Technology Executive Committee
Special event on innovation and climate change
Summary note

I. Introduction

A. Background

1. As part of its workplan, the Technology Executive Committee (TEC) decided to hold a special event on how technological innovation can support the implementation of nationally determined contributions (NDCs) and mid-century strategies. The event would build on the TEC's previous work on innovation[1] and the adoption of the Paris Agreement. It decided to hold the event during the United Nations Climate Change Conference in May 2017. The TEC requested its taskforce on innovation and research, development and demonstration to organize the event.[2]

B. Scope of note

2. This note summarizes the proceedings and discussions of the special event.

C. Possible action by the Technology Executive Committee

3. As decided at its 14th meeting, the TEC may consider this note as it prepares its TEC Brief and key messages and recommendations to COP 23 on innovation and research, development and demonstration. It may also take this into account as it considers further activities on this issue as part of its current or future workplans.

II. Overview

4. The TEC held the special event on Friday 12 May 2017 at the World Conference Centre Bonn in Germany. The event was open to all participants registered to attend the United Nations Climate Change Conference in May 2017, with more than 100 participating. This included TEC members, the Chair and Vice-Chair of the Advisory Board of the Climate Technology Centre and Network (CTCN), and the CTCN Director. It also included representatives of governments, United Nations agencies, intergovernmental organizations, non-governmental organizations, the private sector and academia, and invited expert

[1] See: http://unfccc.int/ttclear/tec/impact.html.
[2] Taskforce membership may be found here: http://unfccc.int/ttclear/tec/members.html

speakers. Stakeholders also participated in the event virtually by following the live webcast and commenting online through Twitter. Mr. Zitouni Ould-Dada, Head of the Technology Unit, United Nations Environment Programme, moderated the event.

5. The event aimed to:

(a) Describe technological innovation and outline the capacities required to nurture an effective innovation process;

(b) Analyze and highlight the key role that innovation policy and international cooperation on innovation can play in accelerating the implementation of NDCs and mid-century strategies in developing countries;

(c) Showcase experiences, good practices and lessons learned from previous efforts relevant to developing countries;

(d) Identify the following, to accelerate the implementation of NDCs and mid-century strategies:

(i) Innovations with high potential in developing countries;

(ii) Innovation policies and international cooperation on innovation that can be established, strengthened and/or implemented;

(iii) Possible financing models for innovation that can support developing countries.

6. The event had four main sessions:

(a) Session I: Keynote speakers

(b) Session II: National efforts to stimulate climate tech innovation

(c) Session III: Sectoral tech innovation enhancing climate action

(d) Session IV: Plenary discussion

7. On the event format, the TEC used a setup which promoted dialogue and interaction. It encouraged the invited experts to speak without slides or with a minimal amount of them. It also allocated significant time for prolonged question and answer sessions. In addition, the TEC screened three videos during the event highlighting the use of innovative climate technologies in concrete developing country settings.

8. Comprehensive information on the event, including a summary video, the webcast recording and speaker slides, are available on the UNFCCC climate technology website, TT:CLEAR: http://unfccc.int/ttclear/events/2017_event2.

III. Summary of discussion

A. High level opening

9. The event was opened by Ms. Wanna Tanunchaiwatana, Officer in Charge of the Finance, Technology and Capacity-Building Programme of the United Nations Climate Change Secretariat.

10. Ms. Patricia Espinosa, Executive Secretary of the United Nations Climate Change Secretariat, opened the event. Ms. Espinosa highlighted that climate technologies are already making a difference in the lives of billions of people and shaping the future of social and economic development. She said that the world must scale up and speed up use of these technologies to achieve the vision laid out in the Paris Agreement and the Agenda for Sustainable Development. Climate technology innovation is the foundation on which to build solutions. Through innovation, one can reduce costs of technologies and improve their performance. It can also build global capacity and increase knowledge to bring new technologies from the research labs to the world.

11. H.E. Ms. Ségolène Royal, France, noted that the event is the first in the post Paris era to attend to decisions for implementing the Paris Agreement. Innovation is a key issue for implementing the Agreement, and many initiatives established during COP 21 have a focus on this. She also noted the importance of bringing together innovation on green finance and technology to address global warming.

