonetheless, the NDC highlights the need for a shift to using low carbon / cleaner energy technologies, as well as better adaptation technologies for achieving its target.
37	Eritrea	2017-2020	A TNA has not yet been undertaken in the country. The NDC makes a general reference to the need for technology transfer to help achieve its targets.
38	Ethiopia	N/A	A TNA has not yet been undertaken in the country. The NDC calls for further research to identify and quantify the international support needed in the form of technology transfer, finance and capacity building as part of its implementation process.
39	Ghana	2013	The NDC highlights that its development is based on other national processes and document, including the TNA. The sectors prioritized in the TNA (water and agricultural sectors) are also highlighted in the NDC for programs under the adaptation action plan. The NDC also highlights the need for technology development and transfer through international partnership to help achieve the set targets.
40	Guinea	N/A	A TNA has not yet been undertaken in the country. However, the NDC identifies sectors and activities where the introduction of climate technologies will help achieve the set goals.

#	Country	TNA completion year	Extent to which "Technology issues" or TNAs and TAPs are addressed in the NDC.
41	Kenya	2013	Although a TNA has been undertaken in the country, the NDC does not make any direct reference to it. However, the NDC clearly highlights the need for technology development and transfer under both mitigation and adaptation efforts. The NDC also recognises the local technology deficit and highlights the need for international support in technology development and transfer to address mitigation and adaptation to climate change.
42	Lebanon	2013	A TNA has been undertaken in the country and the NDC focuses mainly on the sectors which were prioritized in the TNA, for both adaptation and mitigation. The NDC also highlights the need for technology transfer to help achieve its targets.
43	Liberia	2017-2020	A TNA has not yet been undertaken in the country. The NDC highlights the need for technology transfer and training to facilitate achieving its goals.
44	Malawi	2017-2020	Malawi is yet to undertake a TNA, however, the NDC specifies the need for technology transfer as a means of international assistance to help meet its conditional targets. The NDC goes on to specify some examples of technologies that will help achieve its targets, e.g.: irrigation technologies for farming, water harvesting technologies, renewable energy technologies, among others.
45	Mali	2012	The NDC highlights the need for implementing the Technology Action Plans (TAPs) derived from the TNA process undertaken in the country. The NDC views the TAPs as the necessary preliminary groundwork to be conducted before its implementation forecasted to begin post 2020.
46	Mauritius	2013	The NDC makes specific reference to the need for expanding solar, wind and other renewable energy sources, which is the focus of the TNA for Mitigation. This is also linked to the uptake of smarter, more efficient technologies in the energy sector. Similarly, in the case of adaptation, technologies from the TNA are listed as measures for achieving the targets of the NDC.
47	Morocco	2012	The NDC incorporates all the sectors and targets of the TNA into a more general, nation/economy wide plan for addressing mitigation and adaptation to climate change. Numerous climate technologies are discussed in the NDC, as in the TNA, however, the main difference is that the TNA goes further and prioritises few technologies, whereas the NDC remains broad.
48	Niger	2017-2020	Niger has not yet undertaken a TNA, however, the NDC highlights the need for technology transfer as a means of international assistance to help meet their conditional targets. The NDC specifies the need for technology transfer in the prioritised sectors of Agriculture, Forestry and Other Land Use (AFOLU), and Energy. This is because these are the 2 highest contributors to the country's emissions.
49	Rwanda	2013	Rwanda has undertaken a TNA and the results are highlighted in the NDC, showing some connection between the processes.
50	Sao Tome & Principe	2017-2020	A TNA has not yet been undertaken for the country. However, the NDC highlights the need for technological assistance to achieve its targets. The NDC goes further to identify specific forms of technological assistance that it will need.

