Framework Convention on Climate Change

TEC/2018/17/14

Technology Executive Committee

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Report on development and enhancement of endogenous capacities and technologies

Background paper

I. Introduction

A. Background

1. At the 21st session of the Conference of the Parties (COP 21) held in November 2015, the COP requested the TEC and the CTCN, in supporting the implementation of the Paris Agreement, to undertake further work relating to, inter alia: (a) technology research, development and demonstration; (b) the development and enhancement of endogenous capacities and technologies (decision 1/CP.21, paragraph 66).

2. At TEC 14, the TEC requested its task force on emerging and cross-cutting issues to assist the TEC in defining the concept and scope of endogenous capacities and technologies. This work was reflected as the activity 18.3 in the updated rolling work plan of the TEC for 2016-2018.

3. At TEC 15, the TEC requested the task force to work on this issue further by identifying elements and features that could be used to indicate endogenous capacities and technologies and the ways they could be developed or enhanced. The TEC also requested the task force to reach out to other related Convention bodies to seek relevant information in their respective area of work.

B. Objective of the report

4. The overall objective is to support the TEC to identify elements and features that could be used to indicate endogenous capacities and technologies and the ways they could be developed or enhanced, with a view to promoting better understanding of countries and relevant stakeholders on this issue and ultimately facilitating development and enhancement of endogenous capacities and technologies for countries in addressing climate change.

5. The task force agreed that the final outcome of this work will be a report containing recommendations on this issue, which can be shared with countries, other constituted bodies, Financial Mechanism operating entities and other relevant stakeholders.

C. Scope and approach

6. The scope of this work is endogenous capacities and technologies in the context of technology development and transfer to address climate change. The two-past works - preliminary study prepared by the secretariat before TEC 14 and the intersessional work done by the task force between TEC 14 and TEC 15 served as the basis for this work.

7. To identify elements and features that could be used to indicate endogenous capacities and technologies and the ways they could be developed or enhanced, the task force took the following approach:

(a) Review the past TEC work on this issue including the preliminary study and the intersessional work between TEC 14 and TEC 15, and conduct further desk review on relevant case studies and examples, as needed;

(b) Review relevant work and activities of other bodies including the Adaptation Committee (AC), the Least Developed Countries Expert Group (LEG), the Paris Committee on Capacity-Building (PCCB), the Global Environmental Facility (GEF) and the Green Climate Fund (GCF).

(c) Conduct a survey with tailored questionnaires for target groups such as NDEs and other stakeholder organizations;

(d) Prepare a draft report containing possible recommendations on common elements and features of endogenous capacities and technologies and the ways they could be developed or enhanced, based on the desk review, the analysis of the survey and further feedback provided through potential outreach activity.

II. Work undertaken by the TEC on development and enhancement of endogenous capacities and technologies in 2017

8. The current work in this area includes reviewing concept and scope of endogenous capacity and technologies, examples, and requirements in various processes under the Convention. Furthermore, work on this issue will be reported to the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA).

A. Preliminary study

9. The preliminary study prepared by the secretariat presented an initial approach to the definition of endogenous development taking into account different contexts and establishes a number of elements which could represent the endogenous characteristics. It then presented examples of how these elements were applied in different contexts in order to give a more comprehensive and realistic idea of the concept. Six case studies that involve both mitigation and adaptation technologies around the world were selected and lessons learned drawn from their implementation.

10. Further, initial conclusions and recommendations were drawn, taking into account the limitations of this study. These include the need to identify internal needs and define priorities to determine the means for building capacity, taking into account a participatory approach. Further, it was also observed that external cooperation and processes are effective only when the internal conditions are understood, taken into account and owned by the governments. And finally, to ensure the acceptance of the development process and its sustainability, social capital must be empowered and community ownership must be boosted. The creation, empowerment or strengthening of local institutions and local markets also plays an important role for sustainability of the projects.

11. A number of recommendations made to the TEC include a further in-depth study in the endogenous capacity and technology, taking into account the need to develop a clearer understanding of the concept “endogenous” as it relates to climate technology development and transfer and look into areas where examples are lacking.

1. Six case studies reviewed in the preliminary study

12. After identifying elements indicative of endogenous concept, the preliminary study looked into how the concept is applied to various situations through an examination of a number of case studies. The case studies are: 1: Access to drinking water in rural and low-income regions of Colombia- Inter-American Development Bank IDB; 2: The Biogas Programme for the Animal Husbandry Sector of Vietnam; 3: AGRUCO - Integrated Community Programmes for Self-Management and Sustainable Development in Bolivia; 4: Bamboo processing industry in Sri Lanka; 5: Solar powered kiosk for mobile phone battery charge; and 6: Bioethanol- Revolution in Brazil. The cases show how endogenous issues related to capacities and technologies have been addressed, allowing the identification of challenges, enablers and barriers during the implementation process.

B. The intersessional work between TEC 14 and TEC 15

13. The intersessional work was undertaken in parallel in three modules, namely (a) possible concept and key elements of endogenous capacities and technologies; (b) review of assessment of

endogenous capacities and technologies under various Convention process; and (c) review of examples which may contain features of endogenous capacities and technologies.

1. Module 1: Possible concept and key elements of endogenous capacities and technologies

14. This module explored the concept of endogenous capacities and technologies by looking at relevant literatures. Based on findings from the literature and review of the preliminary study, this module attempts to explain the concept of endogenous capacities and endogenous technologies, and also identify elements of endogenous capacity and technology.

15. Literatures discussing endogenous capacity and technology in the context of climate change are hardly found, which may mean there is no defined or established concept of this issue. However, there are some literature mentioning about endogenous capacity in the context of sustainable development, which may provide a basic concept to explain endogenous capacities and endogenous technologies in the context of climate change. Rather than proposing a rigid definition, the endogenous capacity and technology can be explained in terms of what the expected outcomes (end results) and the process/means to achieve these outcomes.

2. Module 2: Review of assessment of endogenous capacities and technologies under various Convention process

16. This module examined how endogenous capacities and technologies are dealt in the various Convention process including the CTCN, GEF, GCF. In addition, it also reviewed how endogenous issue is reported in the national communications, biennial reports, and biennial update reports.

17. CTCN technical assistance process contains an explicit criterion related to enhancement of endogenous capacities, while such criteria appear to be implicit in the GEF funding processes. The GCF is currently considering the issue of endogenous capacities. Nevertheless, it is observed there are no common ways to assess how endogenous capacity and technology would be developed/enhanced. Endogenous capacities and technologies also appear as information to be provided in some national reports. But again, there are no clear guidance of how to present and assess this information.

3. Module 3: Review of examples which may contain features of endogenous capacities and technologies

18. This module looked at examples of the CTCN technical assistances, NDCs and TNAs, and examined how the elements/features of endogenous capacity and technology are indicated in these examples.

19. In terms of the CTCN technical assistances, examples show some clear features of development or enhancement of endogenous capacity or technology. On the other hand, while some kinds of such features can also be found in a few examples of NDCs and TNAs, they are vague and not described in detail. This may be attributed in part to ambiguity of this issue. But further review of other type of examples may be needed for getting exact overview.

C. Possible key elements of endogenous capacities and technologies

20. Based on findings from the preliminary study and the intersessional work between TEC 14 and TEC 15, the following possible key elements of endogenous capacities and technologies can be presented, with an additional element, marked with *.

(a) National/community ownership and self-sustainability.

(b) Ability of the country/local community to solve problems on their own, based on its wisdom, resources, policies, institutions and social systems as well as their own initiatives and governance.

(c) Creation of self-sustained systems or economies in the local community to utilize the climate technologies.

(d) Ability and possibility to develop new technologies or modify existing ones to improve them and/or adapt them to local conditions.

(e) *Adaptation technologies are mostly home-grown, while many mitigation technologies are transferred from abroad and adapted to local conditions.

(f) Newly developed or commercialized climate technologies in the country

21. These indicative elements can be made sustainable through the following enabling processes:

(a) Participation of various local stakeholders;

(b) Empowering social capital and boosting national and community ownership;

(c) Involvement of the governments;

(d) Considering and incorporating indigenous and local knowledge;

(e) Capacity building or training for local players based on their respective role in managing/and utilizing the climate technology;

(f) Facilitating process to understand, adapt, utilize, improve and replicate existing technologies;

(g) Facilitating research, development and demonstration of new climate technologies.

III. Relevant works undertaken by other bodies

22. This chapter reviews inputs from the GEF, AC and PCCB, which are responses from these bodies to the request for information on their works on enhancement and development of endogenous capacities and technologies. The responses sent by these bodies are documents and links to their works. This chapter also reviews information shared by the UNFCCC secretariat supporting the LEG on its works on this issue. The review looked for information directly or indirectly related to enhancement and development of endogenous capacities and technologies.

A. Global Environmental Facility

23. The GEF provided inputs through two documents. The first one contains description of the Climate Change Mitigation and Adaptation Results Framework and a number of examples of GCF programmes/projects related to climate technology. The second document is Climate Change Focal Area Study 2017, which provides an evaluation of GEF portfolio on climate change. The first document corresponds largely to the queries sent by the secretariat on behalf of the TEC, which were:

(a) Policies/strategies which address enhancement and development of endogenous capacities and technologies, directly or indirectly.

(b) Criteria and indicators used for operationalizing such policies/strategies.

(c) Examples of projects/programmes which may enhance or develop endogenous capacities and technologies.

(d) Challenges and lessons learned from such projects/programmes Policies/ strategies which address enhancement and development of endogenous capacities and technologies, directly or indirectly.

1. Summary of inputs

(a) Climate Change Mitigation and Adaptation Results Framework

24. The document largely touches upon the first two queries. It does not make specific reference to development and enhancement of endogenous capacities and technologies. However, the Results Framework contains goals, objectives, programmes and indicators of its focal area of climate change, and they may have indirect reference to endogenous capacities and technologies.

25. For example, the goal under mitigation framework refers: “to support developing countries and economies in transition to make transformational shifts towards a low-emission, resilient development path.’ Under this goal, one of the objectives of the mitigation framework is to promote innovation, technology transfer, and supportive policies and strategies. Under this objective, one of the programmes refers to promoting the timely development, demonstration, and financing of low-emission technologies and mitigation options. The outcome under this programme has been

formulated as accelerated adoption of innovative technologies and management practices for GHG emission reduction and carbon sequestration." This outcome is to be measured by the indicator of deployment of low GHG technologies and practices.

26. The goal in the adaptation results framework has been mentioned as "increase resilience to the adverse impacts of climate change in vulnerable developing countries, through both near- and long-term adaptation measures in affected sectors, areas and communities; leading to a reduction of expected socio-economic losses associated with climate change and variability." The outcome of this goal is expected to be climate-resilient technologies and practices adopted and scaled up, which will be measured by the indicator of the extent of adoption of climate-resilient technologies.

27. From the above it appears that, although the programmes, outcomes or indicators do not mention explicitly endogenous capacities or technologies, the elements related to such capacity development can be inferred from the objectives and programmes (e.g. innovation, supportive policies, fostering enabling environments, etc.).

28. Besides, technology transfer, previously a stand-alone strategic objective in GEF-5, was identified as a cross-cutting theme in GEF-6. This means that in all programmes of GEF, technology transfer would remain an integral component. As a result, in all programmes and projects for adaptation and mitigation undertaken under GEF funding, technology transfer will remain a built-in component.

(b) GEF Programmes/Projects

29. This GEF document contains information on global, regional and national projects related to different aspects of mitigation and adaptation, which can be used to respond to queries three and four.

30. The global project promoting accelerated transfer and scaled-up deployment of climate change mitigation (CCM) technologies through the CTCN (UNIDO) includes three components, all of which are related to climate technology: (i) technical assistance for climate technology in response to requests to the CTCN; (ii) partnerships to accelerate the investment and transfer of climate technology; and (iii) networks and capacity-building for climate technology.

31. The four regional projects are also directly or indirectly related to promotion of technology in its various dimensions including financing and networking for technology development and transfer. For example, the regional project: Pilot African Climate Technology Finance Center and Network (AfDB) supports the deployment of technologies for both CCM and climate change adaptation (CCA) in Sub-Saharan Africa. CCM activities focus exclusively on the energy sector and are more specifically aligned with the SEforAll initiative, whereas the CCA activities focus exclusively on the water sector. The project components include: (i) enhancing networking and knowledge dissemination with respect to climate technology transfer and finance; (ii) enabling scale-up of technology transfer through policy, institutional and organizational reforms of the enabling environments at the national and regional levels through technical assistance; and (iii) integrating climate change aspects into investment programs and projects. These regional projects for promoting mitigation and adaptation are generating lessons to help inform the Technology Mechanism, in particular the CTCN, and facilitate coordination and cooperation on climate technology development and transfer.