12. Mr. Michael Rantil, TEC Chair, welcomed all participants and highlighted that the event is part of the Committee's work to respond to mandates from the Paris Outcomes. He noted that so far 145 Parties have submitted their NDCs and six Parties mid-century strategies. In these documents, many countries note their technology needs, opportunities and challenges. Technological innovation is key for addressing these challenges and climate change, as it is through this process that countries develop and implement climate solutions.

B. Session I: Keynote Speakers

13. Session I featured high-level speakers who considered the importance of technological innovation for addressing climate change.

14. Mr. Youba Sokona, Vice-Chair of the Intergovernmental Panel on Climate Change, stressed that based on science the window of opportunity for achieving a 2 degree Celsius rise in global warming is rapidly closing. For this we need to stabilize emissions and reduce carbon intensity. And this involves radically changing the mix of technologies used to produce and consume energy. He highlighted a study on NDCs which found that many developing countries emphasized the need to remove technological barriers for meeting commitments. But there is not a one-size fits all approach for addressing these challenges. It requires building innovation systems in multiple dimensions at multiple levels. To achieve this, Mr. Sokona highlighted four priorities:

(a) System leadership, that catalyses collective leadership in the vision to build institutions, invest in future technologies and build capacity to manage knowledge institutions;

(b) Institutions, laws and political space that will allow the innovation system to flourish;

(c) Human, organizational and financial resources. He stressed that finance should come from a variety of sources, including both domestic and external. Some financing should come from a country's budget to develop national ownership.

(d) Balancing short term and long-term interests. There is a tension between the two, as innovation systems cannot be built overnight. There thus needs to be a balance between the short-term imperative of devoting resources for immediate needs, and long-term issues related to the climate and development.

15. Mr. Anders Wijkman, Co-President of the Club of Rome, noted that the role of innovation for reducing greenhouse gases is crucial. He stressed that for too long incrementalism has been guiding efforts. With the challenge of moving to zero emissions in 2050, the world need transformative change. In the European Union, an effective policy environment has led to some success in reducing emissions in the power sector. Yet there is not a similarly conducive policy environment in other areas such as agriculture, manufacturing and materials. For the necessary innovation to happen in these areas we need regulations and incentives, with finance also important. He concluded that the following is needed for transformative innovation to happen:

(a) Systems approach, which moves beyond focusing on individual technology areas;

(b) Focus on both hardware and software, with innovation not only on technologies but also on business models;

(c) Institutions;

(d) Rules and regulations;

(e) Convening of stakeholders;

(f) Metrics, to better understand climate risks and impacts of innovation.

16. Ms. Katherina Tomoff, Vice-President of Shared Value, Deutsch Post DHL Group, spoke of the company's aim to achieve net zero greenhouse gas emissions by 2050. She highlighted the various measures it is undertaking to achieve this target, including developing its own electric delivery vehicles. The company would welcome regulations which gives incentives to leading companies to innovate and stay competitive. Yet, she said it is important for industry and policy-makers to work together to develop policies, to ensure the desired outcome is achieved.

17. Mr. Bruce Campbell, Director, CGIAR Research Programme on Climate Change, Agriculture and Food Security, was the session's final speaker. He highlighted the key role of technological innovation in building resilience and reducing emissions in the agricultural sector. He highlighted examples of innovation in this sector, including that of rural Kenyan farmers using mobile phones for buying seed insurance. This has significantly reduced costs of insurance. He highlighted that to enhance agricultural innovation CGIAR uses a 'three thirds' approach. The first step involves working with stakeholders to understand the problem they need to address. Secondly, research is undertaken with these stakeholders, often in partnerships. The third step involves disseminating the research through creative communication approaches, capacity-building, and by working with farmers and other stakeholders to use the research products.

18. In the following discussion, participants raised questions including: the role of external and domestic finance for innovation; how to balance technological innovation for mitigating and adapting to climate change; the role of specific technologies for addressing climate change; how to build capacity for developing countries to undertake technological innovation activities; and of the role the private sector plays in climate innovation efforts.

19. The panellists, in responding to these questions, noted the following. Both external and domestic finance may be necessary for effective innovation efforts. Domestic financing may play a key role in developing local ownership and facilitating a credible and sustainable innovation process. Technological innovation is needed to scale up and speed up both mitigation and adaptation responses to climate change. 'Smart regulation', which stimulates and provides incentives to low-carbon and climate-resilient innovation, is required in all sectors, not just the power sector. Furthermore, the private sector must play a key role in climate action. Policies must incentivize those private sector actors who want to play a role in the transformative change. Finally, there is a need to close the gap between the needs of those who want to invest in innovative solutions and those who are undertaking innovation activities.

