Technology Executive Committee

06 April 2021

Twenty-second meeting

Virtual meeting, 20-23 April and 26 April 2021 (TEC-CTCN Joint session)

Draft paper on enabling environments and challenges to technology development and transfer identified in TNAs, NDCs and CTCN technical assistance[1]

I. Introduction

1. As per activity 1 of the thematic area Enabling environment and capacity building of its workplan for 2019-2022, the TEC is to examine enabling environments, including challenges and opportunities to incentivize the private and public sector in the development and transfer of technologies, building on TEC previous work on adaptation and mitigation technologies.

2. At TEC 21, the task force on Enabling environment and capacity building, with the assistant of the secretariat and a consultant, presented a draft paper on examining enabling environments and challenges, including barriers based on TNA, NDC, CTCN technical assistance, and relevant TEC Briefs.

3. The TEC 21 considered the findings contained in the draft paper and provided guidance to the taskforce on Enabling environment to continue working on the paper, with a view to incorporating relevant information from NDCs submitted in 2020 and finalizing it at TEC 23.

II. Scope of the note

4. The annex I to this note contains the draft paper on enabling environments and challenges to technology development and transfer identified in TNAs, NDCs and CTCN technical assistance, and relevant TEC Briefs. The annex V to this note contains a concept note for a thematic dialogue.

III. Possible action by the Technology Executive Committee

5. The TEC will be invited to consider the draft paper and provide guidance to the Enabling environment and capacity building task force for its further improvement, with a view to finalizing the paper at TEC 23.

---

[1] This paper was prepared with the support of Sara Traerup, Léa Jehl Le Manceau and Lucy Ellen Gregersen.

Annex I

Draft paper on enabling environments and challenges to technology development and transfer identified in TNAs, NDCs and CTCN technical assistance

I. Executive Summary

1.   In order to achieve the objectives of the Paris Agreement, climate technologies must be implemented quickly and on a large scale. The Parties to the Convention reported multiple challenges within the different processes of technology development, deployment and transfer. As these various challenges are evolving in time along with the technologies and their implementation, there is a need to consider the latest challenges reported by the Parties in respect of different technology-related processes.

2.   The TEC agreed, in its rolling work plan for 2019-2022, to an activity on examining enabling environments, including challenges and opportunities to incentivize the private and public sector in the development and transfer of technologies, building on TEC previous work on adaptation and mitigation technologies. An outcome of that activity includes a paper on examining enabling environments and challenges, including challenges based on TNA, NDC, CTCN technical assistance, and relevant TEC Briefs. Thus, this paper presents the most recent information on challenges and enablers as reported in Technology Needs Assessments (TNAs), Nationally determined Contributions (NDCs) and CTCN Technical Assistance (TA); it identifies challenges and opportunities to improve enabling environments for addressing the challenges; and it assist the TEC in delivering relevant key messages and recommendations to the Parties at COP.

3.   The findings of this paper suggest that:

(a)   The pathways for technology development and transfer are generally government-driven, private sector-driven or community-driven. An integrated governance structure is central to the success of technology development and transfer.

(b)   To achieve a significant impact on the development and transfer of a specific technology, it is necessary to apply a relatively broad set of complementary enablers addressing the challenges at various levels. The final choice of one set of enablers over another is generally a strategic question.

(c)   Although the process of technology development and transfer varies, the importance of considering the entire governance structure (government, private sector and community) is clear. This includes consideration throughout of strategies to overcome challenges to technology development and transfer related to investment costs, research, development, awareness-raising, institutional capacity and so forth.

(d)   Given that many Parties identify the social, cultural and institutional challenges to technology development and transfer in their TNAs, NDCs and CTCN TAs, these challenges must be appropriately considered when assessing the potential for technology development and transfer. The challenges can only be addressed through the inclusion of all stakeholders in the governance system.

(e)   Overcoming the economic and financial challenges is central to achieving technology development and transfer, and the Financial Mechanism has played a key role in leveraging resources from the public and private sector in order to stimulate markets for technology development and transfer.

(f)   Efforts to realize technology development and transfer should not target the economic and financial aspects narrowly as a single cause. Instead, multifaceted actions are recommended, where Governments have a major role to play in creating enabling environments, for example through establishing appropriate legal and regulatory frameworks.

(g)   A combination of market stimulation and human capacity development is identified as key by developing country Parties, whereas support programmes designed to strengthen

capacities of developing country Parties, in particular for LDCs, is reported as critical to the creation of the long-term enabling environments required for technology development and transfer within these countries.

(h) These findings are supplementary to, and closely aligned with, previous work by the TEC,[2,3] on the challenges and enabling environments to technology development and transfer.

4. The following key messages are suggested:

(a) There is an increasing opportunity for extended cooperation between committed public and private institutions, that have practical experience in evaluating, using, implementing and financing new technological innovations.

(b) Governments have a major role to play in creating enabling environments to address the challenges to technology development and transfer by establishing and enforcing the appropriate regulatory and institutional frameworks.

(c) Advancing and deploying innovative and sustainable approaches to establish appropriate enabling environments for technology development and transfer are crucial to facilitate technology transition along with sustainable development trajectories.

(d) Sharing good examples from countries that have integrated actions on climate technologies, including the creation of their enabling environments, into government planning and policies, could stimulate adoption of a similar approach amongst other countries.

(e) The Financial Mechanism has a key position leveraging resources from the public and the private sector to stimulate markets for technology development and transfer.

(f) To enable the development and transfer of adaptation technologies, it is key to establish information and raise awareness about the potential of these to reduce climate vulnerabilities, and to strengthen institutional and organizational aspects.

(g) To enable the development and transfer of mitigation technologies, it is key to establish appropriate legal and regulatory frameworks, and to enhance technical capacities.

II. Introduction

A. Background

5. In order to achieve the objectives of the Paris Agreement, climate technologies must be implemented quickly and on a large scale. The Parties to the Convention report multiple challenges within the different processes preventing technology development and transfer. As these challenges are evolving in time along with the technologies and their implementation, there is a need to consider the latest challenges reported by the Parties in respect of different technology-related processes. In addition, there is also a need to examine the enabling environments that have and may help countries overcome the existing challenges and help them in achieving climate technology development and transfer at the speed and scale required. The challenges and opportunities encountered through the technology development and transfer process are a key consideration.

6. For some time, the Technology Executive Committee (TEC) has engaged in a number of activities on enabling environments and challenges for technology development and transfer.

7. As part of the TEC's rolling work plan for 2012-2013, the TEC undertook the following work on enabling environments and challenges:

(a) In 2012, the TEC held two thematic dialogues on enabling environments and challenges to technology development and transfer, as well as calling for inputs on this topic.[4]

---

[2] TEC/2013/7/10.
[3] TEC/2013/6/10.
[4] TEC/2013/7/10.

(b)   In 2013, the TEC prepared a report on the challenges and enablers identified in the TNA reports of 21 developing countries. Countries submitted these reports in 2012 and 2013.[5]

8.   In the TEC's rolling work plan for 2014-2015,[6] the TEC noted that it would initiate consideration of further work on enablers and challenges, taking into account the outcomes of the workshop on national systems of innovation. The TEC initiated this work at TEC11.

9.   At its twelfth meeting, held in 2016, the TEC held a thematic dialogue on enablers of and challenges to South–South cooperation regarding technologies for adaptation.

10.   The TEC also incorporated a task to map Technology Needs Assessments (TNAs), Nationally Determined Contributions (NDCs) and Technical Assistance (TA) documents of the Climate Technology Centre and Network (CTCN) regarding enabling environments and challenges into its rolling work plan for 2016-2018.[7] This activity was also linked to the TEC's work on activity 15.5 of its work plan, which, in relation to the GEF was intended to *"Provide policy advice on measures to create enabling environments for technology development and transfer in developing countries and an analysis of the challenges that hamper project/programme implementation"*. The paper was presented at the TEC17.[8]

11.   Furthermore, the TEC agreed, in its rolling work plan for 2019-2022, to an activity on examining enabling environments, including challenges and opportunities to incentivize the private and public sector in the development and transfer of technologies, building on TEC previous work on adaptation and mitigation technologies. An outcome of that activity includes a paper on enabling environments and challenges based on TNAs, NDCs, CTCN technical assistance, and relevant TEC Briefs.

B.   Objectives

12.   The objectives of this paper are to:

(a)   Examine enabling environment and challenges based on TNAs, NDCs and CTCN Technical Assistance and relevant TEC briefs;

(b)   Based on the mapping, identify policies and strategies to improve enabling environments and address the challenges; and

(c)   Assist the TEC in delivering relevant key messages and recommendations to the Parties at COP 26.

C.   Approach and data

13.   The paper follows the understanding of technology development and transfer set out in the IPCC's Special Report on Methodological and Technological Issues in Technology Transfer[9] as 'the broad set of processes covering the flows of knowledge, experience and equipment amongst different stakeholders, such as governments, private sector entities, financial institutions, NGOs and research institutions. Transfer encompasses diffusion of technologies and technology cooperation across and within countries. It comprises the process of learning to understand, utilize and replicate the technology, including the capacity to choose it and adapt it to local conditions.'

1.   Approach

14.   The approach to identifying enablers and challenges builds on the methodology outlined in the guidebook *Overcoming barriers for the transfer and diffusion of climate technologies*.[10] This

---

[5] TEC/2013/6/10.

[6] TEC/2015/10/12–an.III.

[7] TEC/2016/12/13–an.

[8] TEC/2018/17/4.

[9] IPCC (2000) B. Metz, O. Davidson, J.-W. Martens, S. Van Rooijen, and L. V. W Mcgrory (eds.) IPCC's Special Report on Methodological and Technological Issues in Technology Transfer. Cambridge University Press, UK.