32. Section four of the GEF document also contains a summary table briefly explaining 11 national-level projects, most of which are related to technology transfer, or introduction of locally-driven technologies and their piloting. Of this list of projects, two projects are discussed in the boxes below, to glean their contributions to enhancement of endogenous capacities and technologies. They are Typha-based Thermal Insulation Material Production in Senegal, and Promotion and Development of Local Solar Technologies in Chile. Though the GEF document does not have much details on these and other national projects, some important features and lessons can be uncovered.

Box 1

Project in Senegal: Typha-based Thermal Insulation Material Production Project (UNDP)

1. The project started implementation in November 2013. It includes the following components: (i) sustainable typha management; (ii) transfer of typha raw material processing technology; (iii) development of local production; (iv) transfer of bio-climatic and energy efficient building technology; (v) typha-based building materials application demonstration; and (vi) marketing and dissemination. The project has already drafted an officially recognized Senegal's standard on typha harvesting, drying and transportation, and provided equipment to national laboratories for the testing of typha-based materials. The promising results of the materials testing carried out allow the project to confirm the choice of materials typhaaustralis and typha-earth for the construction of high-performance building materials in terms of hydro-thermal regulation. These bio-materials offer a measurable improvement in the comfort of the habitat (both for thermal rehabilitation and new constructions).

2. The project results so far available point to several positive impacts on the local economy:

(a) Locally-driven development of typha-based building material responds to the scarcity of resources and raw materials for the industrial production of building materials;

(b) Use of this building material enhances energy efficiency and comfort level in the habitats;

(c) It also contributes to the socio-economic development of the building sector through its expansion, motivation and adoption by local entrepreneurs and communities; and

(d) The project also trained craftspersons in the production and use of these materials in the construction of demonstration prototypes, and production of typha-earth blocks and typha-based materials as well as panels. These efforts are expanding employment, creating green jobs.

3. However, quite a number of challenges has been encountered in carrying out the activities, which are: (i) time-consuming nature of conducting the demonstration activities because of the experimental nature and the relatively small number of companies that have acquired the necessary know-how; and (ii) providing assurance to building professionals of the mechanical, hydro-thermal and performance characteristics of typha-based materials. Once adoption and expansion start happening, these challenges can be overcome with the capacities built under the project.

4. The contributing factors and lessons learned from this project are manifold (i) demonstration plays a fundamentally important role in convincing stakeholders of the value and role of typha-based materials in improving the energy performance of buildings; industry partners, who were initially reluctant to develop organic materials based on typha, are now motivated to support the development of typha-based construction materials; (ii) the commitment of universities and laboratories to continue the research and development of typha-based materials has been instrumental in laying the foundation for typha-based material production, iii) capacity building through training and communications with stakeholders, and iv) combination of local, indigenous knowledge and initiatives with transferred hard and soft skills proved important in development and enhancement of endogenous capacities and technologies.

Box 2

Project in Chile: Promotion and Development of Local Solar Technologies (IDB)

1. The project was endorsed by the GEF in June 2012, and started implementation in November 2013. It includes the following components: (i) technology transfer and capacity-building for solar technology; (ii) development of demonstrative projects using solar power; and (iii) design of incentives and financial mechanisms to promote solar power. Since then the project has supported the Solar Roof program by installing 200 kW of photovoltaic (PV) panels in public buildings, was expected to complete 300 kW by the end of FY2017. The agency has focused on implementing the solar rooftops program in public buildings in Chile. The activities of this programme include technical visits to design the project, carrying out the bidding process to install the solar panels and their associated equipment, and monitoring the installation.

2. The speed with which the PV technology has been incorporated has exceeded the expectations of the project design. The project has positive contributions to the solar development in Chile:

(a) By providing capacity-building and training to solar technicians, and dissemination of information to the public and private sector agents,

(b) Disseminating the benefit rules under the Law 20571 on Distributed Generation and Law 20897 on Water Heaters, and

(c) The project has also contributed to increasing skills by enhancing labor competencies in solar thermal and PV technicians. This could be acquired and certified through the tax exemption of the costs involved by the National Service of Training and Employment.

3. This demo project appears to have had quick and expanding impacts on the development of solar technology in Chile. The following contributing factors and lessons from the project can be filtered from the project: a) as Chile's experience in solar technology shows, enabling sectoral policy-legal framework for development of endogenous capacities and technologies is important; b) capacity building through information dissemination, awareness raising, training and backup support for installation; c) application of market-based systems like bidding process for installation; and d) introduction of financial incentives, such as tax exemptions of the costs involved.

(c) Second Input from GEF: Climate Change Focal Area Study 2017

33. The main purpose of this study was to provide insight and lessons for GEF's climate change support moving forward, by assessing the relevance, results, effectiveness, and lessons learned through GEF support to climate change mitigation and adaptation. The findings of this study and other complementary GEF Independent Evaluation Office (IEO) assessments feed into the Sixth Comprehensive Evaluation of the GEF. This evaluation has references related to GEF's efforts in promoting climate technologies.

34. GEF climate change projects have frequently piloted or demonstrated new technologies, as are evident from the projects implemented under GEF funding. The global, regional or national level projects are all geared to development, demonstration or transfer of climate technologies. For example, the national level projects included solid waste composting, solar chill, solar roofing, bio-waste to energy production, typha-based production of building materials, root hydration system irrigation in arid lands, etc. More than 60 percent of the projects analyzed under this focal area study piloted specific renewable energy, energy efficiency, or sustainable transport technologies.

2. Concluding remarks

35. Though endogenous capacities/technologies are not explicitly mentioned in the GEF mitigation and adaptation frameworks, elements of developing endogenous capacity and technology appear engrained in the GEF results framework.

36. The review above shows that often the positive end results under the GEF-funded projects happen due to a number of factors:

(a) beginning with demonstration activities to support endogenous technology, new product development or manufacturing, with a clear strategy for up-scaling early in the project,

(b) multiple-component approach, as was evident also from the two projects reviewed above, to implementation of such projects: this includes capacity building of stakeholders, market-based incentives and transformation;

(c) providing support to clean-technology entrepreneurs and start-ups by organizing acceleration and technology competition programmes and facilitating access to venture capitals and strategic investors,

(d) supporting private-sector enterprises for proof-of-concept stage development of advanced clean energy technologies seeking to fill a void in the current public and private financing landscape for early-stage technology commercialization in the country;

(e) public-private and industry-academia partnerships;

(f) aligning local indigenous knowledge with transfer of hard and soft technologies;

(g) designing context-specific financing mechanisms, and

(h) promoting enabling policy-legal environment in the countries implementing projects for development and enhancement of endogenous capacities and technologies.

37. What many of these projects have in common is that they are facilitating greater collaboration between a variety of actors, including public and private entities from academia, business and industry, civil society, and community-based initiatives that otherwise would not interact or collaborate easily, thereby fulfilling a crucial coordination and facilitation role in the development of technology innovation systems. These experiences and lessons learned that the GEF has accumulated through long years of operation with its portfolio of climate change could be shared with other financial institutions.

B. Green Climate Fund

38. The GCF provided inputs through a document titled “GCF feedback on the request for inputs on endogenous capacity and technology”. The document was a response to queries sent by the UNFCCC secretariat on behalf of the TEC, which were:

(a) Policies/strategies which address enhancement and development of endogenous capacities and technologies, directly or indirectly

(b) Criteria and indicators used for operationalizing such policies/strategies

(c) Examples of projects/programmes which may enhance or develop endogenous capacities and technologies.

(d) Challenges and lessons learned from such projects/programmes.

1. Summary of inputs

39. Relating to funding proposals, overall, the GCF investment framework elaborates activity sub-criteria and assessment factors for adaptation and mitigation funding proposals, adopted by decision B.09/05. The investment framework contains activity sub-criteria and/or assessment factors relevant to low-emission or climate-resilient technologies. Accredited entities are expected to develop funding proposals with due consideration of the investment criteria and the relevant activity-specific sub-criteria and indicative assessment factors, including:

(a) Potential for strengthened regulatory frameworks and policies to drive investment in low-emission technologies and activities, promote development of additional low-emission policies, and/or improve climate-responsive planning and development;

(b) Opportunities for targeting innovative solutions, new market segments, developing or adopting new technologies, business models, modal shifts and/or processes;

(c) Degree to which the programme or project reduces proposed risks of investment in technologies and strategies that promote climate resilience in developing countries;

(d) Contribution of the programme or project to country's priorities for low-emission and climate-resilient development and demonstration of alignment with technology needs assessmen1ts (TNAs); and

(e) Explanations of how best available technologies and/or best practices, including those of indigenous peoples and local communities, are considered and applied.

40. The GCF input provided a list of 9 brief project examples guided by the definition of endogenous capacity, as given in relevant UNFCCC documents, which are mentioned as follows:

(f) The building up of both human capability and institutional infrastructures, besides setting up suitable mechanisms for policy formulation and implementation at the government level;

(g) The sensible and autonomous decision-making capacity to manage technological change at all levels of society;

(h) The set of human and institutional capabilities necessary to address the question of managing clean(er) technology, either indigenously developed or adapted from abroad;

(i) National innovation systems, local/national ownership, human capital, local/national knowledge, local/national economies, external resources that best fit the local/national conditions, participatory approach, institutional infrastructures and policy mechanisms that boost internal developments.

41. The list of 9 examples covering both GCF approved projects as well as Readiness support measures by the GCF include: Climate finance energy efficiency, renewable energy and climate resilience, Climate information services, Transformational shift to low carbon economy, Scaling of modernized climate information and early warning systems, Technology roadmap for implementing climate action plans, Strengthened drought and flood management through improved science-based information, Development of an energy efficiency master plan, Vulnerability and adaptation study and Drought early warning and forecasting system.

42. Of all these examples, only one (#1 in the list) covers 10 countries of Asia, Europe and Africa, while the other 8 examples are individual country-based, in the Middle East, Asia and the Pacific and Africa. All the examples have substantial share of co-financing.

43. A careful reading of the profiles indicates that they are mostly meant for development of endogenous capacities for soft technologies, directly or indirectly. These on-going projects and Readiness measures directly or indirectly respond to the first and third queries sought by the secretariat. Out of the nine projects and Readiness support measures, profiles of a project focusing on mitigation and a Readiness support measure for adaptation, have been presented in the boxes below:

Box 1

GCF approved project FP025: **Scaling up private sector climate finance through local financial institutions (GCF-EBRD SEFF -Sustainable Energy Financing Facilities Co-Financing Programme)**

Objective of the project:

1. To deliver climate finance to the private sector at scale through Partner Financial Institutions (PFIs) across 10 countries and to create self-sustaining markets in the areas of energy efficiency (EE), renewable energy (RE) and climate resilience (CR).

2. The project is aimed both for mitigation and adaptation, with 27.5M tonnes of CO2 equivalent avoided, and 72,840 people will benefit from the activities. It has the components of credit loans and technical support, which are planned along the following lines:

(a) Sustainable Energy Financing Facilities (SEFF): on-lending programme that will provide credit lines to PFIs to create self-sustaining markets in the areas of EE, RE, CR.

(b) Deliver climate finance at scale via PFIs in developing countries and address multiple market barriers along the technology supply chains and unlock the potential of private sector finance:

(i) Building the capacity of all actors along the climate technology supply chain, in particular by encouraging local PFIs to establish and grow climate financing solutions for RE, EE and CR that currently either do not exist at all, or are underserved

(ii) Stimulating demand for best-available climate technologies by providing much-needed long-term finance that more closely matches the financial characteristics of RE, EE and CR projects

(iii) Facilitating the creation of new markets by demonstrating the profitability and enhanced competitiveness of climate technologies and ultimately de-risking climate investments to leverage a growing level of funding from the private sector over time.

3. Looking at the project components, it appears that it is meant for driving the promotion and enhancement of EE, RE and CF through green financing as the handmaiden of clean technology. Together, the project appears to have great potential to build capacity of all actors including the PFIs, through a demand-driven approach for best available climate technologies.

Box 2

GCF Readiness support: Strengthened drought and flood management through improved science - based information availability and management in Myanmar

1. The Objectives of the project are:

(a) to establish a science and web-based data and information portal based on satellite data of relevance for climate change adaptation within Myanmar, to be used as a planning tool for flood and drought management.

(b) Enhance the capacities of staff within the concerned government line agencies in the use and application of the data and information portal for informed decisions.

(c) Enable decision makers within relevant ministries to use the transferred knowledge, practices and technologies actively in climate related planning towards the water or agriculture sector

2. To achieve the objectives, the project will have the following activities:

(a) Assessment of technology and information needs and technology validation;
(b) Development and validation of drought and flood management portal;
(c) Awareness raising and capacity building for using the established portal.