C. Session II: National efforts to stimulate climate tech innovation

20. Session II focused on efforts to stimulate climate tech innovation on a national (cross-sectoral) level. At the start of the session a video showed an innovative technology for mapping rising sea levels: 'Drones, Data and Rising Sea Levels in the Maldives.'[3]

21. Mr. Ajay Mathur, Director General of the Energy and Resources Institute, gave the first intervention. He said that for implementing NDCs we cannot wait for entrepreneurs to produce products, find finance and develop marketing chains. This will happen but it takes time. He argued that it is important to create demand pull for innovative climate technologies in addition to technology push. To achieve this there is a need for specifications and testing laboratories that can help innovative products be produced and consolidated in a market. In addition, Mr. Mathur said domestic public-private funds may play a key role in supporting higher risk investments in the innovation of new climate technologies. Finally, Mr. Mathur said that there is not a one-size-fits-all approach to enhancing technological innovation.

22. Mr. Edward Mungai, Chief Executive Officer of the Kenya Climate Innovation Centre, noted there are opportunities for climate innovation, especially local market-based solutions. He highlighted his centre's experience, that in three years they have received more than 3000 ideas and 70 of these are now market products addressing climate change. Thus, one should think of climate change as an opportunity, especially for the private sector. He also noted that in undertaking climate technology innovation one should begin with the end in mind: what is the desired result? By focusing on this, technologies may address multiple issues and deliver significant co-benefits. He said a key issue was on understanding how businesses can scale products for broad diffusion. To achieve this, governments must provide incentives through policies and regulations. Furthermore, in his experience financing is available. The challenge is to develop innovative financing instruments that support innovation actions. For example, he said proof of concept, green bonds and seed financing are needed to help businesses attend to the challenges of scaling. In developing demand pull, it is also important to create awareness amongst consumers, including local communities, of the climate and developmental benefits of using clean technologies.

23. Miguel Ángel Blesa, Secretary of Planning and Policy, Ministry of Science and Technology, Argentina, was the final speaker. He described Argentina's economic, social and environmental attributes and the impact of climate change on the country. He highlighted the need to strengthen cooperation and articulation of action between Argentine ministries to respond to climate change. Furthermore, they have identified strengthening national research and development capabilities to address science and technology needs as key for addressing climate change. He concluded by noting that the CTCN could support Argentina to build its capacity, including through actions at the regional level.

24. In the discussion, participants asked, inter alia: how to incorporate indigenous knowledge into the innovation process; how to incorporate user experience into product design; how to facilitate cross-border innovation; and the role of the Technology Mechanism and international collaboration in accelerating climate action in developing countries.

[3] United Nations Development Programme: https://youtu.be/VmddGrg5kHQ

25. In responding to the questions the panellists noted the following. To address climate change there is a need to undertake innovation on finance, business models and other areas as well as technology. Technology is only one part of a large array of social, political and economic factors that make up an innovation system. In this vein, innovative business models which can help translate the ideas of individuals and small- and medium-size enterprises into market products can facilitate climate action and the development of sustainable livelihoods. Once ideas are developed into market products, another challenge is to bridge the gap between small scale and wider diffusion. Technology pull (as well as innovative business models) can play a key role here. Thus, as well as working on technology push, some participants suggested that the TEC could explore how countries can strengthen the demand pull of climate technologies.

D. Session III: Sectoral tech innovation enhancing climate action

26. Session III highlighted climate tech innovation efforts in specific sectors. At the start of the session a video showed an innovative technology for providing off-grid electricity: 'SolarCity and Tesla: Ta'u Microgrid.'[4]

27. Mr. Joshua Romisher, Vice President of Corporate Finance, Off-Grid Electric Tanzania Limited, said the company aims to power off-grid homes across Africa through renewable energy. It provides solar home systems to homes and businesses in rural communities through an innovative financial product. Since beginning in 2012, Off-Grid Electric has 125,000 customers and works in five African countries. But the company is not yet profitable and relies on the support of angel investors and public and multilateral finance. Scalability is a key issue: Off-Grid Electric has 125,000 customers in Tanzania but estimates that 6 million homes could use its products. The challenge is to identify innovative financial and business models that will facilitate replicability and scalability in different country settings. They believe that public funds, multilateral assistance, and engaging with local partners will play important roles in supporting them to bridge issues of scalability.