[10] UNEP DTU Partnership (2015) Overcoming Barriers to the Transfer and Diffusion of Climate Technologies. Available at: https://bit.ly/2TxwQeG.

methodology has been adopted as standard in previous TEC work on challenges and enablers (e.g. TEC/2013/6/10; TEC/2018/17/4).

15. NDCs vary greatly in their descriptions of enabling environments and challenges to technology development and transfer, which are thus mapped using broader criteria of inclusion than TNAs and CTCN TAs were. Consequently, mapping the enablers and challenges listed in NDCs involves investigating the aspects that Parties report as necessary in implementing their NDCs through the application of technologies.

16. In TNAs, enablers and challenges are identified and assessed following the TNA methodology and are subsequently reported for each priority technology included in the TNAs. For all technologies in TNAs, between four or five enablers and two and nine challenges are reported per technology. An overview of challenges and enablers categories, with explanatory text, is inserted in Annex I.

17. In most cases the CTCN TAs cover detailed technology-specific national or local initiatives. However, many CTCN TAs do not identify enablers of and challenges to technology development and transfer, since the CTCN mandate covers more than these particular aspects.

2. Data

18. The current database for this paper includes information from:

(a) 58 developing country countries' TNAs, in which challenges and enablers were identified for 668 technologies. Of the 668 technologies, 300 were in the climate change mitigation category and 368 in the adaptation category.

(b) 141 NDCs downloaded from the NDC registry, including new and updated NDCs.

(c) 101 CTCN TAs downloaded from the CTCN website[11] that were available as of February 2021 and supplemented with information provided by CTCN Secretariat staff. Each TA in many instances cover more than 1 technology, hence 244 technologies in total are identified from the TAs.

Table 1
Data overview

	Number	*Technologies*	*Enablers*	*Challenges*
TNAs	58	668	3245	3451
CTCN TAs	101	244	567	556
NDCs	141[i]		1084	414
Totals	*300*	*912*	*4896*	*4421*

[i] See annex for overview of updated and new NDCs analysed.

19. In view of the role of National Designated Entities (NDEs) to the UNFCCC Technology Mechanism, countries are encouraged to nominate their NDE as their National TNA Coordinator. This involves providing vision and leadership for the overall TNA effort, facilitating the tasks of communication including with stakeholder groups, formation of networks, information acquisition, and coordination and communication of all work products.

20. There is a considerable overlap between individuals who are NDEs and TNA Coordinators respectively. For 31% of Non-Annex I Parties the same person is both NDE and TNA Coordinator, while for 76% of Non-Annex I Parties, the TNA Coordinator and the NDE are from the same government entity.

III. Enabling environments and related challenges

21. Creating and advancing enabling environments for technology development and transfer to deploy innovative, sustainable technologies create various opportunities related to an effective

---

[11] CTCN website at: https://www.ctc-n.org/technical-assistance/data.

dialogue and new ways of thinking in order to raise awareness of the economic, social and environmental aspects of technology transition and potential development trajectories.

22.   It makes possible extended cooperation between committed public and private organizations with practical experience in evaluating, using, implementing and financing technological innovations. A key opportunity for joint government and private research programmes lies in the development and demonstration of innovative technologies that address sustainable development objectives, are available at low cost and have a substantial impact on reducing emissions and/or increasing resilience to climate change.

23.   While governments have a leading role in creating the enabling environments for technology development and transfers by integrating these objectives into policies and planning, the majority of investments in technology come from the private sector, international donor programmes and financial institutions. In developing countries, the markets for climate technologies are rapidly expanding, creating new and improved opportunities for international exports, as well as for domestic production and joint ventures across regional borders.

24.   Another factor is leading by example, which creates opportunities to transfer one country's good experiences and learnings to another. This could, for example, be achieved by showcasing good examples from countries that have integrated actions on climate technologies, including the creation of their enabling environments, into government planning and policies, and henceforth into their governments' own operations. Sharing such experiences could stimulate the adoption of similar approaches by other countries.

Box 1

Example. Leading by example: Knowledge and experience sharing about climate change adaptation and mitigation technologies diffusion, to stimulate the adoption of similar approaches amongst other countries

With over 1 300 registrations, a series of Technology Needs Assessments (TNA) webinars[a] "Climate technologies and Technology Needs Assessments" have generated great interest from governments, academia, businesses and NGOs worldwide.

Together with its regional TNA partners and country representatives, UNEP DTU Partnership, UNEP and the UNFCCC closely collaborated to organise a series of regional webinars to provide an overview of countries' climate technology priorities and activities to enhance their implementation.

The series of TNA webinars were launched together with "Regional Technology Briefs" and focused on the following regions: Africa, Asia-Pacific, Latin America & the Caribbean. The objective of the briefs and webinars are to stimulate the adoption of similar approaches amongst other countries, through knowledge and experience sharing from TNA countries that have integrated actions on climate technologies.

[a]   The webinars and briefs can be found here: https://tech-action.unepdtu.org/webinars/

A.   Enabling environments

25.   The information generated from the data extracted from NDCs, TNAs and CTCN TAs reveals that the most frequently identified enablers across all technologies are in the economic and financial category. 90% of the mitigation technologies are reported to require the implementation of enablers within this category, as is the case for 83% of the technologies for adaptation. An overview is provided in Figure 1.

26.   The data analysis shows that, in addition to financial resources, systematic and structural changes must be made to facilitate the development and transfer of technologies. Subsidization is often listed by as a key main enabler of technology development and transfer. Most developing country Parties identified the creation of enabling environments in the economic and financial sectors through regulation and policies as necessary to assist with the development and transfer of new technologies.

Box 2

Example. Systematic and structural changes: Establishment of appropriate frameworks for mitigation technology development and transfer in Tunisia

---

The transport sector in Tunisia is a large contributor to the country's GHG emissions. According to the 2012 GHG emissions inventory, the sector accounts for 23.9% of GHG emissions attributable to energy.

It is estimated that this figure will increase considerably in the following years given the steady increase in the number of vehicles in Tunisia, which reached two million in 2016, especially passenger cars. Tunisia's TNA prioritized the technology of hybrid vehicles, in particular fully hybrid vehicles, because of its relevance to the Tunisian context. First, this technology has significant potential for reducing emissions, especially since the traffic in Tunisian cities is characterized by braking and stopping, which considerably increases fuel consumption and CO_2 emissions compared to a conventional vehicle. Secondly, it does not require huge investments since a special infrastructure does not need to be created. In addition, Tunisia has emphasized the environmental and social co-benefits of the technology, such as the reduction in pollution and noise levels in urban areas, which would have a visible impact on the health of its inhabitants.

Hybrid cars are currently not on the market in Tunisia, and through its TNA, the country identified challenges related to lack of approved standards and very low knowledge of the technology. Consequently, the Tunisian government, acting outside any international cooperation, have introduced a national program to create enabling environment conditions for hybrid cars by establishing appropriate regulatory and legal framework and by building the capacity of relevant stakeholders.

27.   Since inadequate human skills, institutions and organizations, as well as information and awareness, are frequently identified as challenges across all technologies, Parties highlight the need to enhance capacities by strengthening the structures, competencies and resources of individuals, institutions, organizations and sectors. The reported need to enhance human skills also reflects the necessity to establish and/or enhance related education policies, publicly funded research and development and training programmes.

28.   Specifically for adaptation, enablers in the category of information and awareness-raising are listed as the second most reported enablers, being registered for 64% of the technologies, while enablers for 58% are registered in the categories of institutional and organizational enablers, as well as with regard to the technical aspects.

29.   For mitigation, the second most reported category is the legal and regulatory frameworks, which are reported for 63% of the technologies, while the technical aspects are reported for 60%.

Figure 1
Overview of enablers for technology development and transfer
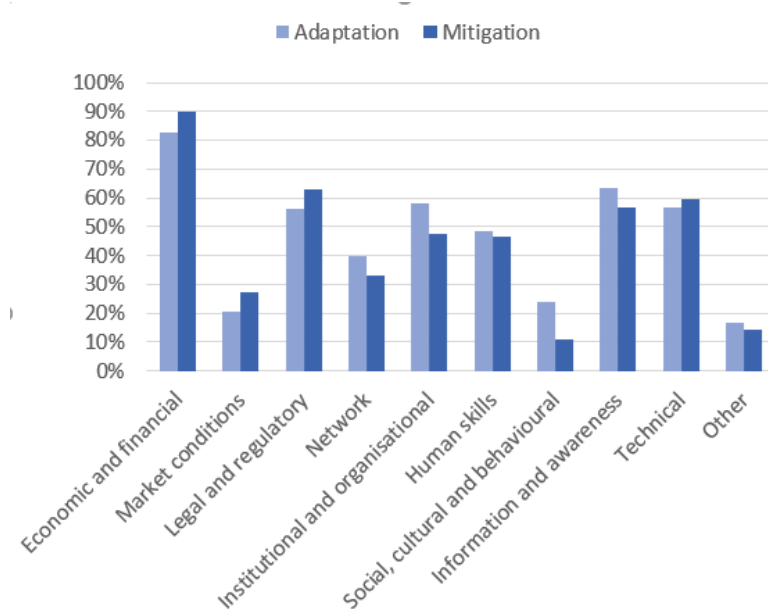
1. SIDS, LDCs and Non-Annex I Parties

30. Distinguishing between enablers reported by SIDS, LDCs and Non-Annex I Parties, the most frequently reported enablers across all three fall within the economic and financial category. An overview is provided in Figure 2.

31. Different patterns occur between the enablers being reported across the three groups (SIDS, LDCs and Non-Annex I Parties):

32. For 87% of technologies SIDS identifies a need for enablers to be implemented in the financial and economic category, while enablers in the technical category are listed for 62% of the technologies. For 55% of the technologies implementation of enablers are in the legal and regulatory category and 50% are in the institutional and organizational category are listed as required.