3. The project appears to have good potential for putting Myanmar, a country which for long remained isolated, on to a track of climate science-based policy-making, thereby adding capacity of policy makers to address such issues.

44. Relating to GCF's Readiness support, the funding programme to enhance country ownership and access to the Fund, technology-related aspects have been developed at the output-level in order to strengthen the capacity of NDAs to advance technology in their overall engagement with the

GCF. These are now part of the updated Readiness and Preparatory Support Guidebook as shown in the table below.

Table. Technology-related outputs specified in the Readiness and Preparatory Support Guidebook

Outcomes	Outputs
1. Relating to institutional capacity and coordination mechanisms in place to govern and coordinate climate action and finance	1.5 Effective coordination mechanism between NDA and NDE for the UNFCCC TEC and other climate finance focal points
2. Relating to Country Programming process	2.5 Appropriate climate technology solutions identified and priorities in accordance with national strategies and plans 2.6 Feasibility of selected climate technologies for mitigation and adaption assessed and incorporated into planning processes
4. Relating to Climate finance strategies and project pipeline strengthened	4.4 Market preparation and business planning for deployment and scale-up of prioritized climate technology solutions

2. Concluding remarks

45. As the GCF projects and Readiness support measures are on-going, challenges and lessons from such projects are yet to be learned.

46. Though the project profiles do not explicitly mention `endogenous technologies,' they focus on development of local/national capacities and mostly on soft technologies, such as web portals, early warning systems, energy efficiency and renewable energy technologies, etc.

47. Both the projects and the Readiness support measures have great potential in establishing demand-driven approaches to development of capacities and clean technology. After completion of these projects, an evaluation can substantiate this claim.

C. Adaptation Committee

1. Summary of inputs

48. The secretariat sought for the following information from the Adaptation Committee (AC):

(a) Past and on-going work of the AC, which may be relevant for the enhancement and development of endogenous capacities and technologies; and

(b) Future work of the AC, which may provide additional information to the TEC in considering the issue of enhancement and development of endogenous capacities and technologies

49. In response to these two queries, AC has sent a number of links to their meeting outcomes and expert level meetings on different issues.

50. A review of the information contained in the reports downloaded from those links reveals that AC works so far do not have any direct link to enhancement and development of endogenous technologies, but rather contribution to capacity building for adaptation. Some of the briefs which are the results of the AC expert group have links with capacity development, but nothing for endogenous technologies. Such briefs/reports include topics of economic diversification for adaptation, mainstreaming of adaptation into national planning and strategy and indigenous and traditional knowledge and practices for adaptation.

51. An area that may be relevant was the AC work on indigenous and traditional knowledge. The AC held a joint meeting on 01 April 2014 with the Nairobi Work Programme (NWP) on available tools for the use of indigenous and traditional knowledge and practices (ITKPs) for adaptation, needs of local and indigenous communities and the application of gender-sensitive approaches and tools for adaptation. The participants shared good practices, opportunities and challenges with respect to

the use of ITKPs for adaptation, addressing the needs of local and indigenous communities, and the application of gender-sensitive approaches and tools for adaptation. The meeting has developed a long list of recommendations targeted at local, national and multilateral levels, both for ITKPs and mainstreaming of gender considerations into the adaptation processes. Some of these recommendations are: sharing and scaling of good practices of ITKPs, integration of ITKPs with national adaptation planning process, appreciation of ITKPs by all actors including national governments, experts and multilateral agencies, access to support for scaling of ITKPs.

52. The AC also informed its future work including the organisation of a Technical Expert Meeting in 2018 on adaptation planning for vulnerable groups, communities and ecosystems. In addition, the AC will develop its 2019-2021 workplan over the course of this year.

2. Concluding remarks

53. The AC has taken initiative with the NWP to strengthen indigenous knowledge and practices for adaptation so that it can further contribute to sustainable adaptation. Such an initiative may be relevant to development and enhancement of endogenous capacities.

54. In terms of future work, in remains to be seen whether there is a specific activity relating to endogenous capacities and technologies is planned at this moment.

D. Paris Committee on capacity-building

1. Summary of inputs

55. The secretariat sought from the PCCB information on its future work, which may provide additional information to the TEC in considering the issue of enhancement and development of endogenous capacities and technologies.

56. COP21 held in Paris established the PCCB to oversee and manage the five-year work plan (2016-2020) aimed at sustainable capacity building in developing countries to address climate change mitigation and adaptation. PCCB held its first meeting in May 2017 and the second one took place during SB 48 session in April-May 2018. The initial focus of PCCB work is on capacity building for implementation of NDCs of the developing countries.

57. The PCCB work plan for the period 2016-2020 contains nine activities.[1] It is observed that "technology" is not explicitly mentioned among these activities. Yet one of its mandates is to explore how developing country Parties can take ownership of building and maintaining capacity over time and space. This may have relevance to the TEC work on endogenous capacities and technologies, because developing the latter obviously will facilitate the ownership of capacity building process in developing countries. In its input, the PCCB suggested to work together and create synergies with the TEC on the topic of endogenous capacities and technologies.

58. Responding to the suggestion by the PCCB, the TEC task force on emerging and cross-cutting issues had a meeting with the PCCB working group on linkages with the existing bodies under the Convention to exchange views on possible collaboration between the two committees during the Bonn Climate Change Conference in May 2018. The PCCB working group agreed to distribute the TEC survey on endogenous capacities and technologies to the members and observers of the PCCB to fill in it, and share some case studies which may relevant to this issue.

2. Concluding remarks

59. One of its mandates, namely, to explore how developing country Parties can take ownership of building and maintaining capacity over time and space, may be an area of work in which the TEC and PCCB can make a collaboration and create synergies.

E. Least Developed Countries Expert Group

1. Summary of inputs

60. The secretariat sought for the following information from the UNFCCC secretariat supporting the LEG: 1) Past and on-going work of the LEG, which may be relevant for the

[1] https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf#page=11

enhancement and development of endogenous capacities and technologies; and 2) future work of the LEG, which may provide additional information to the TEC in considering the issue of enhancement and development of endogenous capacities and technologies.

61. The LEG has undertaken no specific work related to endogenous capacities and technologies so far. However, it has developed a supplementary guidance on Strengthening Gender Considerations in Adaptation Planning and Implementation (UNFCCC, 2015), which contains some suggestions and guiding principles on how to integrate gender as a cross-cutting issue in preparation of the national adaptation plans (NAPs).

62. The guidance suggests to "ensure the participation of the most vulnerable groups, including women, in the process to formulate and implement NAPs. This includes integrating the perspectives of women and drawing on their unique adaptation knowledge and local coping strategies when formulating the NAP."

63. The guidance also suggests that funding allocation be analyzed in terms of whether it is aimed at building the capacity of women, or adapting sectors/areas that are, built upon the work of women. In Tajikistan, for instance, CARE International has assisted in designing adaptation technologies related to household/community food security, through the construction of small greenhouses for vegetables, which allow for an extended growing season. The project also promotes food preservation by working with women to ensure the safe storage of surplus food.

64. Further, the LEG guidance urges that national governments to prioritize efforts to build the capacity of women and gender-focused organizations at the national level, including through dedicated training. Such trainings for enhancing their adaptive capacities may in turn enable women better to contribute to developing endogenous technologies based on their age-old indigenous and newly-acquired modern knowledge and skills.

2. Concluding remarks

65. As for future work of the LEG, it is mandated to provide technical guidance and support to the process to formulate and implement NAPs. There the TEC work on endogenous capacities and technologies may be a useful reference for the LEG work as kind of a supplementary guidance.

IV. Results and analysis of the survey

A. Survey overview

66. Following the guidance given by the TEC at TEC 16, two surveys were conducted to explore perceptions about endogenous capacities and technologies. The first was targeted to NDEs and the other was targeted to relevant observers and experts, including former TEC members.

1. Purpose

67. The purpose of the surveys was to collect perceptions about endogenous capacities and technologies from relevant stakeholders and experts. The results were intended to help the TEC to identify elements and features that could be used to describe, develop, and enhance endogenous capacities and technologies. In addition, the survey results may be used by the COP, CTCN, countries, subsidiary and constituted bodies and other relevant stakeholders, including local and municipal governments, international agencies, non-governmental organizations and the private sector in planning for implementation of the Paris Agreement.

2. Target respondents

(a) National designated entities

68. National designated entities (NDEs) serve as national coordinators for the development and transfer of technologies. They also act as focal points for interacting with the Climate Technology Centre and Network (CTCN). As liaisons between countries and the Technology Mechanism, the NDEs possess in-depth knowledge and considerable experience about national planning processes, operations, and capacities relating to climate technologies. The first survey (hereinafter referred to as the "NDE survey") targeted the NDEs of the 159 countries that have appointed NDEs.

(b) Relevant observers and experts

69. NDEs are not the only people with expertise and interest in climate-related technologies and capacity building. The NDE survey was modified to address issues more appropriate for distribution to relevant observers and experts. The second survey (hereinafter referred to as the "Observer survey") targeted current and former TEC members, observers who have attended TEC meetings, and others knowledgeable about climate technologies and capacity building. The observer survey also was forwarded to all members of the Paris Committee on Capacity Building (PCCB) and other attendees of the second meeting of the PCCB.

3. Survey format and type of questions

70. The surveys were constructed using Survey Monkey software. The NDE survey included 27 questions, and the observer survey asked 20 questions. Many of the questions required ratings for several items. The survey used mostly rating scales and other closed-ended questions that would provide more quantitative data, but these questions also provided options to add an "other" response. Open-ended questions also were used when needed to collect information that cannot be easily obtained through more structured questions.

4. Survey distribution and response

71. The NDE survey was sent by email to 159 NDEs registered as at 12 April 2018, and the survey was closed on 1 June 2018. The Observer survey was initially sent by email on 26 April 2018 to current and former TEC members, TEC observers, and anyone who had attended past TEC meetings. On 7 May 2018, the Observer survey also was sent to PCCB members and other attendees of the second meeting of the PCCB. The Observer survey also was closed on 1 June 2018.

5. Interpreting results

72. Both surveys produced relatively few respondents. There is no way to know how representative respondents are of the entire group of NDEs or of people knowledgeable about climate technologies in general. Results should be regarded simply as the expressed opinions of those who chose to participate.

73. Most of the results are presented as percentages of respondents who answered that question; questions with a different analytical basis are noted. Cumulative percentages often do not add to 100% because of rounding error. General statements have been made about highest and lowest ratings and large differences between groups. No effort has been made to determine statistical significance of differences between groups or between items.

B. Survey results and analysis

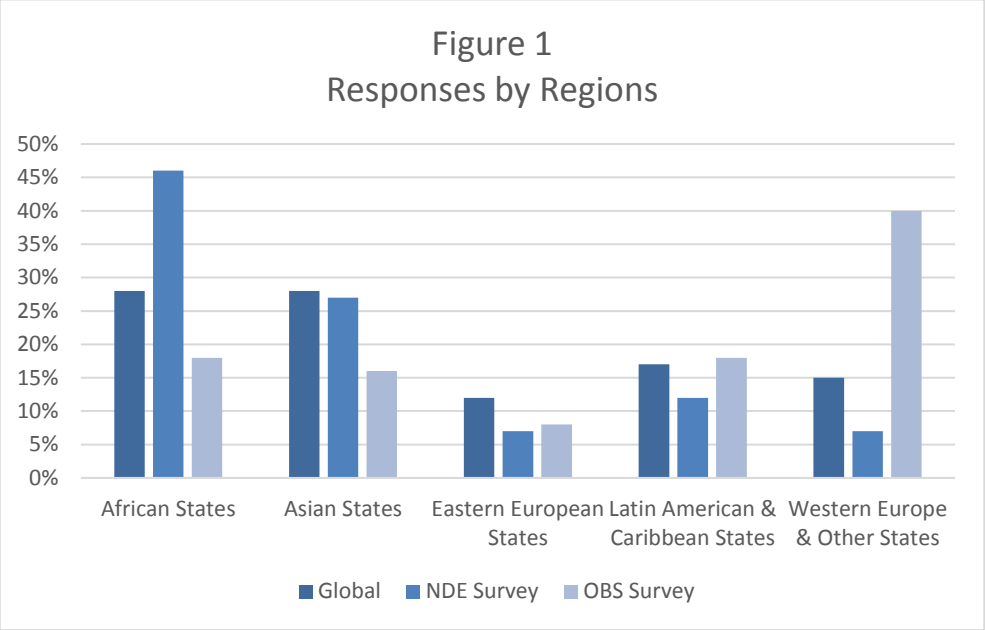
1. Respondent characteristics

(a) Countries and regions

74. The 41 NDE respondents were from 35 countries; 6 countries had 2 respondents. The 51 0bserver respondents were from 32 countries; 9 of these had multiple respondents. The NDE respondents included 11% from Annex I countries, while 57% of the Observer respondents were from Annex I countries.