28. Mr. Glenroy Brown, Climate Service Specialist of the Jamaican Meteorological Service, described a seasonal drought forecasting system that they developed to help local farmers predict weather conditions. A key challenge was to work with the stakeholders to address their needs and incorporate indigenous knowledge related to weather prediction and farming methods. They worked with farmers to develop the system and then trained 1000 farmers and extension officers to use it. Following the training, the tool has helped to substantially reduce losses due to drought amongst those using it. The tool is now used throughout the Caribbean and Central America. They are now working to further develop the system with farmers and national authorities.

29. Mr. Masaaki Okabe, Leader at the Asahi Glass Co., Japan, noted that as buildings have long lifetimes, their design and the materials used in their construction can have energy usage impacts in the long-term. For example, buildings lose 70 per cent of their heat through windows. This loss, compacted over a long lifetime, can result in significant economic and environmental costs. Energy efficiency measures in buildings can thus have positive long-term effects. To this end, Asahi has developed a glass which filters out 75 per cent of solar

[4] SolarCity. https://www.youtube.com/watch?v=VZjEvwrDXn0

heat. Mr. Okabe also referred to other innovations developed by the company. They have developed a solar power generation technology which can replace flat glass. They have also developed heat-shielding road surfaces which reduce absorbed heat.

30. Ms. Xiaomei Duan, Technical Director of the Far East BRT Planning Co., Ltd., China, was the final speaker. She described bus rapid transport projects in China, other Asian countries and Africa. If implemented effectively, bus rapid transport systems increase mobility, residency satisfaction and air quality. Key to replication is: knowledge sharing; political support; demonstration projects; the prioritization of public transport; and effective traffic demand management. She highlighted that in many Asian and African cities there is political will to improve public transportation. What is lacking are plans on how to act upon this political will and put in place high-quality, high-capacity bus rapid transport systems.

31. In the following discussion, participants asked, inter alia: what the barriers to replication are; how governments can assist with policies and laws to create positive enabling environments for technology diffusion; and how to address the needs of stakeholders resistant to change. In responding, the panellists noted that technology replication and scaling-up requires engaging with local partners who can facilitate government buy-in, local financial support and customer awareness. Demonstration projects also play a key role in facilitating government buy-in and building customer awareness. Furthermore, a technology may need to be modified to suit local conditions. Demonstration projects that incorporate local knowledge can play a key role in achieving this.

E. Session IV: Plenary discussion

32. Session IV consisted of plenary discussions around three key questions. At the start of the session a video showed an innovative technology for early warning systems: 'UNEP CLIMWARN Project in Kenya on Early Warning Systems.'[5]

1. How can we nurture innovation in countries, enhancing the implementation of nationally determined contributions and mid-century strategies?

33. Mr. Ajay Mathur led the discussion on this question. He noted that new low-emission and climate-resilient technologies present large opportunities for moving to a sustainable future. Through their NDCs, countries have indicated that they will need to use such technologies at scale to meet their contributions. He asked the audience to share experiences in successful climate technology innovation activities. He also asked them to identify key factors that made those experiences successful.

34. Participants noted that to nurture innovation in countries the following elements could be important: demonstration projects; clear business models; political leadership and buy-in; policies and regulations; innovative financing; local ownership; financial commitment from local partners; personal and organizational commitment; and the use of innovative technologies as tools for scaling up and replication (such as mobile phones). It was also noted that there is value in sharing knowledge and learning in both directions between developed and developing countries. For instance, developing countries have rich experience in community involvement and work on decentralized systems.

[5] United Nations Environment Programme. https://www.youtube.com/watch?v=waUXps5QV40

2. How can international cooperation accelerate climate technology innovation efforts in countries, enhancing the implementation of nationally determined contributions and mid-century strategies?

35. Ms. Ellina Levina, Senior Climate and Energy Policy Analyst of the International Energy Agency (IEA), led the discussion on this question. She noted that since 1974 the IEA has promoted collaboration on energy technology innovation with the understanding that collaboration helps accelerate deployment, bring new ideas and share information. IEA has 39 technology collaboration programmes on different energy technologies which draw on the participation of 6000 experts, 300 institutions and 52 countries. She stressed that in IEA's experience most funds for innovation come from the public sector. They are thus exploring how to further engage the private sector in energy innovation activities. She also said that while developing country participation in the technology collaboration programmes was growing, most participants were developed countries. The IEA would like to understand what capacity countries need to take part in international technology collaboration programmes. Finally, she noted that the IEA would like to understand how to further integrate the existing support tools and technology collaboration initiatives to better serve countries in performing technology development and transfer. This includes existing funds (such as the Green Climate Fund), technical resources (TEC and CTCN) and existing collaboration programmes (such as the IEA programmes).