33. LDCs report the most enablers required per technology and are hence ranked highest in the need for the implementation of enablers in six out of nine enabler categories, including economic and financial enablers (for 89% of technologies), information and awareness raining enablers (for 67% of technologies), and legal and regulatory enablers (for 61% of technologies).

34. Non-Annex I Parties reported that for 86% of their priority technologies the enablers within the economic and financial category are required in order to establish appropriate enabling environments. Also, for 67% of the technologies, required enablers are identified within the categories of information and awareness, technical (58%), and legal and regulatory (61%) enablers.

Figure 2
Distribution of enablers identified by SIDS, LDCs, and Non-Annex I Parties
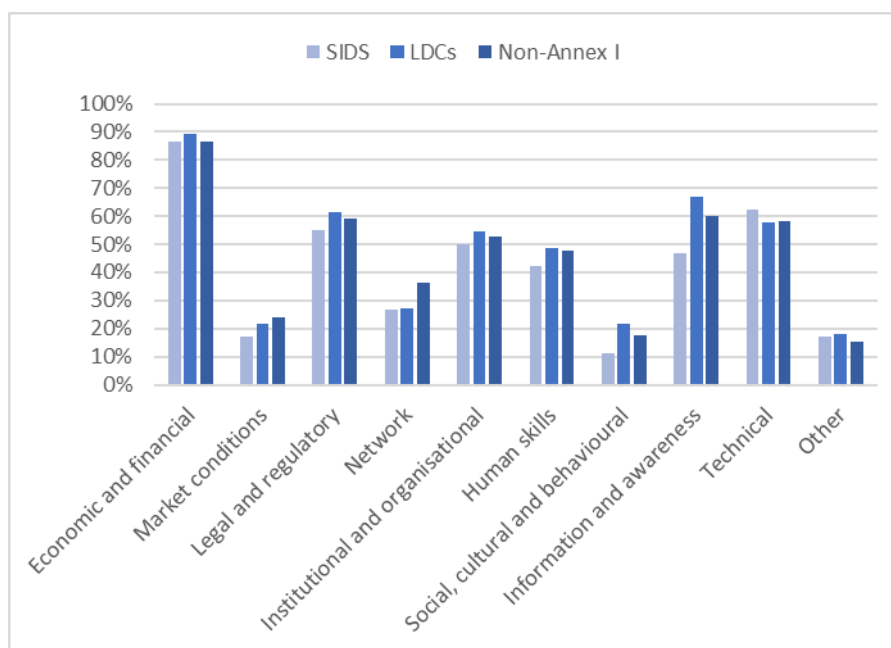
2. Regional Analysis

35. A regional overview of enablers is provided in Figure 3.

36. In the Africa region, the most frequently identified enablers are firstly, economic and financial (88%), secondly, information and awareness (65%), legal and regulatory (59%), and finally, technical (54%).

37. In Latin America and the Caribbean, economic and financial (83%) enablers are also predominant and are followed by technical enablers (62%), alongside institutional and organizational (59%) and information and awareness (57%).

38. In the Asia region, economic and financial enablers (85%) predominate over legal and regulatory (67%) and technical (62%) enablers, which are closely followed by the improvement of institutional and organizational capacities (61%).

39.   In Europe, economic and financial (91%) enablers are dominant as well. They are followed by the need to improve legal and regulatory frameworks (78%) and incentives to increase information and awareness (67%).

40.   In Oceania, economic and financial enablers are report for 92% of the technologies. For 80% of the technologies, enablers in the technical category are reported as being necessary. Like the challenge overview, no enablers in the category of market conditions were identified for Oceania, and also there no enablers were identified in the category of network enablers. Again, the reason for this may be that the data available from this region come from CTCN TAs and NDCs, for which challenges and enablers are reported for 13 countries only.

Figure 3
Regional distribution of reported enablers
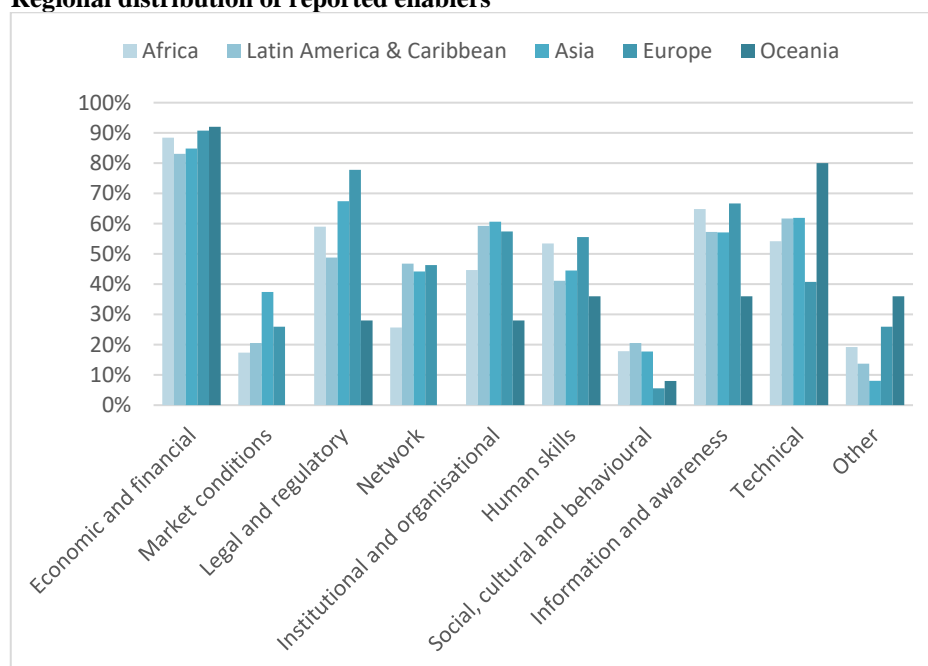
3.   **Sectoral analysis of enablers**

41.   This section builds on CTCN TA and TNA data only and focuses on the energy and transport sectors in the case of mitigation, and the water and agriculture sectors in the case of adaptation.

(a)   **Enablers in mitigation sectors: energy and transport**

42.   In the energy sector, economic and financial enablers are identified as required for 89% of the technologies, enablers in the legal and regulatory category for 73%. For example, by updating and enforcing technical regulations for appliances and strengthening the associated governance and legal frameworks, use of energy-efficient appliances in the residential and public sectors can be increased, thus contributing to climate change mitigation.

Box 3

Example. Catalysing private- and public- sector investments in Armenia, to build a market for energy-efficient building retrofits.

Armenia is highly vulnerable to the adverse impacts of climate change. Unsustainable energy use in buildings is one of the core problems for the Armenian population, as about one third of Armenian households are energy-poor, meaning that they spend more than 10% of their budget on energy. At the same time, half of the energy use in buildings depends on imported fossil fuels, and 24% of the country's CO_2 emissions come from energy use in buildings, making domestic energy consumption a major GHG emitter of the country while also increasing energy dependence on foreign resources.

Armenia's TNA recognized these problems and identified improving energy efficiency in buildings as a high priority to reduce CO_2 emissions, energy poverty and dependence on fossil-fuel imports all at once. As a result, a project focusing on improving energy efficiency through building retrofits has received funding from the Green Climate Fund alongside co-financing from other sources,

> resulting in a total project value of USD 29.8 million. The aim of the project is to build a market for energy-efficient building retrofits in Armenia, simultaneously catalysing private- and public-sector investments of up to USD 100 million.
>
> The project will combat the three problems identified above simultaneously: first, achieve sizable energy savings and emissions reductions of up to 5.8 tons of $CO2$ both directly and indirectly over the lifetime of the project; second, reduce dependence on energy imports while creating green jobs; and third, reduce energy poverty and thus directly benefit over 200,000 people. This lays the basis for a more climate-sustainable energy sector and buildings in accordance with Armenia's NDC.

43. In the transport sector, legal and regulatory enablers are dominant, being identified for 84% of the technologies, whereas economic and financial enablers are identified for 80%. For example, hybrid cars may not be currently available in the market because of a lack of approved standards and low knowledge of the technology. Hence enablers put in place by the government could include implementation of an appropriate regulatory and legal framework and building the capacity of relevant stakeholders. This could be done through the introduction of a national programme in support of hybrid cars.

44. For both sectors, the implementation of enablers related to information and awareness, institutional and organizational aspects, as well as technical, are identified as key for many technologies to create the required enabling environments for technology development and transfer.

Figure 4
Enablers in the mitigation sectors: energy and transport
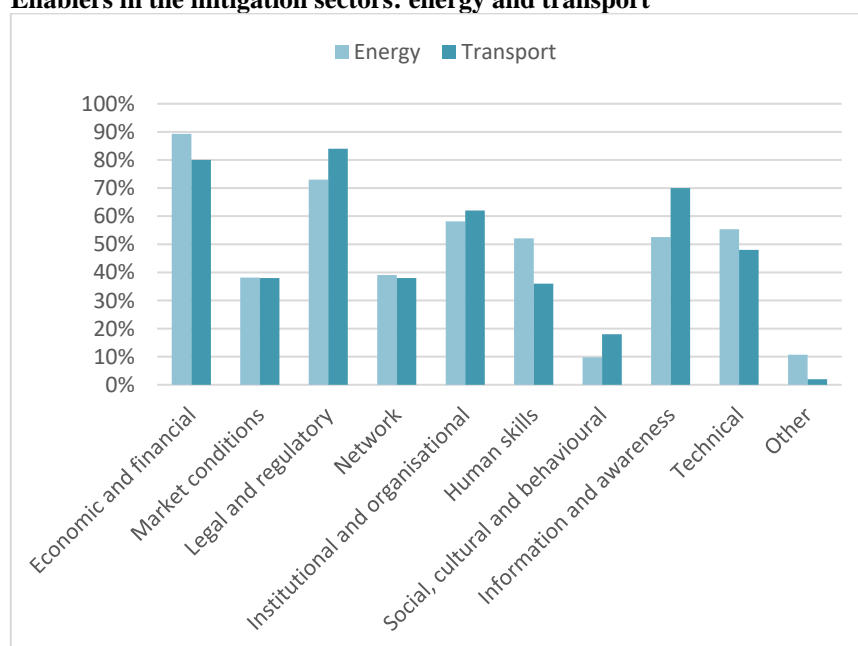
(b)   Enablers in adaptation sectors: agriculture and water

45. An overview of enablers identified for technologies in the respective sectors of agriculture and water for adaptation is provided in Figure 5.