75. Figure 1 shows the distribution of the United Nations regions in which respondents' countries are located. African States were somewhat over-represented on the NDE survey, while Western Europe and Other States were under-represented. The Observer survey showed a different response pattern. Both Asian States and African States were less well represented, while Western Europe and Other States were over-represented.

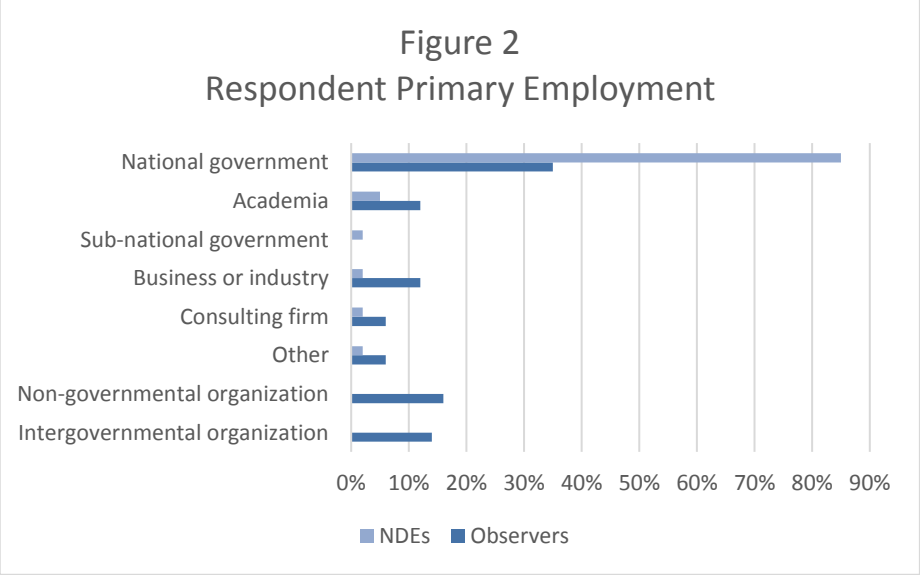
Figure 1. Response Regions



(b) Employment

76. Figure 2 shows the primary employers for the two respondent groups. As would be expected, almost all the NDE respondents work for their national government. Observers reported much more varied employment, although 59% of them also work for national governments, more than twice the number working for any single other employer. The high number working for governments is not surprising, given that many of the observer respondents are negotiators. The second most frequent observer employers are non-governmental organizations, but NGOs employ fewer than one in five observer respondents.

Figure 2. Respondent Primary Employment

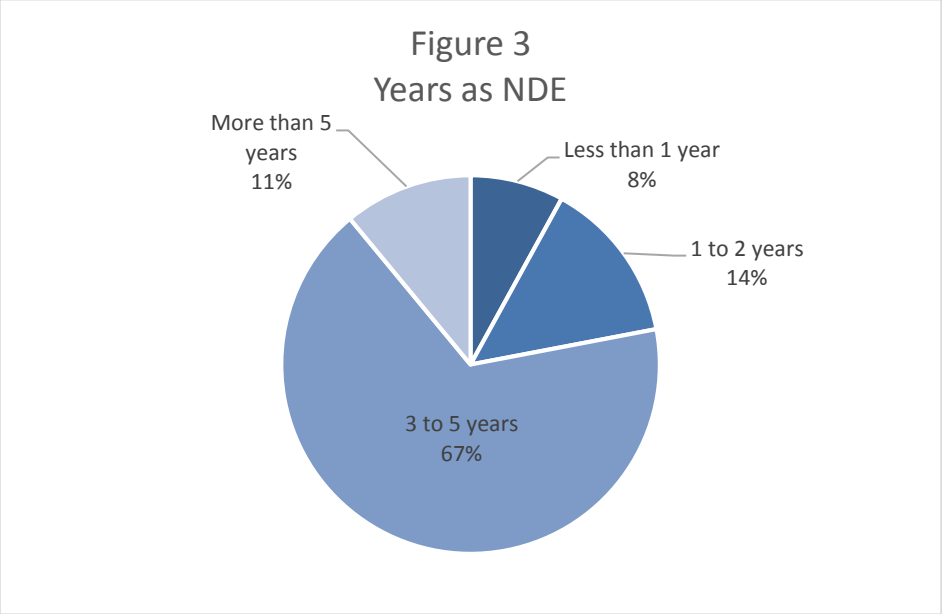


(c) NDE experience

77. Most (37) of the 41 NDE respondents currently serve as or work for the NDE for their country. Quite a few observers (23%) also have served as NDEs. Only the NDE survey asked how many years the respondent has served as an NDE. More than two-thirds of the 37 NDEs have served 3 years or more. Only 8% have served less than one year.

78. The NDE results were cross-tabulated with time spent serving as NDEs. No correlations were apparent between experience and responses.

Figure 3. Years as NDE



2. Understanding of endogenous capacities and technologies

(a) Components of endogenous capacities

79. The preliminary study conducted in 2017 found no clear definition of endogenous capacities and technologies. The NDE and Observer surveys were conducted in part to collect perceptions about what should be included in the definitions.

80. Both the NDE and Observer surveys presented ten activities that could be included in a definition of "endogenous capacities" and asked respondents to indicate whether each activity definitely or probably should be included, or definitely or probably should not be included in the definition. Respondents also could say they were not sure or had no opinion.

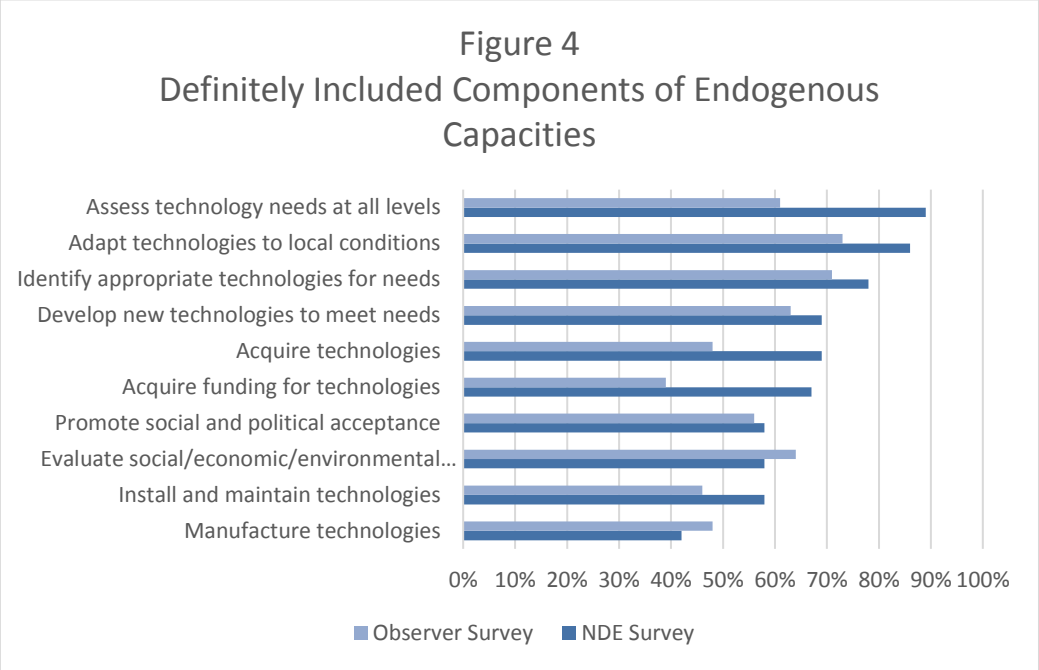
81. Respondents were quite inclusive in defining endogenous capacities. At least 70% of the NDE respondents and at least 60% of the Observer respondents said each of the activities "definitely" or "probably" should be included in the definition.

82. Figure 4 narrows the analysis by focusing only on the percentages of NDE and Observer respondents who said an activity "definitely" should be included in the definition of endogenous capacities. More than four out of five of the NDE respondents supported including "Assess climate-related technology needs from the individual to the national levels" and "Adapt technologies to local needs and conditions". More than three out of four also supported "Identify appropriate technologies to assist in meeting those needs". Almost seven of ten NDEs thought three more comments definitely should be included; these were "Develop new technologies to meet mitigation and adaptation needs", Acquire technologies", and "Acquire funding for technologies". "Manufacture technologies" was the only activity that fewer than half of the NDE respondents said definitely should be included in the definition.

83. The Observer respondents gave somewhat lower scores than the NDEs to all but two of the ten activities but were still quite inclusive. At least six of ten observers would definitely include "Adapt technologies to local needs and conditions", "Identify appropriate technologies to assist in meeting those needs", "Evaluate social, economic, and environmental impacts of technologies", "Develop new technologies to meet needs", and "Assess climate-related technology needs from the individual to the national levels". Observers gave their lowest support to including "Acquire funding for technologies", "Install and maintain technologies", "Acquire technologies", and "Manufacture technologies" in the definition.

84. The largest differences between the NDEs and observers were on "Assess climate-related technology needs from the individual to the national levels" and "Acquiring funding", although the observers did provide strong support for assessing technology needs, as indicated above.

Figure 4. Definitely Included Components of Endogenous Capacities

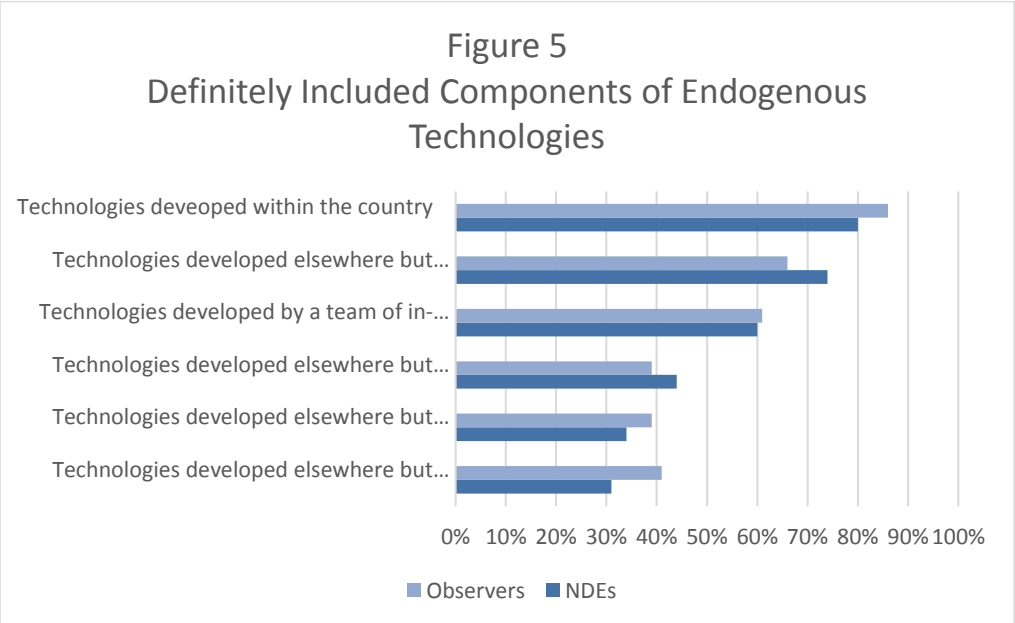


(b) Components of endogenous technologies

85. Both surveys presented a list of six types of technology development and asked respondents to consider whether each one should be included in a definition of "endogenous technologies".

86. About six out of ten of both the NDE and Observer respondents thought each item probably or definitely should be included in a definition of "endogenous technologies". Figure 5 narrows the analysis by showing the percentages of NDE and Observer respondents who said a type of technology "definitely" should be included in the definition of endogenous technologies. The rankings of responses between the NDE and Observer groups were nearly identical, and even the magnitudes were similar. Technologies developed or adapted within the country clearly mattered. Both groups gave top ratings to technologies developed within the country, developed by a team of in-country and external people, or developed elsewhere but adapted to local needs and conditions. Technologies developed elsewhere but tested, manufactured, or deployed within the country had lower support for inclusion in the definition.

Figure 5. Definitely Included Components of Endogenous Technologies



3. Helpfulness of training and resources

87. In addition to perceptions about definitions, the survey asked what training and resources would be most useful to enhance a country's endogenous technologies and capacities. Other questions focused on the usefulness of various resources in dealing with climate technology issues.

(a) Training or resources for enhancing abilities on endogenous capacities and technologies

88. Each of the twelve listed activities was regarded as "very" or "somewhat" helpful by at least 66% of the two groups. Figure 6 summarizes the percent saying an activity would be "very" helpful.