#	Country	TNA completion year	Extent to which “Technology issues” or TNAs and TAPs are addressed in the NDC.
51	Senegal	2012	The NDC has a section dedicated to discussing the technology needs of the country, where a very wide range of technologies are highlighted for the various sectors of the economy. However, the technology needs discussed in the NDC only partially match those of the TNA, and the discussion is not as developed as in the TNA.
52	Sudan	2013	The TNA process has been conducted for Sudan, for both Adaptation and Mitigation Technologies. The prioritized technologies from the TNA process (Mitigation and Adaptation) are included in the list of technological developments/transfers needed to reach the targets of the NDC.
53	Uganda	2017-2020	The country is yet to undertake a TNA. However, the NDC highlights the need for assistance in the form of the transfer of clean technologies from the international community to help achieve its goals.
54	Zambia	2013	The NDC highlights the country’s TNA process as one of the climate-related projects conducted in response to climate change impacts. The results and outcomes of the TNA process have also contributed to the development of the objectives of the NDC.
Asian and CIS Countries			
55	Afghanistan	2017-2020	A TNA has not yet been undertaken in Afghanistan. The NDC highlights the need for international assistance in the form of technology transfer for achieving its conditional targets. It also identifies the sectors and sub-sectors where technological assistance will be needed.
56	Azerbaijan	2012	A TNA has been undertaken in the country; however the NDC makes no direct reference to the TNA process and its results. The NDC focuses on a broad spectrum of sectors, with clear reference to the need for modern, environment-friendly technologies, allowing the country to move towards a low emissions development path.
57	Bangladesh	2012	The country has undertaken a TNA and the NDC is based on existing national strategies, to which the TNA has contributed. Although the NDC focuses on all sectors of the economy, the sector prioritised in the TNA for mitigation (the energy sector) is also one of its key sectors for achieving its targets. The NDC also states the need for support in the form of technology transfer (as well as finance and capacity building) to help achieve its conditional targets.
58	Bhutan	2013	Although a TNA has been conducted in Bhutan, the NDC makes no direct reference to it. The NDC generally highlights the need for cleaner technologies in some of the same sectors as the TNA, with not specific mention of which technologies would work best.
59	Cambodia	2013	Although a TNA has been carried out in the country, the NDC calls for another TNA to be carried out at the start of its implementation phase. The NDC also highlights the need for support, in the form of technology transfer, capacity building and finance to help achieve its targets.
60	Fiji	2017-2020	Fiji is yet to undertake a TNA, and the NDC focuses on the role that renewable energy technologies can play in helping achieve its targets.

#	Country	TNA completion year	Extent to which “Technology issues” or TNAs and TAPs are addressed in the NDC.
61	Georgia	2012	A TNA has been undertaken in the country, however, the NDC makes no direct reference to the process and its results. The NDC highlights the need for technology transfer as a form of international assistance to meet its conditional targets.
62	Indonesia	2012	Indonesia has undertaken a TNA and although the NDC does not directly reference the results of this process, the focus sectors match that of the TNA for mitigation. Therefore, it could be fair to expect that the results of the TNA will be helpful in the implementation of the NDC.
63	Kazakhstan	2017	A TNA is currently under preparation in Kazakhstan, however, there is no direct reference to the TNA process in the NDC. The NDC broadly highlights the need for energy efficient technologies to help achieve mitigation targets.
64	Laos	2013	The results of the TNA have made limited contribution to the development of the NDC. Although the NDC adopts a very broad focus, including all sectors of the economy, the strongest focus is on the energy sector, which was not prioritized in the TNA.
65	Mongolia	2013	A TNA has been undertaken in Mongolia and the results have contributed to the development of the NDC. The TNA is used as a source for the NDC in cases where they coincide on sectors – such as the Agricultural, and the residential and commercial sectors. The NDC also highlights the need for technological support (as well as financial and capacity building) as a condition for achieving the set targets.
66	Myanmar	2017-2020	Myanmar has not yet undertaken a full TNA process, however, the NDC makes reference to an initial TNA which was conducted as part of the preparation of the Initial National Communications of the country. The NDC calls for the transfer of Environmentally Sound Technologies (ESTs) such as renewable energy and energy efficiency technologies for mitigation, as well as flood control technology and early warning technologies for adaptation.
67	Nauru	2017-2020	Nauru is yet to undertake a TNA, however, the NDC highlights the need for this process to help the country track its needs for new equipment, techniques, services, capacities and skills necessary to build resilience to climate change.
68	Nepal	N/A	The TNA process has not been completed in Nepal. The NDC highlights the role of “renewable energy technologies” and other “energy efficiency technologies” in helping the country reduce carbon emissions and become more climate resilient, while also continuing its development and poverty reduction goals. The NDC also highlights the need for international assistance in the form of finance, technology transfer and capacity building to help achieve its targets.
69	Sri Lanka	2012	A TNA has been undertaken in Sri Lanka, and the NDC draws from the results of this process, as well as numerous other national policies and strategies aimed at addressing climate change. The NDC highlights the need to move away from old and unsustainable technologies to more efficient technologies to help reduce GHG emissions across all sectors, without burdening the country’s socio-economic development. It calls for greater details and more sector specific TNAs to be conducted as part of the implementation phase. The NDC also highlights the need for international support in the form of technology transfer, finance and capacity building.

#	Country	TNA completion year	Extent to which "Technology issues" or TNAs and TAPs are addressed in the NDC.
70	Thailand	2012	The country has undertaken a TNA and the results are directly referenced in the NDC. The same sectors prioritised in the TNA have been prioritized in the NDC, highlighting the need for international support in the form of technology transfer (as well as in capacity building and financial) to achieve the set targets.
71	Vietnam	2012	A TNA has been undertaken in Vietnam, and the main sectors prioritized in the TNA match those prioritized in the NDC. Similarly, some of the technologies assessed and prioritized in the TNA have been further highlighted and discussed in the NDC for achieving its goals (along with other technologies assessed but not prioritized in the TNA). The NDC also highlights the need for international support in the form of technology transfer to help achieve its goals.