46. In the agriculture sector, economic and financial (81%) and information and awareness (67%) enablers are the most commonly identified enablers, followed by legal and regulatory and institutional and organizational enablers (56%).

47. In the water sector, enablers in the economic and financial category are reported for 86% of the technologies, followed by legal and regulatory (72%), information and awareness (59%) and institutional and organizational enablers (58%).

48. For example, strengthening a country's human skills and capacity to build an early warning system for droughts will increase the country's capacity to adapt to climate change and increased climate variability in both the agriculture and water sectors. Building this capacity will also facilitate

future interventions that will have positive impacts on organizations and stakeholders involved in dry-season management, including local farmers.

Figure 5
Enablers identified in the adaptation sectors: agriculture and water
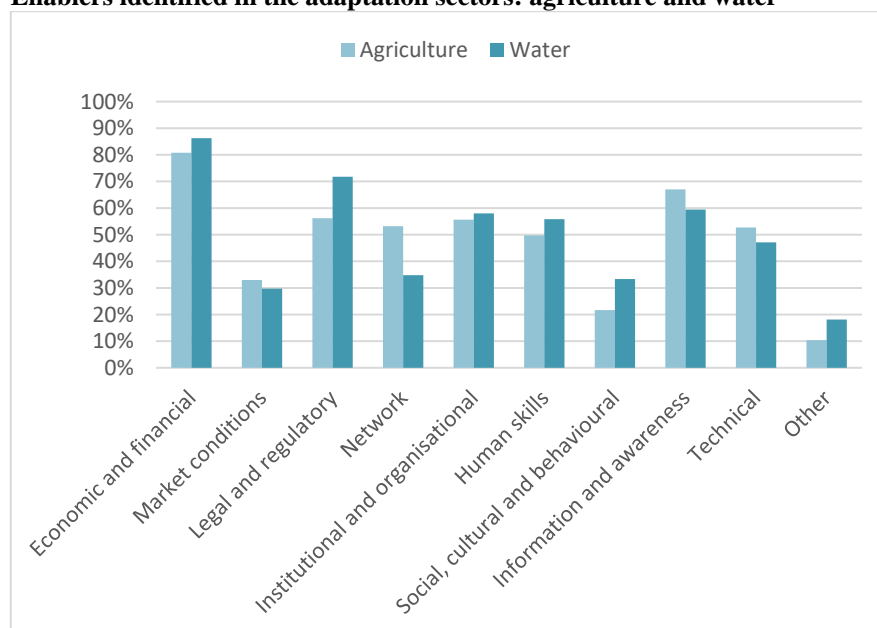
B.   Challenges

49.   An overview of the distribution of all challenges reported for technology development and transfer in TNAs, NDCs and CTCN TAs for mitigation and adaptation technologies respectively is provided in Figure 6.

50.   Challenges in the economic and financial category are the most frequently reported for both adaptation and mitigation technologies. Challenges in this category are related to, for example, the high initial cost of technologies, difficulties in obtaining loans, uncertainties regarding returns on investments and a general lack of financial resources. Specifically, the economic and financial challenges listed for some technologies at the household level are the high up-front costs and high capital costs.

51.   Even though technologies are inherently dependent on or affected by national and/or regional conditions, specific economic and financial challenges are general to most types of technology. For instance, among the most commonly reported challenges to the diffusion of solar energy technology are the high initial costs and interest rates on loans for purchasing the systems. Despite technological improvements and lower prices, most Parties still identify the high installation costs as a challenge. Some Parties explain how high interest rates on loans for solar technologies hinder the penetration of solar PV, while operating and maintenance costs are cited as an additional challenge, especially for small-scale, decentralized or off-grid solar PV projects. For 56% of the technologies across mitigation and adaptation, challenges are also reported in the category of legal and regulatory frameworks, highlighting a need for improved, strengthened and streamlined domestic policy frameworks to facilitate the development and transfer of technologies.

52.   Specifically in relation to adaptation, economic and financial challenges are reported for 81% of the technologies, whereas challenges in the category of information and awareness are reported for 60%. Technical challenges are reported for 57% of the technologies, and challenges related to legal and regulatory frameworks are reported for 55%.

53.   In relation to mitigation, economic and financial challenges are identified for 86% of the technologies, while for 64% challenges are reported in the technical category. Legal and regulatory challenges are identified for 57% of the technologies.

Figure 6
Challenges to technology development and transfer
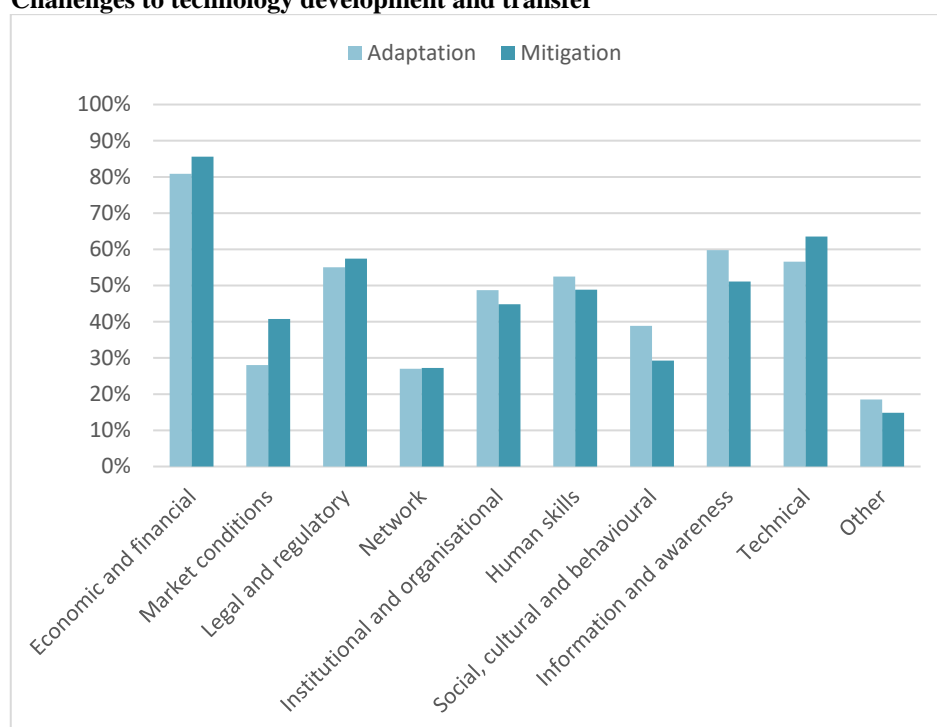
1. SIDS, LDCs and Non-Annex I Parties

54. With respect to how challenges to technology development and transfer are reported by the groups of small island developing states (SIDS), least developed countries (LDCs) and Non-Annex I Parties respectively, differences are related especially to the categories of institutional and organizational challenges, human skills, and social, cultural and behavioural aspects. In summary:

(a) SIDS report the majority of challenges in the economic and financial (80%), technical (58%), and information and awareness (50%%) categories. SIDS report fewer challenges per technology than LDCs and Non-Annex I Parties;

(b) LDCs report the majority of the challenges in the economic and financial (84%), information and awareness (59%) and technical (58%) categories. LDCs list more challenges in the categories related to both the institutional and organizational aspects and human skills than SIDS and Non-Annex I Parties;

(c) Non-Annex I Parties report the majority of challenges in the economic and financial (83%), technical (60%), legal and regulatory and information and awareness (56%) categories. Non-Annex I Parties report more challenges related to network development, and technical challenges, than SIDS and LDCs.

55. Across Non-Annex I Parties, LDCs and SIDS, economic and financial challenges stand out as the single most important category. An overview is provided in Figure 7.

Figure 7
Distribution of challenges identified by SIDS, LDCs, and Non-Annex I Parties
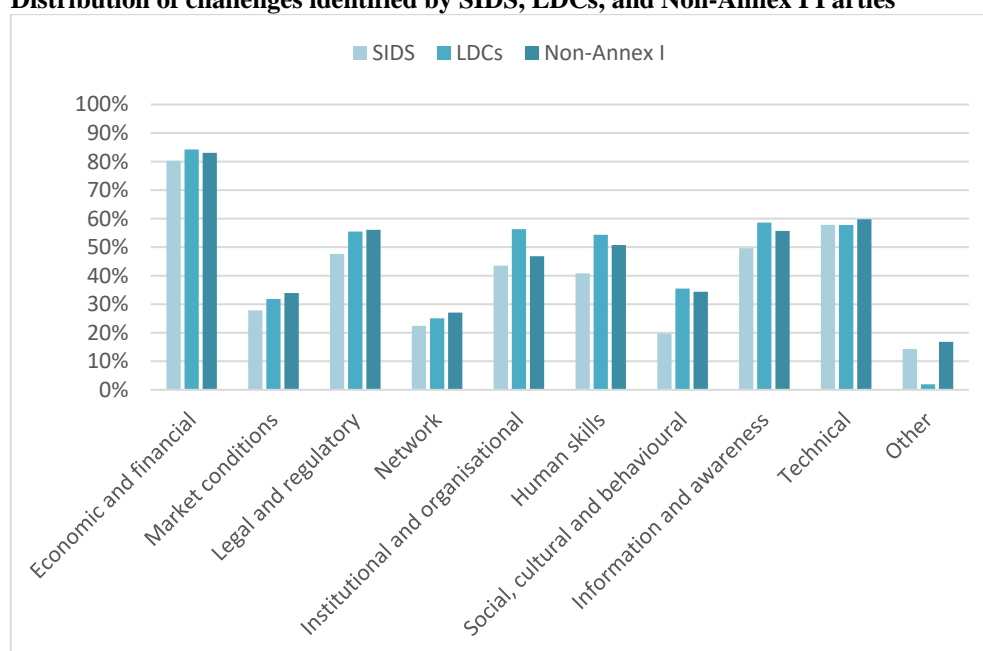
56. Looking into the challenges reported, within the information and awareness category, the availability of and access to information on technology costs, performance and effects are key. Here the CTCN, while providing technical assistance to Parties upon request, plays a role in closing this information gap.