89. The NDE helpfulness ratings were generally higher than those on the Observer survey, with only three exceptions, and these differences were small. At least nine out of ten of the NDE survey respondents gave "Very" helpful ratings to "Assessing local community needs for climate-related technologies" and "Encouraging development and adaptation of technologies to meet local needs". On other questions, over 70% of both NDE and Observer respondents supported "Selecting appropriate technologies", "Adapting technologies to local needs and conditions", and "Utilizing local and indigenous knowledge". The biggest differences between the NDE and Observer responses were on "Importing technologies" and "Managing finances relating to technologies", which were rated as very helpful by more NDE survey respondents. Percentages for both groups dropped gradually from a high of 97% (NDEs on assessing local community needs) to a low of 13% (Observers for importing technologies).

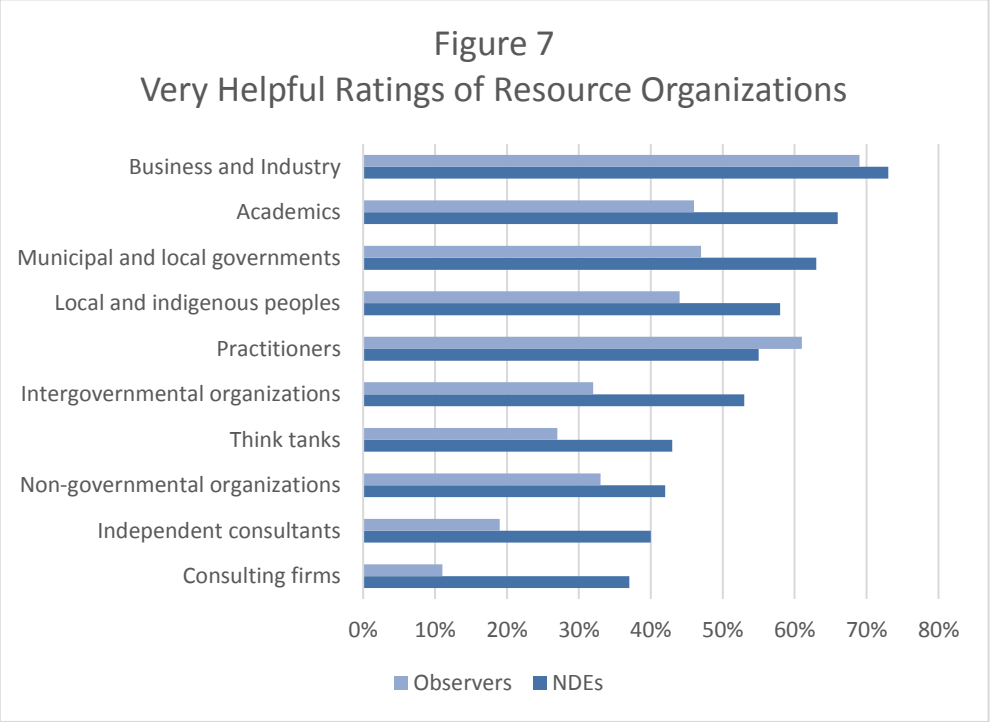
Figure 6. Very Helpful Ratings of Training or Resources

(b) Resource organizations

90. Both surveys asked about the types of organizations respondents found most helpful in dealing with climate technology issues. All ten listed resources were regarded as "very" or "somewhat" helpful by at least 73% of respondents.

91. Figure 7 shows the percent that rated each of the resources as "Very" helpful. Both groups gave their highest ratings to business and industry. NDE respondents also said academics and municipal and local governments were very helpful, while observer respondents gave their second highest ratings to practitioners, the only resource where observers gave more "Very" helpful ratings than NDEs. Both groups gave their lowest "Very" helpful ratings to consulting firms, independent consultants, non-governmental organizations, and think tanks, but almost three out of four still found these resources to be at least somewhat helpful.

Figure 7. Very Helpful Ratings of Resource Organizations



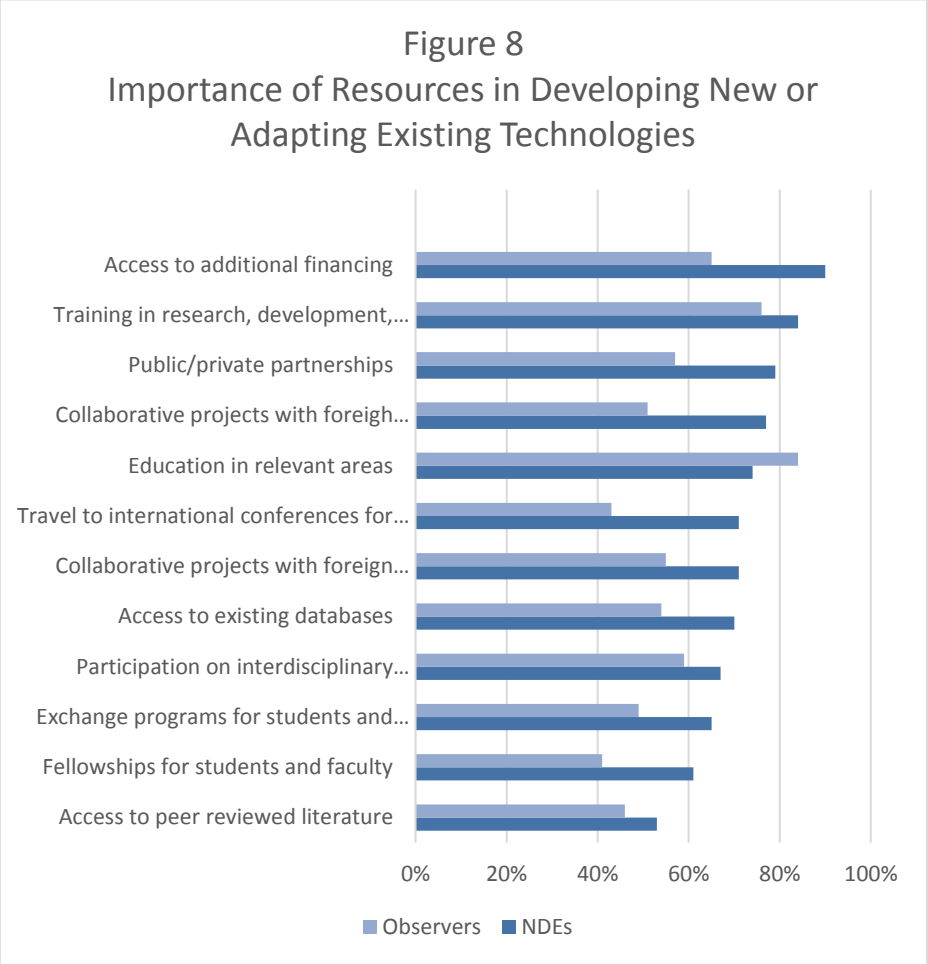
(c) Resources for developing or adapting technologies

92. Both groups were asked about the importance of twelve resources in developing new or adapting existing climate-related technologies. NDEs were asked to focus on importance to their country, while Observers were invited to rate importance in general. On this question, every resource was rated as "very" or "somewhat" important by at least 84% of the NDE respondents.

93. Figure 8 shows the percentage rating a resource as "very" important. Every listed resource was rated as "Very" important by at least half the NDEs and 40% of the observers.

94. Observer ratings were lower than NDE ratings for every resource, except for "Educational programs in relevant areas of engineering, science, and social science", which observers rated as slightly more important than NDEs. NDEs gave the highest rating to "Access to additional financing", followed by "Training in research, development, and innovation process", while observers gave top ratings to "Educational programs in relevant areas of engineering, science, and social science", followed by "Training in research, development, and innovation process".

Figure 8. Importance of Resources in Developing New or Adapting Existing Technologies



4. Country experiences

95. The NDE survey asked about technology-related planning already underway in countries. Questions were asked about the balance between endogenous and external consultants, and about NDE involvement in the projects. The survey also asked about mitigation and adaptation actions addressed by the different processes. These questions were not included in the Observer survey, as most observers are less likely to be knowledgeable about ongoing processes in their countries.

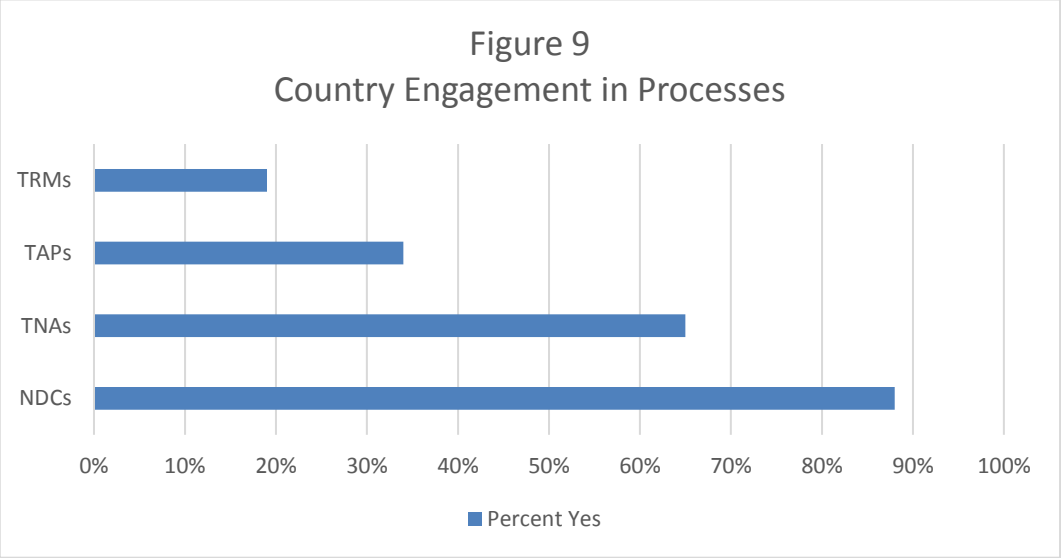
(a) Relevant processes

96. Countries already have conducted many types of climate action projects that involve endogenous capacities and technologies. The NDE survey asked respondents whether their country had undertaken a Technology Needs Assessment (TNA), Technology Action Plan (TAP), Technology Roadmap (TRM), and/or Nationally Determined Contributions (NDCs).

97. Figure 9 shows the percentage of respondents saying their country had undertaken each activity.

98. Almost all NDE respondents reported their country had submitted NDCs. Fewer reported development of TNAs, TAPs, or TRMs. The reports for TNAs and TRMs may not be accurate, as up to 29% respondents said they were not sure whether their country had engaged in that activity.

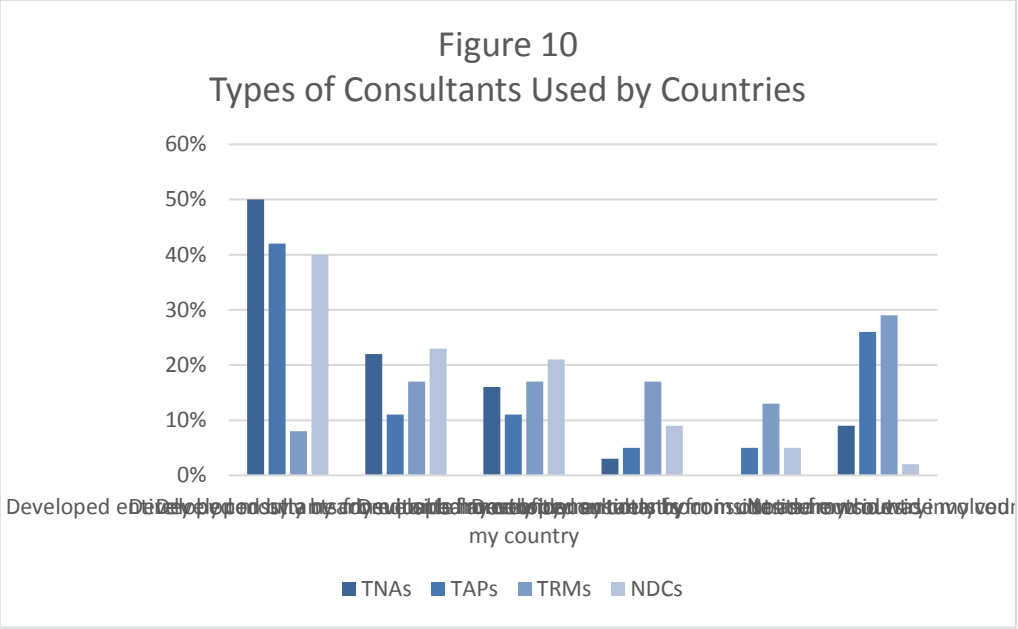
Figure 9. Country Engagement in Process



(b) Balance of consultants

99. The NDE survey went on to ask about the balance of consultants from inside or outside the country who were involved in each activity. Figure 10 shows the percentage of each type of consultant involved in each process. For TNAs, TAPs, and NDCs, nearly half of the NDEs said their country relied entirely on in-country consultants. Relatively few processes were conducted primarily or entirely by foreign consultants. NDEs seem to know least about the TAP and TRM processes; nearly one in three reported they were not sure who had been involved.

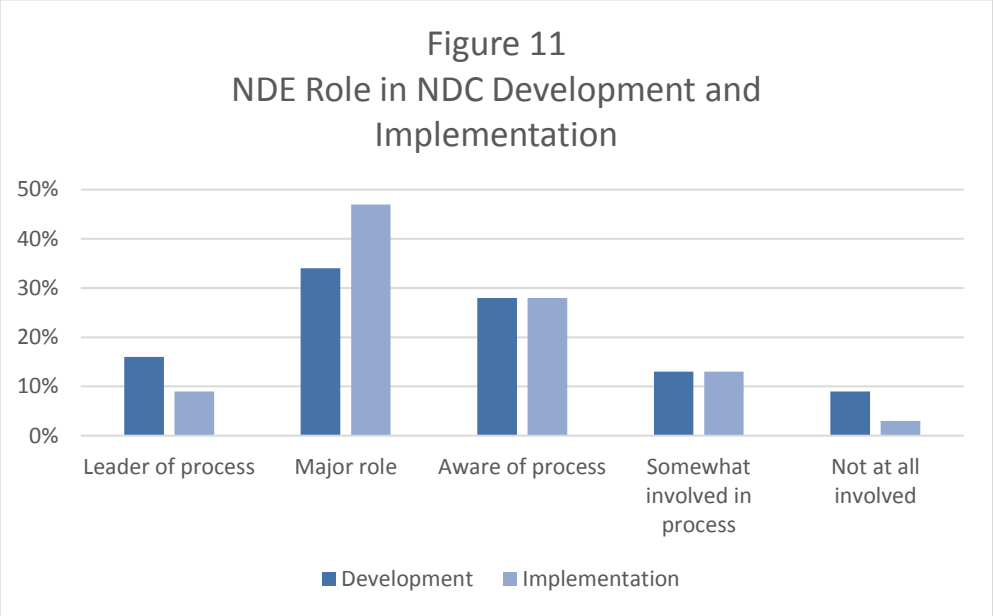
Figure 10. Types of Consultants Used by Countries



(c) NDE roles

100. The NDEs also were asked about the level of their personal involvement in developing and implementing the INDCs/NDCs. More than half have played a major role or led the NDC development or implementation efforts in their country. Very few NDEs reported not being involved at all.

Figure 11. NDE Role in NDC Development and Implementation

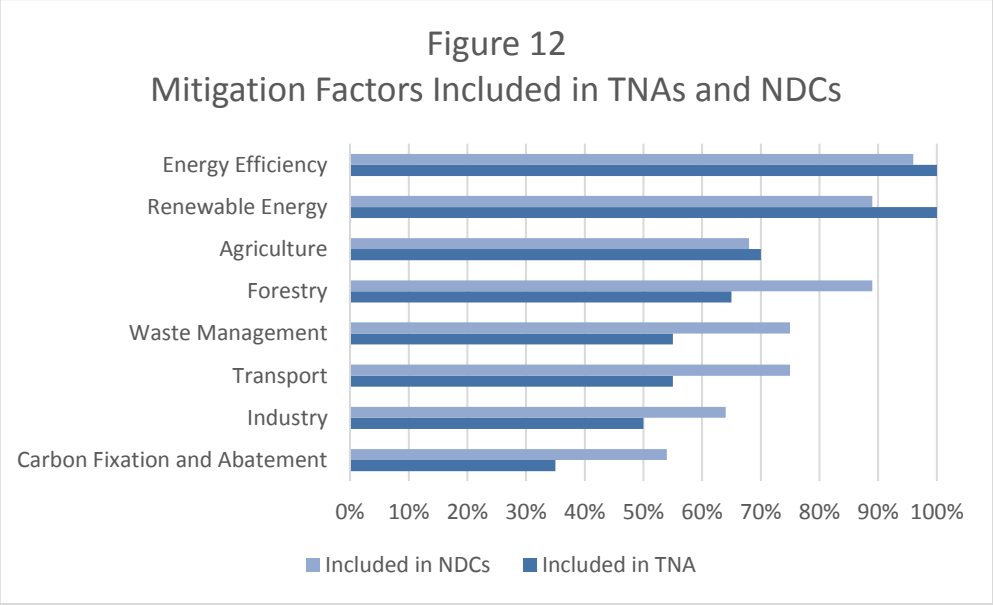


(d) Mitigation and adaptation activities

101. The NDE survey also asked whether eight mitigation and seven adaptation sectors had been included in the country's TNAs, TAPs, TRMs, and NDCs. Figure 12 shows the percent of respondents saying a mitigation sector had been included, and Figure 13 does the same for adaptation factors. Only NDCs and TNAs have been included in the charts because relatively few countries have conducted TAPs or TRMs.

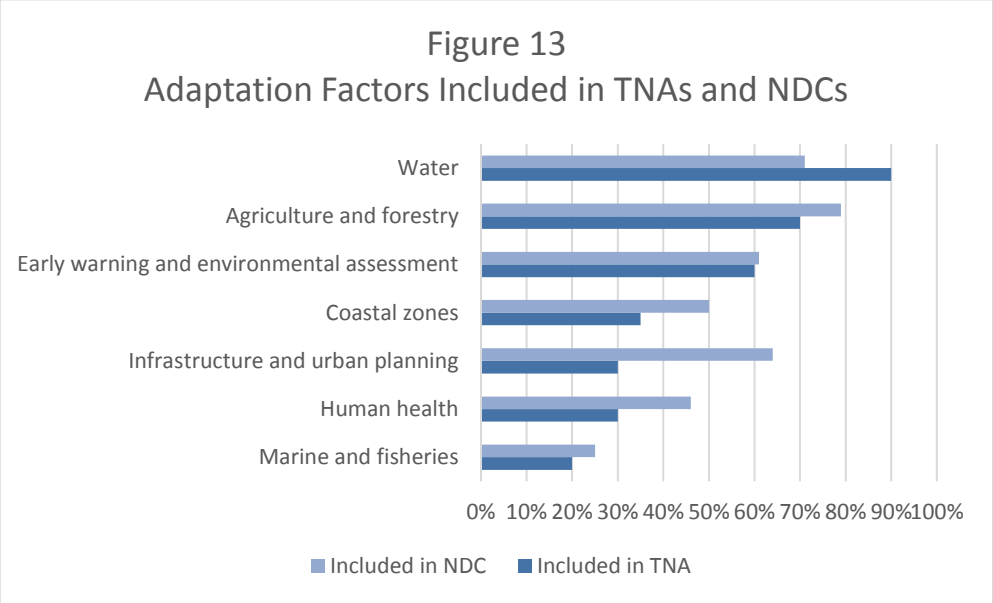
102. All the mitigation sectors were included in at least half of the NDCs, with almost all TNAs and NDCs addressing energy efficiency and renewable energy; almost all TNAs also included forestry components. NDCs were least likely to address carbon fixation and abatement. TNAs showed similar patterns, but with fewer countries including most of the sectors.

Figure 12. Mitigation Factors Included in TNAs and NDCs



103. Countries were less likely to include adaptation factors in either their NDCs or TNAs. Water, along with Agriculture and forestry, were the only two adaptation sectors included by at least seven out of ten countries. Early warning and environmental assessment were also frequently included. Infrastructure and urban planning, Coastal zones, and Human health were more often included in NDCs than in TNAs. Countries were generally more likely to include adaptation in their NDCs than in their TNAs except for Water, which was more often addressed in TNAs.

Figure 13. Adaptation Factors Included in TNAs and NDCs



5. Collaboration

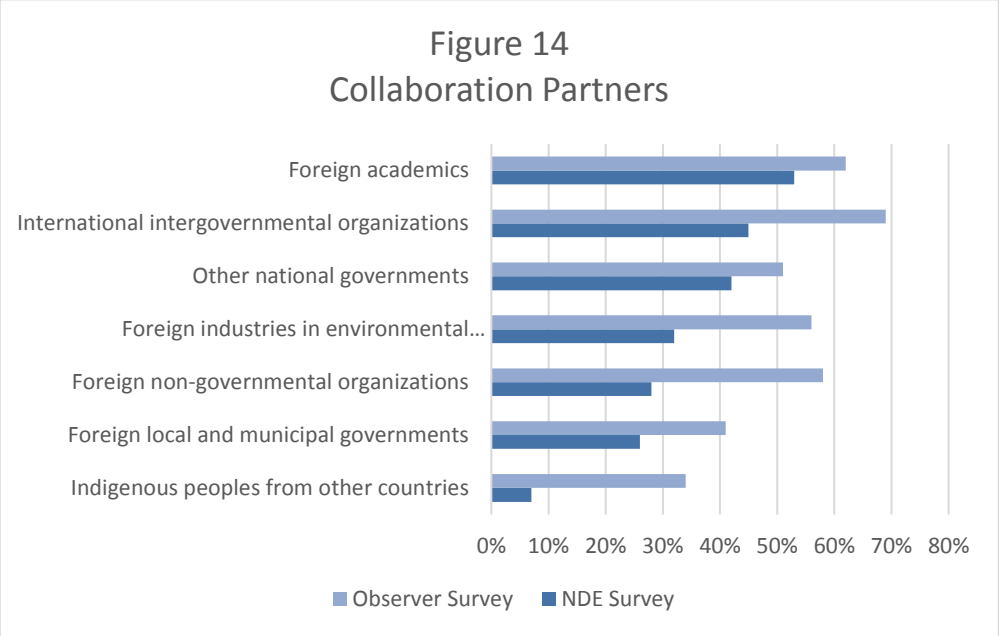
104. Countries typically collaborate with numerous groups in addressing climate-related technology issues. The surveys attempted to identify groups that most often served as partners and asked whether collaboration has led to the development of new or modified technologies.

(a) Collaborative partners

105. The NDEs were asked if their country has engaged in collaborative partnerships with different groups to develop new technologies, modify existing technologies, and/or modify the management or use of existing technologies. Figure 14 reports the percentages of respondents who replied "Yes." NDEs reported that their countries had engaged in many partnerships and were most likely to have collaborated with foreign academic institutions, individual researchers knowledgeable about technologies, and International intergovernmental organizations, or other national governments. The NDEs said their countries were least likely to have engaged with indigenous peoples from other countries.

106. Observers were asked a similar question regarding collaborative partnerships in which they or their organization have participated. They reported more partnerships in each category than the NDEs, but the rankings were similar. Observers and their organizations also were most likely to have collaborated with international intergovernmental organizations and foreign academics, and least likely to have collaborated with foreign indigenous peoples.

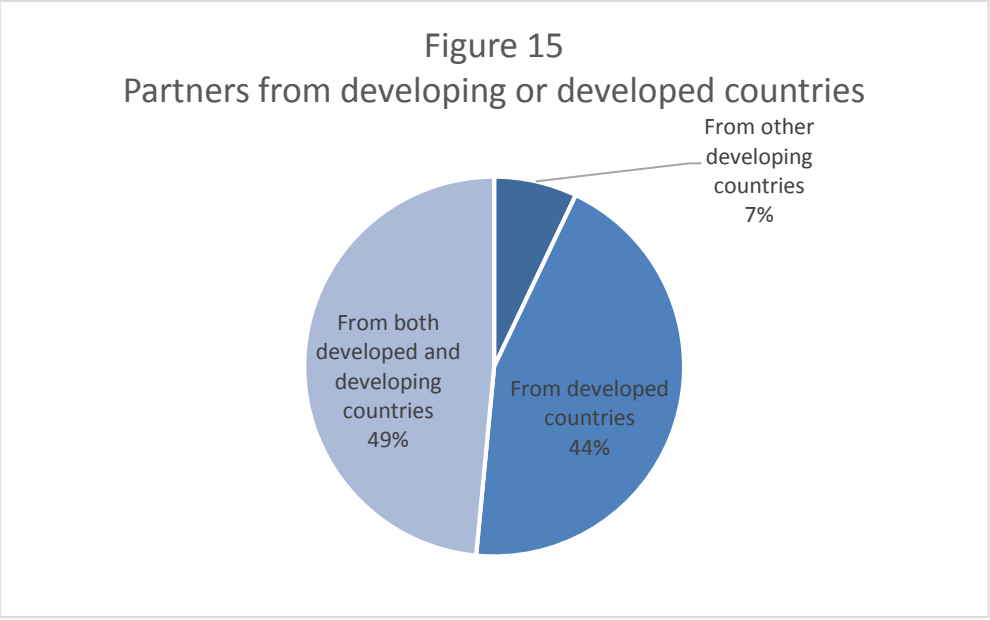
Figure 14. Collaboration Partners



(b) Collaboration with developing and developed countries

107. The NDE survey asked whether collaborative work was conducted with individuals and/or organizations from other developing countries or from developed countries. Results are shown in Figure 15. Most of the 27 respondents to this question reported that their country had collaborated with developed countries, and a majority had collaborated with a developing country. Very few reported collaborating exclusively with a developing country.