57. For example, full information is needed to identify and understand the impacts and effectiveness of technologies, their requirements for enabling environments and the potential scale of their applications. While the lack of sufficient data is a global problem, this challenge is particularly pronounced in developing countries where such data are often unavailable and/or unreliable. The building of skills in data gathering, analysis, management, presentation, verification, standardization and harmonization removes uncertainty and is therefore a key aspect of overcoming those challenges that are critical in creating an effective enabling environment for technology development and transfer.

2. Regional analysis

58. In the Africa region, the most frequently identified challenges are firstly, economic and financial (83%), secondly, technical challenges (56%) and thirdly, human skills (52%).

59. In the Latin America and Caribbean region, economic and financial (82%) challenges are also predominant and are followed by the lack of information and awareness (58%), alongside legal and regulatory and technical (57%) challenges.

60. In the Asia region, economic and financial (84%) challenges predominate over technical (68%) and legal and regulatory (62%) challenges, which are closely followed by a lack of information and awareness (58%).

61. In the Europe region, legal and regulatory (83%) challenges are almost as important as economic and financial challenges (85%) and are followed by the lack of information and awareness (74%).

62. In the Oceania region, economic and financial (80%), technical (60%) and institutional and organizational capacity (53%)are the three main identified challenges.

Figure 8
Challenges identified per region
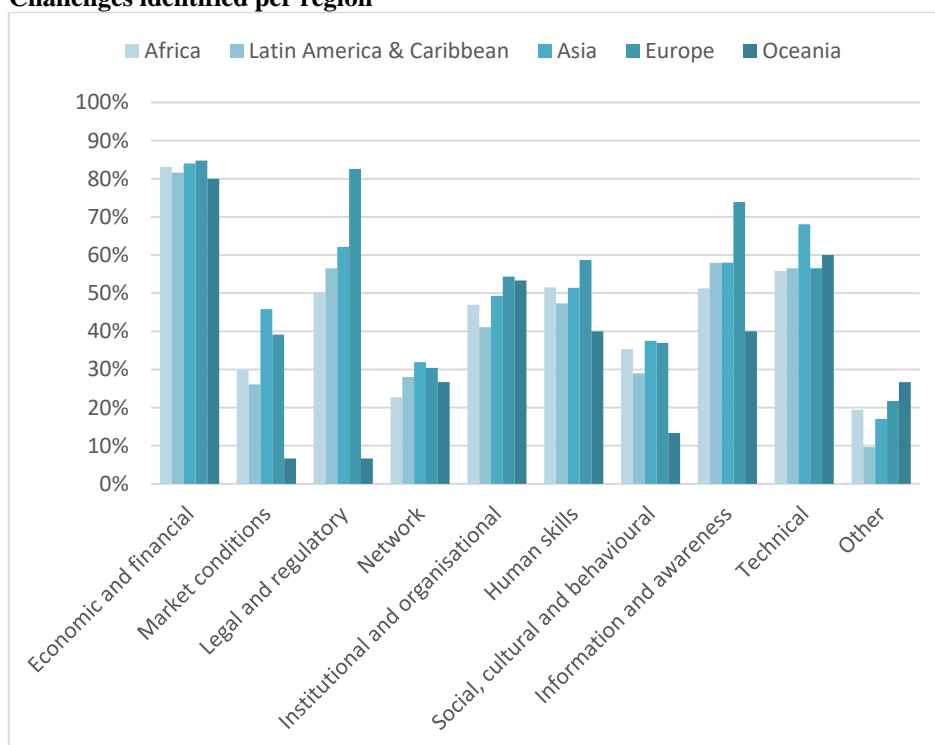
63.   Across regions, economic and financial challenges, technical challenges, and the lack of information and awareness are frequently reported. In all regions, the Parties have identified economic and financial challenges as the most common challenges to technology development and transfer. Similarly, in three out of five regions, the technical challenge is the second most frequently identified challenge. Legal and regulatory challenges figure in the top three of the most commonly reported challenges in three regions out of five.

Box 4
Example. Regional challenges: Challenges in the southern African region

In the southern Africa region Parties have reported multiple challenges with regard to energy-efficient technologies, such as energy-efficient lightning technologies, air conditioning, transformers, motors and refrigerators. Hence, with respect to the economic and financial challenges, countries in the region highlighted the limited support for project preparation, as well as the limited exposure to local financial institutions supporting the development of renewable energy and energy-efficient investment projects.

Furthermore, regarding the legal and regulatory challenges, Parties report inadequate or a lack of enabling domestic policies and regulations aimed at increasing market stimulation regarding, for example, the uptake of renewable energy and energy-efficient technologies. In many instances, it was reported that if private sector companies are not provided with economic and financial incentives, they may not implement energy-efficient technologies that require upfront capital investment. The private sector is often identified as a main actor along the entire pathway from technology development to diffusion, both in addressing shorter- and longer-term technological needs. Market opportunities, investment procedures and profitability criteria are key words used in discussing the incentives and behaviour of both the providers and recipients of technology.

The isolation of energy policy development, creating a disharmony with regional and international policies, was stated as being another major challenge to the successful deployment of technology, alongside the inability to create an integrated market due to a lack of harmonization in labelling technologies.

In addition, countries in the southern African region identified limited capacity and awareness among stakeholders regarding the technical and economic potential of deploying renewable energy and energy-efficient technologies. Similarly, the positive social and environmental impacts of such technologies are not widely acknowledged across countries. This lack of information and awareness directly influences decision-making processes when it comes to investment and therefore often leads to 'business as usual' purchasing scenarios.

Finally, countries in the region identified other challenges, such as the shortages of skilled technical personnel (technical capacity for the installation, operation and management of the concerned technologies) and the lack of knowledge at the vocational and university levels, which limit the successful deployment of technologies. To overcome shortages of skilled technical personnel, countries include often times, as part of their TAPs, training programmes and capacity building of personnel.

3. Sectoral analysis

64.   As NDCs often do not list specific challenges at the sector level but only do so generally in respect of technology transfer issues, this section builds on CTCN TA and TNA data only. The most commonly identified sectors across the database are energy and transport in the case of mitigation, and water and agriculture in the case of adaptation.

(a)   Challenges in the mitigation sectors: energy and transport

65.   Economic and financial challenges are the most commonly identified challenges in the energy sector (85%), followed by technical (73%) and legal and regulatory (62%) challenges.

66.   In the transport sector, economic and financial challenges are dominant, being reported for 82% of the technologies, while legal and regulatory challenges are reported for 77%.

67.   There are considerable differences between the challenges that are listed for the technologies in the two sectors. For example, challenges in the categories of legal and regulatory frameworks, market conditions and networks are more frequently reported for technologies in the transport sector than in the energy sector. An overview of the challenges reported in the two sectors is provided in Figure 9.

Figure 9
Challenges in the mitigation sectors: energy and transport
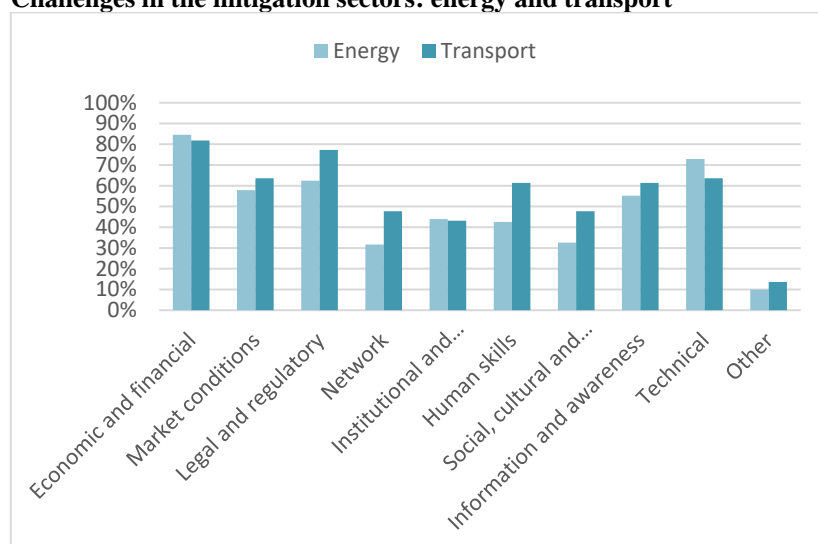
(b)   Challenges in the adaptation sectors: agriculture and water

68.   An overview of the challenges in the agriculture and water sectors are provided in Figure 10.

69.   In the agriculture sector, economic and financial challenges are listed for 86% of all technologies in the sector. Legal and regulatory challenges are also frequently encountered in this sector, as they are reported for 69% of the technologies. The other two main challenges reported for technologies in the agriculture sector are in the categories of information and awareness (60%) and technical (58%).