Figure 15: Partners from developing or developed countries

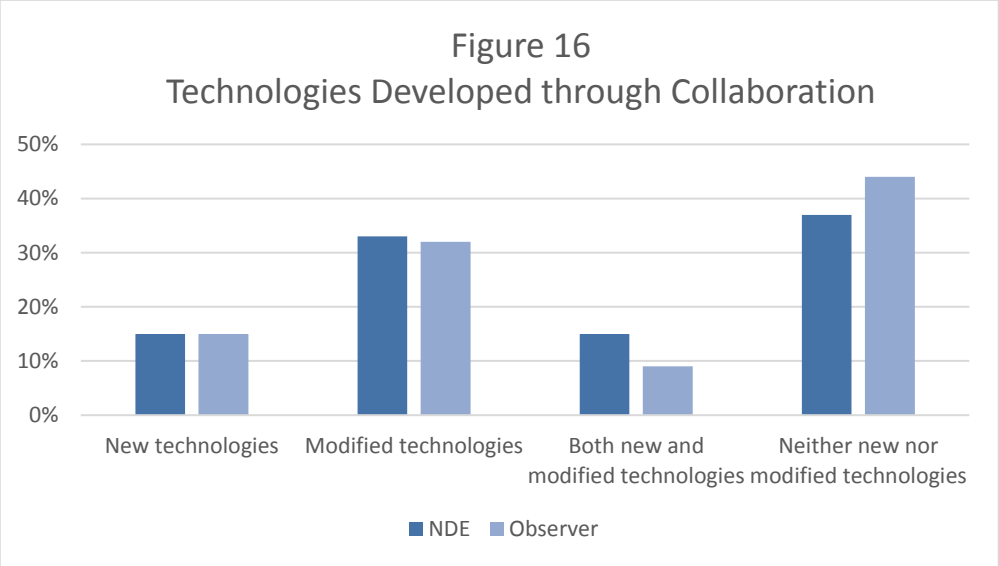


108. Most NDEs and Observers indicated that technologies developed by a team of in-country and external people definitely or probably should be included in the definition of endogenous technologies (NDEs 89%, Observers 95%). Most of both groups also thought technologies developed elsewhere but adapted to local needs and conditions should be included in the definition (NDEs 86%, Observers 93%).

109. In order to explore the role that collaborative partnership can play in these efforts, both surveys asked whether collaborative partnerships have developed new or modified environmental technologies. Figure 16 shows the responses, which were similar for the two groups. Nearly half had developed modified technologies through collaboration, while fewer had developed new

technologies. Over one in three had not developed either new or modified technologies through collaboration.

Figure 16. Technologies Developed through Collaboration



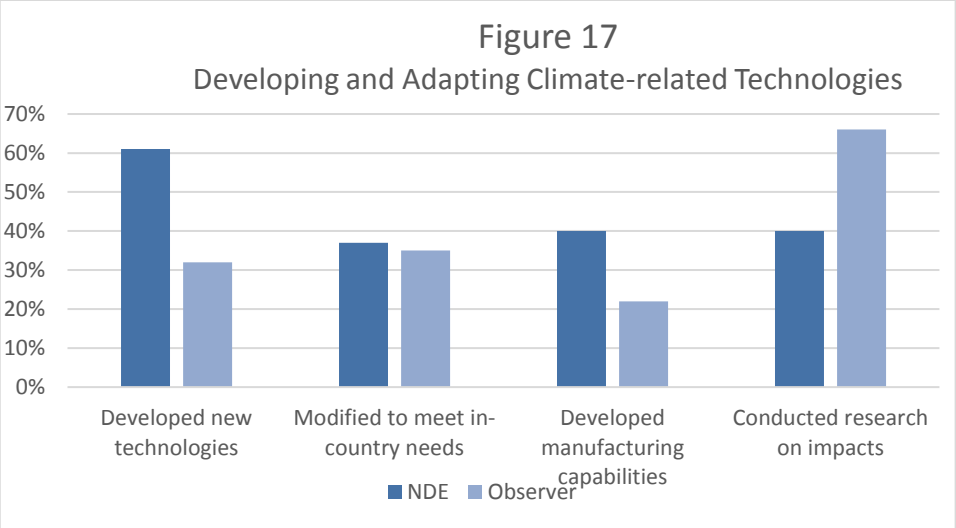
(c) Experience in developing and adapting technologies

110. Both surveys asked about the development of new technologies and the adaptation of technologies to local needs and conditions, both of which had strong support for inclusion in the definition of endogenous technologies. The NDE survey focused on country level development and adaptation, and the Observer survey asked about respondents' personal involvement in such activities. Figure 17 shows NDE and Observer responses.

111. Six out of ten NDEs reported their country was likely to have developed new technologies. Fewer reported action on the other activities, but there was a high level of ambiguity, as well over a third of NDEs reported they were not sure whether their country had engaged in making significant changes to existing technologies to meet in-country needs, developing manufacturing capabilities for technologies, or conducting research on impacts of technologies.

112. Observers were more likely to report having conducted research on the impacts of technologies. Fewer reported being unsure than for the NDEs, but there were close to one in five of the Observer respondents who were unsure about three of the activities. This is surprising, since the observers were reporting on their own behaviour, rather than on what their country had accomplished.

Figure 17. Developing and Adapting Climate-related Technologies

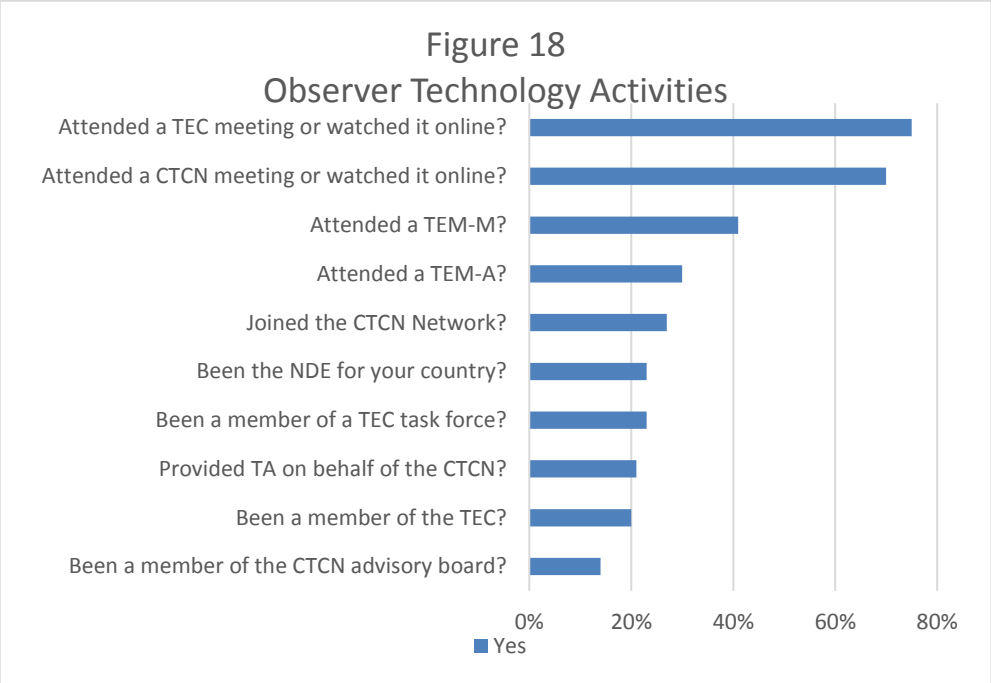


6. Observer engagement

113. By nature of their positions, NDEs have a strong connection to country uses of climate-related technologies. Observer experiences are more varied. The survey asked about observer experiences both with technologies in general, and with aspects of the UNFCCC Technology Mechanism.

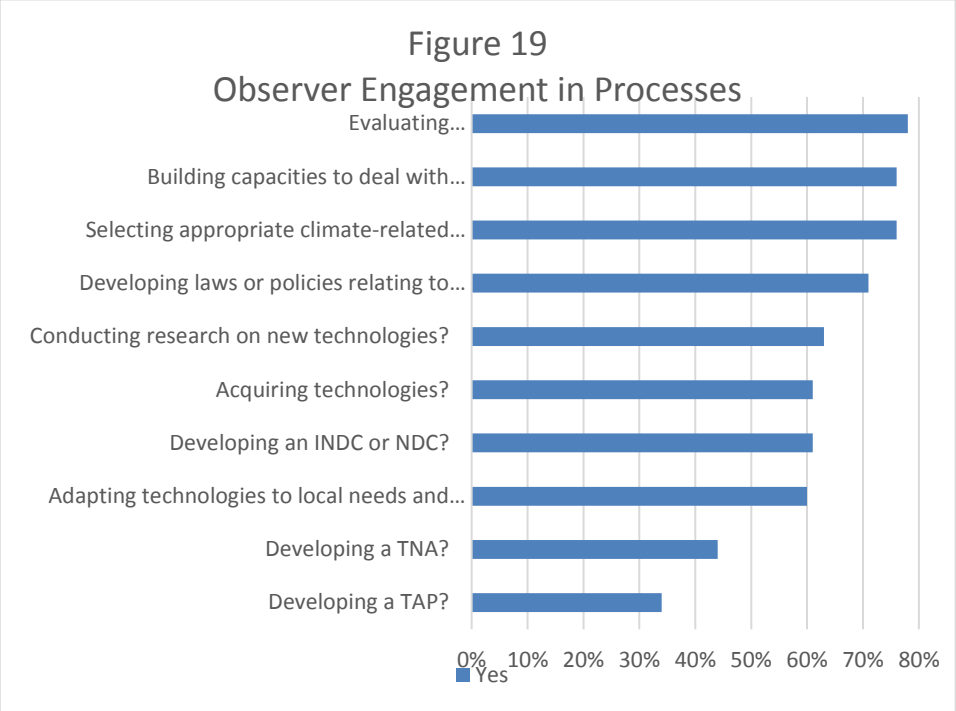
114. Observers were asked to report whether they had ever engaged in ten technology-related activities. Their responses appear in Figure 18. Most had attended or watched a Technology Executive Committee meeting or a Climate Technology Centre and Network meeting. This is to be expected, given that all previous observers at TEC meetings were invited to take the survey. Many had attended a Technical Expert meeting on mitigation (TEM-M). Fewer had attended a TEM-A on adaptation, or had participated in the other activities, which involved more than attending an event.

Figure 18. Observer Technology Activities



115. Observers also were asked about other technology-related activities in which they have been involved. They were most likely to have been involved in evaluating or selecting technologies, in building capacities, or in working on laws or policies. They were least likely to have worked on a TNA or TAP.

Figure 19. Observer Engagement in Processes



C. Conclusions

1. Understanding of endogenous capacities and technologies

116. The TEC sought to continue exploration of the elements and scope of endogenous capacities and technologies. The survey investigated perceptions about components to be included in definitions of endogenous capacities and endogenous technologies.

(a) Both NDEs and Observers have inclusive views of the definitions. Nevertheless, some factors had stronger support than others, which may provide a basis for setting priorities for both definitions and enhancement.

(b) The highest rated components were similar for capacities and technologies, suggesting that there is a relationship between the two. Endogenous capacities, for example, are likely needed before endogenous technologies can be developed.

(c) "Endogenous" is generally defined as something coming from within a system, and respondents seemed to use this as an important factor, putting strongest emphasis on components that were centred within countries.

(d) On the **definition of endogenous capacities**, both NDEs and Observers gave top ratings to capacities in:

- Assessing technology needs at all levels,
- Adapting technologies to local conditions, and
- Identifying appropriate technologies to meet needs of countries.

(e) On the **definition of endogenous technologies**. NDEs and Observers produced extremely similar ratings on components to be included in the definition. The more a component was developed or adapted in-country, the higher the rating. Highest ratings went to:

- Technologies developed within the country,
- Technologies developed elsewhere but adapted to local needs and conditions, and
- Technologies developed by a team of in-country and external people.
- Develop new technologies to meet needs

2. Developing and enhancing endogenous capacities and technologies

117. The TEC also sought to consider ways to develop and enhance endogenous capacities and technologies. Both surveys asked for input about capacity building needs and the types of training and resources that could enhance ongoing processes involving climate-related technologies.

118. Several recurring themes observed from the results of surveys in relation to this are:

(a) **Local needs**. NDEs placed a strong emphasis throughout the survey on assessing and responding to local needs. This was reflected in responses on components of both definitions and on capacity building needs. Observers also saw the importance of local needs, but not to the same extent as the NDEs.

(b) **Training and resources**. When asked to rate the usefulness of various training and resources, respondents saw most resources as at least somewhat useful but tended to give their highest ratings to those closely related to the highest rated components of endogenous capacities and technologies.

(c) **Local and indigenous knowledge**. Both NDEs and observers said utilizing local and indigenous knowledge could be a helpful resource.

(d) **Ongoing processes**. Countries already engage in extensive activities involving endogenous capacities and technologies, and these activities can establish a baseline for future planning.

(e) **NDE roles**. NDEs themselves play a major role in developing and implementing NDCs and could play a similar role in enhancing endogenous needs and capacities.

(f) **Local/national expertise**. The TNA, TAP, TRM, and NDC processes are endogenous efforts, but they often involve both endogenous and out of country resources. NDEs report that their countries rely more on in-country consultants than foreign consultants for both TNAs and NDCs, but countries do employ many other experts.

(g) **Sources of expertise**. People knowledgeable about climate-related technologies are employed by a wide variety of organizations. While NDEs work primarily for national governments, communities seeking expertise on climate-related technologies also may turn to non-governmental, intergovernmental, academic, or business organizations to find experts to work on projects. Respondents to both surveys saw all groups as helpful, with top ratings given to business and academic organizations.

3. Collaborations and partnerships

119. Collaborative partnerships are important both to get things done and to create ongoing relationships to address climate challenges. Respondents were asked about the nature of relationships in which they or their countries have engaged.

(a) Many such partnerships already are in place, both within countries and with partners from other countries.

(b) Triangulated partnerships seem to be the norm, but not for everyone.

(c) Collaborations seem to produce more modifications of existing technologies than development of new ones

4. Other observations

120. Finance is a recurring theme for any climate action. The survey reveals the following:

(a) NDEs and Observer respondents differed on the importance of financing to developing endogenous capacities and technologies. NDEs were more likely than Observers to say acquiring funding for technologies should be included in the definition of endogenous capacities.

(b) NDEs rated managing finances relating to technologies as more helpful for training.

(c) NDEs also saw access to additional funding as the most important resource in developing new or adapting existing technologies. The differences between the two groups may be because observer respondents are more likely to be from countries providing funding, while NDE respondents are more likely to be from countries seeking funding.

121. The following limitations have been observed for the study:

(a) Only NDEs, observers of TEC and CTCN meetings, PCCB members, and a few other experts and interested people were invited to respond to the survey. Other significant groups, such as academics, business and industry, politicians, indigenous peoples, and others who do not follow the negotiations were not sampled.

(b) The NDE response rate was low; only 37 of the159 NDEs surveyed responded. Results cannot be said to represent the view of all NDEs, only of those who chose to respond to the survey.

(c) The observer respondents are not representative of any particular groups. They simply represent the views of 51 persons who have demonstrated an interest in climate-related technology issues.

(d) Country needs for developing and enhancing endogenous capacities and technologies are likely to be country specific.

(e) The report "Development and Enhancement of Endogenous Capacities and Technologies: A preliminary study" prepared by the UNFCCC secretariat in 2017,[2] highlighted the need for a clearer definition of "endogenous capacities and technologies." Results of the surveys indicate that respondents do not have clear definitions in mind, and tend to be inclusive when asked about components of the definitions.

5. Recommendation on actions to develop and enhance endogenous capacities and technologies

122. From the above results, and in response to respondents' perceived needs with regard to endogenous capacities and technologies, there are a number of interventions the TEC could consider as recommendations for developing and enhancing endogenous capacities and technologies:

(a) **Provide multiple training levels**. The emphasis on local needs suggests that capacity building should include issues and training below the national level.

(b) **Target training to local needs**. Build training around local or regional problems, as well as areas NDEs identified as most helpful. Financing, partnerships, expertise, education, policies, evaluation, and other strategies could all contribute to the enhancement of ongoing country processes.

(c) Consider problems at all levels, then collect information and tailor decisions to local needs. Solutions should be appropriate for the scale and type of problems presented.

(d) **Involve NDEs in capacity building**. NDEs have many roles and responsibilities. Consider whether capacity building activities should be targeted to meet NDE needs, how NDEs can contribute to capacity building, and how activities can be coordinated between NDEs and other groups.

(e) **Improve understanding of existing processes**. Even NDEs often reported they were unsure about what their country was doing with TNAs, TAPs, TRMs, and NDCs. These processes are rich sources of information about best practices and not so effective practices that can inform planning for new projects.

(f) **Encourage countries to fill in gaps**. Virtually all countries have developed NDCs, but several have not engaged in TNAs or TAPs. Enquiring why these countries have chosen not to engage might identify areas for capacity building, concerns about current processes, or alternate ways to approach climate-related technologies.

(g) **Evaluate consultant roles**. Consider how to make consultants more responsive to local needs and to help all participants learn from each other.

(h) **Facilitate linkages**. Help countries and communities to identify skills and knowledge needed for different tasks and to locate relevant experts.

(i) **Explore partnerships**. Consider the advantages and disadvantages of different types of partnerships such as bilateral/triangulated, endogenous/external, and cross-sectoral arrangements and publish information for use by anyone involved with climate-related technologies.

[2] http://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/66d97e6cb3594b2cb3cd6f2e5d3c7aba/f7385a9b66db40aba98e08470abcdc11.pdf

(j) **Encourage endogenous development of new and adaptation of existing technologies**. Endogenous new and adapted technologies are more likely to be responsive to local conditions than imported technologies. The development and adaptation processes themselves help to build capacities, contribute to development, provide in-country expertise, and promote national reputations.

(k) **Publicize the survey results**. The CTCN is constantly involved in capacity building and will learn about the survey results at TEC 17. Other subsidiary bodies and constituted groups, particularly those that provided input to the overall study, should receive copies of the reports. Publishing the reports on TT:CLEAR will make the results available to consultants, observers, researchers, and others concerned about endogenous capacities and technologies.

123. The TEC may also wish to consider actors and stakeholders who could play key roles in each of the intervention above.

6. Directions for further work

124. The survey asked about perceptions regarding endogenous capacity needs. What it did not do was ask about the degree to which countries can build capacities internally. A separate study would be needed to investigate the adequacy of in-country educational systems, research institutions, and other organizations to develop endogenous capacities and technologies. Such studies should be conducted at the country level.

125. More information is needed about the advantages and disadvantages of working with endogenous and foreign consultants, and the strengths and weaknesses of the two groups in meeting country needs and enhancing endogenous capacities and technologies.

126. The survey did not address perceptions about the importance of endogenous capacities and technologies in and of themselves, or how they might be used to improve achievement of other goals, such as economic or sustainable development.

V. Conclusions and recommendations

A. Elements and features of endogenous capacities and technologies

127. Respondents of both surveys expressed inclusive views about definitions of endogenous capacities technologies, which means that the concepts of endogenous capacities and technologies cannot be limited to any single element or feature, and do not fall into any tight definition. Nevertheless, the survey results indicate the elements or features respondents think are most important to include in the definitions.

128. With regard to defining endogenous capacities, the respondents, especially NDEs, put strong emphasis on capacities to:

(a) Assess climate-related technology needs from the individual to the national levels;

(b) Identify appropriate technologies to assist in meeting identified needs;

(c) Adapt technologies to local needs and conditions.

129. With regard to defining endogenous technologies, the following features were highlighted by the respondents:

(d) Technologies developed within the country or by a team of in-country and external people;

(e) Technologies developed elsewhere but adapted to local needs and conditions.

130. Perceptions about the definitions of both endogenous capacities and technologies clearly focused on in-country abilities to assess needs at all levels, and to identify and develop technologies to respond to local needs and conditions. These perceptions are compatible with observations from the preliminary study.

B. Ways to develop and enhance endogenous capacities and technologies

131. Results from the preliminary study, desk study, and two surveys suggest that the following strategies can enhance endogenous capacities and technologies in general. Strategies would need to be adapted to specific capacity building needs and opportunities in specific countries.

(a) **Adopt a participatory approach**. A participatory approach, involving all stakeholders, is crucial to identify environmental, social, and economic needs and then define priorities to determine the means for building capacity. Empowering social capital and boosting community ownership will enhance the acceptance, integration and sustainability of the projects.

(b) **Understand internal conditions**. Collaboration, needs assessment, and technology selection and transfer require understanding of the internal social, political, legal, policy, economic, and other conditions.

(c) **Facilitate partnerships with multiple sectors**. Respondents supported partnerships and reported that the academic and business sectors, along with local and municipal governments, contribute the most to sustainable development of endogenous capacities and technologies.

(d) **Incorporate local and indigenous knowledge**. Local and indigenous people have grounded understanding of local needs and conditions. Their skills and knowledge should be integrated in assessing needs and adapting technologies to local needs and conditions. Additional resources and preparation may be needed for all participating actors to enhance intercultural communication towards a respectful and fruitful collective work.

(e) **Facilitate connections to funding**. Technologies and the processes to obtain and maintain them are costly. Promoting access to public funding, venture capital, strategic investors, and other funding sources will be essential to the enhancement of endogenous capacities and technologies.

(f) **Provide tailored training for specific actors at multiple levels**. Climate-related technologies require competence in many different roles, including risk assessors, technicians, legal advisors, funders, policy makers, and others. Capacity building activities should target appropriate groups from the local to the national level and be designed to enhance the skills and knowledge required to carry out each role effectively.

(g) **Enhance capacities of NDEs**. NDEs can play a major role in enhancing endogenous capacities and technologies. They may need support to develop their own capacities to assess technology needs, identify appropriate technologies, and understand the demands and implications of existing processes such as TNAs, TAPs, TRMs and NDCs.

(h) **Monitor progress using indicators**. Countries may monitor and evaluate their progress on development and enhancement of endogenous capacities and technologies. In that context, countries may develop indicators to measure the progress, taking into account their own needs and conditions, or use common indicators that may enhance transparency and comparability.

(i) **Share knowledge broadly**. Enhancement of endogenous capacities and technologies will play an important role in implementation of the Paris Agreement. Ongoing communications among entities about issues and best practices can help to shape planning and reporting procedures by everyone involved.

C. Recommendations for further work by the TEC

132. The TEC, working with the CTCN, provides leadership to the UNFCCC community on issues relating to technologies, including endogenous capacities and technologies. While the TEC cannot do this work alone, it can help other bodies, countries, cities, and other climate actors to understand how technologies fit into their work on climate. By communicating the recommended enhancement strategies, the TEC can improve processes for assessing needs, selecting and deploying appropriate technologies, and helping everyone involved in these processes to develop the capacities appropriate to their roles and responsibilities. The following activities could engage other groups in enhancing endogenous capacities and technologies.

(a) **Communicate the understanding on endogenous capacities and technologies and the strategies for the enhancement**. The TEC may wish to refer the findings and recommendations of this report to Parties and relevant bodies, institutions and stakeholders.

- Parties may refer to the above conclusions to consider their own needs for capacity-building, as well as to consider strategies to develop new technologies and/or adapt technologies to address local needs. They may also be used to identify support or activities which may contribute to the enhancement and development of endogenous capacities and technologies when reporting on this issue in their NCs and BRs.
- Constituted bodies may need examples of how enhancing endogenous capacities and technologies can affect and enhance their own mandates.

(b) **Collaborate with the CTCN**. The TEC may wish to collaborate with the CTCN, which is also working on endogenous issues, by exchanging outcomes of each other's work, organizing a joint event or utilizing the side event of the Technology Mechanism to present their activities and achievements on this issue, addressing the enhancement of NDEs' capacities, and other activities that may enhance endogenous capacities and technologies.

(c) **Collaborate with the PCCB**. As the UNFCCC coordinator on capacity building, the PCCB will be a resource to the TEC on capacity building in general, while the TEC can help the PCCB understand the specific challenges relating to endogenous capacities and technologies, particularly in promotion of ownership of building and maintaining capacity in developing countries.

(d) **Collaborate with the SCF**. The SCF plays a key role in directing policy, setting priorities, and identifying funding sources. The TEC can help the SCF to understand the particular funding needs required in order to plan for, acquire, and deploy technologies essential to mitigation and adaptation. The SCF can then encourage specific funders to contribute more to endogenous technologies.

(e) **Collaborate with the GCF**. The TEC welcomes the work the GCF has undertaken on innovations, incubators, and accelerators. The TEC could ask to expand that collaboration to include the enhancement of funding for endogenous technologies and capacities.

(f) **Continue its work on this issue**. The TEC may wish to undertake further work on development and enhancement of endogenous capacities and technologies, taking into account the above recommended activities and possible future mandates given by the COP and CMA.