70.   In the water sector, it is reported that 92% of the technologies are facing challenges in the economic and financial category. These challenges are followed by technical challenges (64%), legal and regulatory challenges (63%), and the information and awareness (59%).

Figure 10
Challenges in the adaptation sectors: agriculture and water
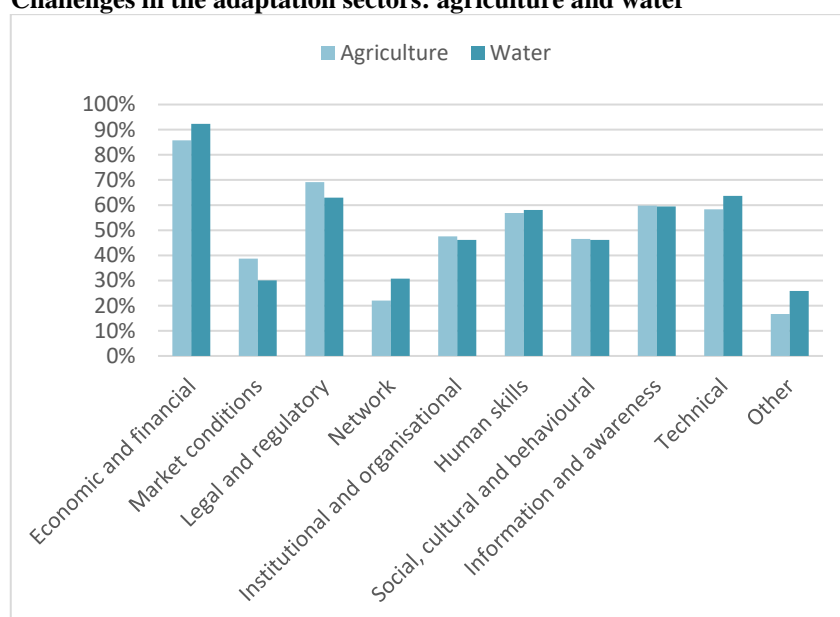
C. Policies and strategies to create enabling environments for technology development and transfer

71.   Given the multidimensional nature of the challenges and opportunities for technology development and transfer, creating enabling environments involves processes that are deeply embedded in differing social, economic and development contexts.

72.   This also implies that technology development and transfer should be understood not as a one-off event, but as an ongoing process that depends upon, and influences, other ongoing national and international processes. Generally, the pathways for technology development and transfer are either government-driven, private sector-driven or community-driven. However, an integrated governance structure is also central to the success of technology development and transfer. For example, a coordinated effort on awareness-building throughout government and private and community groups is likely to improve greatly the likelihood of the technologies in question being successfully transferred.

73.   Also, academia and research play an important role in the process of technology development and transfer.[12] A review of developing countries' NDCs,[13] revealed that almost 50 percent of all developing countries specifically referred to the importance of technological innovation or research and development for achieving their climate objectives. Education policies, publicly funded research and development and training programmes Hence, a strengthening of institutional and scientific capacities is critical for creating long term enabling conditions for technology development and transfer. Joint research and development efforts between countries that have well-developed research and development infrastructure and those countries that are still constrained by access to finance and information related to this, may address some of the challenges with regard to development and transfer of technologies.

74.   This section explores the role of governments, the private sector and communities in the design and implementation of policies and strategies to enhance the enabling environments for technology development and transfer.

---

[12] FCCC/TP/2006/2.
[13] Charlery and Traerup (2018)

1. Governments

75.   Experience shows that, to achieve a significant impact on the development and transfer of a specific technology, it is necessary to apply a relatively broad set of complementary enablers addressing the challenges at various levels.

76.   The final choice of one set of enablers over another is generally a strategic question. The proposed sets of enablers are discussed, negotiated and agreed by relevant stakeholders nationally so as to be consistent with domestic objectives, finally being discussed at the highest level in the ministries involved before selecting the final set of enablers to be included in a programme for technology development and transfer, such as in a Technology Action Plan (TAP).

77.   Limited financial resources to cover the capital costs are typically listed as the main obstacle to technology development and transfers across NDCs, TNAs and CTCN TA documents. This is supplemented with enablers to address lacking or inadequate regulatory frameworks, market conditions, and institutional and organizational capacities. Insufficient human skills are often also identified as challenges, a response measure often being identified through a need for tailored capacity-building.

78.   Another role of governments is related to the design and implementation of policies to incentivize the adoption of technologies, for example, through financial incentives such as seed funding, financial guarantees, tax exemptions and low-interest loans, in addition to the provision of financial support to research, innovation and technological development.

79.   The role of governments in creating the enabling environments for technology development and transfer is further emphasized through their influence on legal and regulatory frameworks for international technology development and transfers and foreign financial flows, including introducing market-based instruments for market regulation and development. Thus, macro-economic policy frameworks also play a central role in creating the enabling conditions for technology development and transfers.

80.   In their TNAs, NDCs and CTCN TAs, Parties also identify the role of governments in providing non-fiscal measures such as the establishment of specific technology standards. Market interventions, for example, to correct subsidy distortions or disincentivize ingrained industries and processes that have created challenges to the uptake of technologies are also listed as a key role for governments.

81.   An effective enabling environment for technology development and transfer is often characterized by greater coordination and communication among government departments and agencies with the goal of streamlining and easing the way for investment in technologies and presenting international efforts with an integrated approach at the national and subnational levels.

2. Private sector

82.   To ensure the best possible results, most technology development and transfer involve cooperation between governments, the private sector and research and development institutions. There is a continuous need to improve involvement by the private sector and to harness private investments in technological cooperation.

83.   The private sector is often identified as a main actor along the entire pathway from technology development to diffusion, both in addressing shorter and longer term technological needs. Market opportunities, investment procedures and profitability criteria are key words used in discussing the incentives and behaviour of both the providers and recipients of technology. In the analysis of TNAs, NDCs and CTCN TAs, many Parties identify a lack of incentives for the private sector to invest in climate technologies, as well as poor institutional linkages, particularly between the public and private sectors, as key challenges to technology development and transfer. Hence, this also underpins one of the functions of the CTCN, namely to 'facilitate international partnerships among public and private stakeholders to accelerate the innovation and diffusion of environmentally sound technologies to developing country Parties'.

84.   The role of the private sector in developing and transferring technology could be extended if provided with the right incentives. This leads us back to the role of national governments in creating the right enabling conditions for both domestic and international technology development and transfer. The introduction of incentives, such as subsidies for investment and tax exemptions, would

likely result in an increase in profitability for the private sector in investing in the required implementation of technology, hence encouraging further investments. In this case, the role of the private sector could be extended by implementing regulations on the part of government.

Box 6

Public-private cooperation: **Cooperation between public and private institutions for scaling-up adaptation technologies in Indonesia**

In Indonesia, coastal zones are greatly impacted by flooding due to a combination of rising sea levels, land subsidence and higher river levels because of extreme weather aggravated by climate change. Subsequently, Indonesia prioritised, in its TNA, technologies for coastal protection, and building on this, requested technical assistance from the Climate Technology Centre and Network (CTCN) focusing on flood-hazard mapping and forecasting systems and hydrological modelling in the city of Jakarta.

The technical assistance brought technology experts together with government agencies to help reduce flooding risks, increased local capacity in high-resolution hydrodynamic modelling, created a hydrodynamic flood model, and helped shape the design of climate resilient infrastructure projects, including, but not limited to, the construction of a giant seawall to reduce the risk of flooding and coastal inundation in Jakarta. Finally, it created anticipated financial support to the tune of an additional 5 million USD through bilateral funding to scale up the technological approach to other polder areas in Jakarta city.

---

3. Communities

85. In the process of transferring technology in all sectors, government, the private sector and community stakeholders all play integral roles. Although the process of transfer varies, the importance of considering the entire governance structure (government, private sector and community) is clear. This includes consideration throughout of strategies to overcome the challenges to technology development and transfer related to investment costs, research, development, awareness-raising, institutional capacity and so forth.

86. Given that many Parties identify challenges related to social, cultural and institutional aspects of technology development and transfer in their TNAs, NDCs and CTCN TAs, these aspects must be appropriately considered when assessing the potential for technology development and transfer. The challenges can only be addressed through the inclusion of all stakeholders in the governance system, as described above. For example, community groups and individuals have an important role to play in the design and implementation of urban planning and management in order to transcend cultural challenges.

87. There is a long history of participatory approaches being essential in creating efficient technology development and transfer processes, including establishing the appropriate enabling environments. A participatory approach results in a process which is needs-driven and appropriate to the local context. The process should be in line with community perceptions of local problems and should draw on local knowledge.

88. Governments may have a strategy to increase the capacity for the local and in-country production of technologies. Communities should be invited into the process through active participation by, for example, reaching out to community-based organizations, awareness-raising campaigns and empowerment through capacity-building. Capacity-building should be designed both for participation in decision-making processes and to increase the capacity of stakeholders throughout the whole technology production chain. This will improve local productive capacity and have a positive impact on local living conditions in general.

89. Purely community-driven pathways may be found in places where a local need for technology is recognized but no government or private sector interest is anticipated.

IV. Key findings

90. The key findings from the analysis of challenges and enabling environments as reported by Parties in their nationally driven TNAs, NDCs and CTCN TAs are presented below. Comparison with findings from previous TEC work,[14,15,16,17] on challenges and enabling environments to technology development and transfer provides additional opportunities for reflections on these issues.

91. The findings of this paper suggest that

92. overcoming the economic and financial challenges is central to achieving technology development and transfer;

93. for none of the prioritized technologies, the economic and financial challenges are listed as the only challenges, suggesting that successfully implementing technologies must be achieved by more than just overcoming the economic and financial challenge;

94. efforts to realize technology development and transfer should not target the economic and financial aspects narrowly as a single cause. Instead, multifaceted actions are recommended, ensuring that all challenges hindering successful development and transfers are targeted;

95. governments have a major role to play in creating enabling environments to address the challenges to technology development and transfer by establishing and enforcing the appropriate regulatory and institutional frameworks;

96. to stimulate the transition to improved enabling environment conditions for technology development and transfer further, a combination of market stimulation and human capacity development is identified as key by developing country Parties;

97. support to programmes designed to strengthen the institutional and scientific capacities, with regards to technology development and transfer, of developing country Parties, in particular for LDCs, is reported as critical to the creation of the long-term enabling environments required for technology development and transfer within these countries;

98. there is a need for education and training, assisting countries in making early-stage decisions on financing, matching country plans technology priorities with funding sources, and in general establishing an essential bridge between the policy and finance communities.

99. These findings are supplementary to, and closely aligned with, previous work by the TEC,[18,19] on the challenges and enabling environments to technology development and transfer, which highlighted the need to

    (a) engage the financial and business community in enhancing access for financing;

    (b) strengthen collaboration on research and development;

    (c) find efficient ways of developing national capacities; and

    (d) initiate activities related to the policy and regulatory frameworks.

100. In addition, the findings of this paper are well aligned with the results from the survey made on the endogenous capacities developed by the TEC as per activity 2 of the thematic area Enabling environment and capacity-building of the workplan for 2019–2022. Financing issues were identified as top enablers and challenges in both work streams. Technical skills were viewed as highly important, as were information, awareness, and communication issues. The endogenous capacities and technologies survey results reflect the perceptions of national representatives, members and observers of various constituted bodies, as well as CTCN Network Members, whereas this paper builds on data on enablers and challenges reported by countries in their national efforts (TNAs, NDCs, and CTCN TAs) under the UNFCCC.

---

[14] TEC/2013/7/10.
[15] TEC/2013/6/10.
[16] TEC/2017/15/14.
[17] TEC/2018/17/4.
[18] TEC/2013/7/10.
[19] TEC/2013/6/10.

101. Finally, the findings of the paper shows the crucial role that the operating entities of the Financial Mechanism have in ensuring a strong collaboration between the operating entities of financial mechanisms, private-sector entities and local and national governments. The findings also highlight the importance of the Financial Mechanism in leveraging resources from the public and private sector in order to stimulate markets for technology development and transfer.

V. Key messages

102. From the findings presented in the paper, the following key messages are suggested:

(a) There is an increasing opportunity for extended cooperation between committed public and private institutions, that have practical experience in evaluating, using, implementing and financing new technological innovations.

(b) Governments have a major role to play in creating enabling environments to address the challenges to technology development and transfer by establishing and enforcing the appropriate regulatory and institutional frameworks.

(c) Advancing and deploying innovative and sustainable approaches to establish appropriate enabling environments for technology development and transfer are crucial to facilitate technology transition along with sustainable development trajectories.

(d) Sharing good examples from countries that have integrated actions on climate technologies, including the creation of their enabling environments, into government planning and policies, could stimulate adoption of a similar approach amongst other countries.

(e) The Financial Mechanism has a key position leveraging resources from the public and the private sector to stimulate markets for technology development and transfer.

(f) To enable the development and transfer of adaptation technologies, it is key to establish information and raise awareness about the potential of these to reduce climate vulnerabilities, and to strengthen institutional and organizational aspects.

(g) To enable the development and transfer of mitigation technologies, it is key to establish appropriate legal and regulatory frameworks, and to enhance technical capacities.

VI. Issues for further consideration

103. There are five crucial elements which make up technology development and transfer,[20] namely finance, capacity-building, systemic issues, technology and trade, all of which must be aligned for technology development and transfer to be achieved. One of the key lessons reiterated from the results of the analysis in this paper is that, in the efforts to achieve technology development and transfer, there is a greater need to understand how, why and where efforts are being directed to each the elements of technology development and transfer.

---

[20] IPCC (2000) B. Metz, O. Davidson, J.-W. Martens, S. Van Rooijen, and L. V. W Mcgrory (eds.) IPCC's Special Report on Methodological and Technological Issues in Technology Transfer. Cambridge University Press, UK.

Annex II

Overview of categories for technology transfer challenges and enablers[1]

	Challenges	Enablers
Economic and financial	High cost of capital, investment in technology considered risky (e.g. due to few prior local reference examples), low expected rate on return	e.g. subsidies, Standard power purchase agreements, feed-in-tariffs, loan guarantees, green marketing (e.g. a premium tariff on 'green' electricity), etc.
Market conditions	Few local suppliers of auxiliary goods and services, uneven playing field (e.g. due to subsidies on competing technologies), market control by industry incumbents	Market liberalisation (e.g. by allowing competitors to the incumbent fossil-based monopoly)
Legal and regulatory	Technology opposing incumbent actors (such as utilities), insufficient legal framework, highly controlled sector, conflicts of interest, political instability, bureaucracy, rent-seeking behaviour	Obligations to generate or purchase 'green' electricity, Public investment policies, Regulation of financial sector institutions
Network	Weak connectivity between actors, incumbent networks being favoured, limited distribution networks	Promotion of industry associations, networks, organisations and alliances
Institutional and organisational capacity	Few professional institutions, limited institutional capacity, limited management and organisational skills	Initiatives to enhance efficiency in government procedures and processes, Capacity-building programmes of governmental agencies and institutions
Human skills	Unskilled technical personnel and inadequate training	Education policies, Publicly funded research and development and training programmes
Social, cultural and behavioural	Consumer preferences and social biases, traditions, dispersed settlements	Involving local communities and civil society (including young people), Targeted assistance to support early adopters and technology front-runners, Promotion of public–private partnerships
Information and awareness	Inadequate information, missing feedback, lack of awareness	Research, Information dissemination, outreach and awareness-raising campaigns
Technical	Poor technology quality/performance, few local reference examples	Improved access to the grid, Support for testing and demonstration facilities (including training programs), Technical standards, certification, and codes
Other	I.e. Environmental impacts, physical infrastructure conditions	Improved infrastructure

---

[1] UNEP DTU Partnership (2015) Overcoming Barriers to the Transfer and Diffusion of Climate Technologies. Available at: http://www.tech-action.org/-/media/Sites/TNA_project/TNA-Guidebooks/Overcoming-Barriers-to-the-Transfer-and-Diffusion-of-Climate-Technologies-2nd-Ed_FINAL.ashx?la=da&hash=9B525D1C40FA16332143AE397F56CF0C03DD4A5B

Annex III

Overview of categories for technology transfer challenges and enablers

I. NDCs

Overview of challenges identified in NDCs (141 NDCs)			
	Challenges		
Category	**Total**	**Mitigation**	**Adaptation**
Economic and financial	100	45	55
Market conditions	9	2	7
Legal and regulatory	25	10	15
Network	21	8	13
Institutional and organizational	45	16	29
Human skills	52	21	31
Social, cultural and behavioural	11	3	8
Information and awareness	54	22	32
Technical	72	31	41
Other	25	12	13
Total	414	170	244

Overview of enablers identified in NDCs (141 NDCs)			
	Enablers		
Category	**Total**	**Mitigation**	**Adaptation**
Economic and financial	260	132	128
Market conditions	19	12	7
Legal and regulatory	94	45	49
Network	49	25	24
Institutional and organizational	111	52	59
Human skills	95	44	51
Social, cultural and behavioural	35	14	21
Information and awareness	129	59	70
Technical	230	118	112
Other	62	31	31
Total	1084	532	552

II.   TNAs

1.   TNAs from 58 countries were included in the data set. In the TNAs, challenges and enablers were identified for 668 technologies. Of these 668 technologies, 300 technologies were in the category of mitigation and 368 in the category of adaptation.

Overview of challenges identified in TNAs (58 TNAs)						
	Non-Annex I		**SIDS**		**LDCs**	
Category	Mitigation	Adaptation	Mitigation	Adaptation	Mitigation	Adaptation
Economic and financial	258	326	34	45	94	125
Market conditions	157	135	26	11	58	45
Legal and regulatory	210	247	34	30	74	95
Network	107	106	11	16	38	36
Institutional and organizational	148	196	19	27	60	82
Human skills	150	205	22	13	61	83
Social, cultural and behavioural	106	181	8	19	35	71
Information and awareness	169	223	16	32	65	92
Technical	209	200	30	20	72	84
Other	47	71	3	6	23	31
Total	**1561**	**1890**	**203**	**219**	**580**	**744**

Overview of enablers identified in TNAs (58 TNAs)						
	Non-Annex I		**SIDS**		**LDCs**	
Category	Mitigation	Adaptation	Mitigation	Adaptation	Mitigation	Adaptation
Economic and financial	263	304	37	45	97	121
Market conditions	127	105	20	6	38	39
Legal and regulatory	219	247	35	35	69	95
Network	125	149	21	19	37	41
Institutional and organizational	156	224	21	27	55	86
Human skills	148	186	18	14	46	70
Social, cultural and behavioural	42	105	6	10	11	48
Information and awareness	173	236	14	34	63	97
Technical	172	172	24	24	64	73
Other	43	49	12	2	13	27
Total	**1468**	**1777**	**208**	**216**	**493**	**697**

III. CTCN TAs

Overview of challenges and enablers identified in CTCN Technical Assistance (101 CTCN TAs)		
Category	**Challenges**	**Enablers**
Economic and financial	106	96
Market conditions	22	5
Legal and regulatory	52	74
Network	24	66
Institutional and organizational	57	75
Human skills	76	80
Social, cultural and behavioural	29	6
Information and awareness	84	106
Technical	88	46
Other	17	11
Total	555	567

Annex IV

Overview of countries included in the database

Country	Region	NDC	TNA	CTCN
Afghanistan	Asia	x	x	x
Albania	Europe	x		x
Algeria	Africa	x		x
Andorra	Europe	x*		
Angola	Africa	x*		
Antigua and Barbuda	Latin America & Caribbean	x		x
Argentina	Latin America & Caribbean	x*	x	x
Armenia	Europe	x	x	x
Azerbaijan	Asia	x	x	x
Bahamas	Latin America & Caribbean	x		
Bahrain	Asia	x		
Bangladesh	Asia	x*	x	x
Barbados	Latin America & Caribbean	x		
Belize	Latin America & Caribbean	x	x	
Benin	Africa	x*		x
Bhutan	Asia	x	x	x
Bolivia	Latin America & Caribbean	x		
Bosnia and Herzegovina	Europe	x		x
Botswana	Africa	x		x
Brazil	Latin America & Caribbean	x*		x
Brunei Darussalam	Asia	x*		
Burkina Faso	Africa	x	x	x
Burundi	Africa	x	x	
Cabo Verde	Africa	x		

Country	Region	NDC	TNA	CTCN
Cambodia	Asia	x*	x	
Cameroon	Africa	x		x
Central African Republic	Africa	x		
Chad	Africa	x		
Chile	Latin America & Caribbean	x*		x
China	Asia	x		
Colombia	Latin America & Caribbean	x*	x	x
Comoros	Africa	x		
Congo	Africa	x		
Cook Islands	Oceania	x		
Costa Rica	Latin America & Caribbean	x*	x	x
Cote D'Ivoire	Africa	x	x	x
Cuba	Latin America & Caribbean	x*		
Democratic People's Republic of Korea	Asia	x*		
Democratic Republic of the Congo	Africa	x		
Djibouti	Africa	x		
Dominica	Latin America & Caribbean	x		
Dominican Republic	Latin America & Caribbean	x*	x	x
Ecuador	Latin America & Caribbean	x*	x	x
Egypt	Africa	x		
El Salvador	Latin America & Caribbean	x	x	
Equatorial Guinea	Africa			
Eritrea	Africa	x		
Eswatini	Africa	x	x	x
Ethiopia	Africa	x*		x
Fiji	Oceania	x*		

Country	Region	NDC	TNA	CTCN
Gabon	Africa	x		
Gambia	Africa	x		x
Georgia	Asia	x	x	x
Ghana	Africa	x	x	x
Grenada	Latin America & Caribbean	x*	x	x
Guatemala	Latin America & Caribbean	x	x	x
Guinea	Africa	x	x	x
Guyana	Latin America & Caribbean	x	x	
Haiti	Latin America & Caribbean	x		
Honduras	Latin America & Caribbean	x	x	x
India	Asia	x		
Indonesia	Asia	x	x	x
Iran	Asia			x
Israel	Asia	x		
Jamaica	Latin America & Caribbean	z*		
Jordan	Asia	x	x	x
Kazakhstan	Asia	x	x	
Kenya	Africa	x*	x	x
Kiribati	Oceania	x		
Kuwait	Asia	x		
Lao People's Democratic Republic	Asia	x	x	x
Lebanon	Asia		x	
Lesotho	Africa	x		x
Liberia	Africa	x*	x	x
Madagascar	Africa	x	x	x
Malawi	Africa	x		x

Country	Region	NDC	TNA	CTCN
Malaysia	Asia	x		
Maldives	Asia	x*		
Mali	Africa	x	x	x
Marshall Islands	Oceania	x*		
Mauritania	Africa	x	x	
Mauritius	Africa	x	x	x
Mexico	Latin America & Caribbean	x*		
Micronesia	Oceania	x		
Mongolia	Asia	x*	x	
Montenegro	Europe	x		
Morocco	Africa	x	x	
Mozambique	Africa	x	x	x
Myanmar	Asia	x		x
Namibia	Africa	x		x
Nauru	Oceania	x		
Nepal	Asia	x*		x
Nicaragua	Latin America & Caribbean	x*		
Niger	Africa	x		x
Nigeria	Africa	x		x
Niue	Oceania	x		
Pakistan	Asia	x	x	x
Palau	Oceania	x		
Panama	Latin America & Caribbean	x*	x	x
Papua New Guinea	Oceania	x*		
Paraguay	Latin America & Caribbean	x		x
Peru	Latin America & Caribbean	x	x	x

Country	Region	NDC	TNA	CTCN
Qatar	Asia	x		
Republic of Korea	Asia	x*		
Republic of Moldova	Europe	x*	x	
Rwanda	Africa	x*	x	
Saint Kitts and Nevis	Latin America & Caribbean	x		
Saint Lucia	Latin America & Caribbean	x*		
Saint Vincent and Grenadines	Latin America & Caribbean	x		
Samoa	Oceania	x		
Sao Tome & Principe	Africa	x	x	
Saudi Arabia	Asia	x		
Senegal	Africa	x*	x	x
Serbia	Europe	x		x
Seychelles	Africa	x	x	x
Sierra Leone	Africa	x		x
Singapore	Asia	x*		
Solomon Islands	Oceania	x		x
Somalia	Africa	x		
South Africa	Africa	x		x
Sri Lanka	Asia	x	x	x
State of Palestine	Asia	x		
Sudan	Africa	x	x	
Suriname	Latin America & Caribbean	x*		
Syrian Arab Republic	Asia	x*	x	
Tajikistan	Asia	x		
Thailand	Asia	x*	x	x
The Former Yugoslav Republic of Macedonia	Europe	x		

Country	Region	NDC	TNA	CTCN
Timor-Leste	Asia	x		
Togo	Africa	x	x	x
Tonga	Oceania	x*		x
Trinidad & Tobago	Latin America & Caribbean	x		
Tunisia	Africa	x	x	x
Turkmenistan	Asia	x		
Tuvalu	Oceania	x		
Uganda	Africa	x	x	x
Ukraine	Asia		x	
United Arab Emirates	Asia	x*		
United Republic of Tanzania	Africa	x	x	x
Uruguay	Latin America & Caribbean	x	x	x
Uzebkistan	Asia	x*		
Vanuatu	Asia	x		
Venezuela	Latin America & Caribbean	x		
Vietnam	Asia	x*	x	x
Zambia	Africa	x*	x	x
Zimbabwe	Africa			x

* Updated or new NDC uploaded to the NDC registry since July 2018.

Annex V

A concept note for a thematic dialogue

I. Strengthening the means to implementation through the creation of enabling frameworks for technology development and transfer for implementation of the Paris Agreement

1.   The event could be organized as an in-session event of 2 hours, or it could be organized as a whole day event. Number of sessions and presentations can be adjusted accordingly.

A.   Background

2.   The Paris Agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C. The Agreement opens op for international collaborations that brings together Governments, civil society, the private sector, the United Nations system and other actors and mobilizes all available resources for the transition of economies to low emission climate resilient development paths. In the lead up to the Paris Agreement countries prepared their Nationally Determined Contributions. After the ratification of the Agreement countries now have to deliver their contributions which are partly voluntary and partly conditional. In going forward, developing countries have technology development and transfer as one of the key pillars to an effective international response to climate change, with requirements for support on finance and capacity building.

3.   The TEC agreed, in its rolling work plan for 2019-2022, to an activity on examining enabling environments, including challenges and opportunities to incentivize the private and public sector in the development and transfer of technologies, building on TEC previous work on adaptation and mitigation technologies.

4.   The findings of this mapping indicate that economic and financial barriers are central to climate actions, though efforts to realize identified technologies should not target the barrier narrowly as a single-causality issue. Instead, multifaceted actions are recommended taken, ensuring that all barriers hindering successful development and transfer are targeted. Furthermore, to stimulate technology development and transfer beyond current levels, the results of the mapping point to the necessity of articulating and presenting opportunities, beyond a discussion of technology hardware and financing, including revisions in related policy and the broader regulatory enabling frameworks. This further leads to private investors, technology suppliers and consumers being key actors that governments and state agencies must engage with to create, steer and scale up markets for technologies.

5.   This event will focus on discussing experiences and identifying future activities to accelerate enablers for technology development and transfer.

B.   Agenda

1.   Opening and rationale

6.   Including an overview of enabling framework conditions identified in NDCs, TNAs and CTCN Technical Assistance (presentation by the TEC)

(a)   Session I: Support

7.   This session discusses how current support relate to the enablers identified by Parties and presented in the draft paper on enabling environments and challenges, as necessary conditions for technology development and transfer. The session further elaborates on what the opportunities are for accessing further support to accelerate and enhance enablers.

8. Presentations by the operating entities of the Financial Mechanism, CTCN, donors, the Technology Bank for LDCs,[1] other development finance institutions.

(b) Session II: Experience sharing

9. Senegal: Government has taken proactive steps to a wider uptake of climate technologies such as establishing a feed-in tariff system for renewable energy technologies.

10. Ghana, Kenya, Mauritius and Namibia: The CTCN Technical Assistance 'Green Cooling Africa Initiative' identifies the most suitable green refrigeration and air conditioning technologies and develops supportive policy measures for technology transfer.

11. Private sector representatives (e.g. Thyssenkrupp): examples of how it operates in developing countries and what the needed actions are to a) create enabling policy and regulatory environments that help facilitate private climate investments in developing countries, and b) ensure implementation of working solutions and not just building plants and equipment.

12. Civil society, NGOs, youths: provides examples from micro loan programmes, capacity building initiatives etc.

(c) Session III:

13. Participants gathered in small groups will share experiences, discuss and consider how to accelerate enablers for climate technology development and transfer in developing countries for achieving the goals of the Paris Agreement. Specific questions for each group will be distributed.

14. The breakout groups will report back to the plenary and there will be an open discussion with all participants to identify means to accelerate creation of enabling framework conditions for climate technology development and transfer in developing countries.

(d) Closing

15. TEC.

---

[1] https://unohrlls.org/technologybank/.