36. Participants noted inter alia: the convening power and key role that universities may play in international collaborative innovation efforts; existing successful bilateral efforts (e.g. the United States of America with India) and regional ones (e.g. European Union); the need to avoid developing new collaborations which duplicate existing ones; the lack of local capacity and knowledge in developing countries to participate effectively in collaborative innovation initiatives; and non-traditional public-private-private forms of collaboration which have demonstrated success.

3. How can the UNFCCC process and its constituted bodies accelerate climate change technology innovation efforts in countries, enhancing the implementation of nationally determined contributions and mid-century strategies?

37. Mr. Jukka Uosukainen, CTCN Director, led discussion on this question. He described the CTCN's delivery of its three core services and its work related to innovation. On this, the CTCN, inter alia, has 70 research institutes as network members, is participating in the TEC special event, and will hold a workshop on first-of-a-kind technologies.[6] It will also take part in the Global, Science and Innovation Conference in October 2017 organized by the Belgium Vlaamse Instelling Voor Technologisch Onderzoek. Mr. Uosukainen then invited participants to consider how the TEC and CTCN could enhance their roles.

38. In the following discussion, participants noted the following. They discussed the types of flows involved in technological innovation and transfer processes. It may be helpful for developing countries to share knowledge on good practices and lessons learned from in-country concrete experiences (South-South flows). This may complement the flows of financial and technological support between the international community and developing countries (North-South flows). Participants also highlighted: the value of regional requests to the CTCN; the value of the CTCN's network in facilitating knowledge sharing; the value of empowering nationally determined entities; and how to build effective national and regional networks with academia to generate innovation-related requests to the CTCN.

F. Summary, way forward and closing

39. In closing, the TEC Vice-Chair, Ms. Duduzile Nhlengethwa, reflected on the day's discussions. She noted that for countries to achieve their NDCs and mid-century strategies there is a need to shift from an incremental approach to one that effects transformational change. Yet there is no one-size-fits-all solution as all countries are different. To achieve transformational change, technological innovation will be key. It is thus important to focus on enhancing the innovation system, with consideration of how all actors take part in the

[6] https://www.ctc-n.org/calendar/events/ctcn-scoping-workshop-supporting-first-kind-climate-technology

innovation process. She noted that participants highlighted that innovation goes beyond technology to finance. Finance has an important role to play in ensuring that innovative technologies are widely diffused. She also highlighted the importance of policies, innovative communication, business models and technology demonstration activities. Facilitating North-South and South-South knowledge and technology transfers is also a key element of an effective innovation process. This had led participants to ask how to promote collaborative research involving developing countries. Finally, she highlighted that innovation cuts across all sustainable development goals. It is thus important to take this big picture focus when advancing innovation efforts.

IV. Issues for possible further consideration

40. As noted in paragraph 3 above, in 2017, as part of the implementation of its workplan, the TEC will prepare a TEC Brief and key messages and recommendations to COP 23 on innovation and research, development and demonstration. It decided to prepare these drawing on the special event on innovation and a TEC technical paper on enhancing the financing of research, development and demonstration of climate technologies.[7] In undertaking these activities, the TEC may wish to consider the following information extracted from interventions during the special event.

41. As Mr. Sokona identified, there is an inherent short-term and long-term tension in enhancing innovation for the implementation of NDCs and mid-century strategies. On the one hand, NDCs are more short-term in focus and often have aims linked to 2025 or 2030. On climate technology innovation, the challenge that countries face is thus more related to facilitating the rapid and wide-scale deployment of mature technologies or technologies that are close to market maturity. As noted by Mr. Mathur, Mr Mungai and Mr. Romisher, amongst others, what actions can be taken to facilitate technology pull, to support the scaling and replication of these technologies in different local, national and regional contexts? As raised by many participants, how can innovative financing and business models support this? In addition, as noted by Mr. Wijkmann and Ms. Tomoff in particular, what smart regulations and policies can provide incentives for public and private actors to engage in these activities?

42. On the other hand, mid-century strategies are by definition more long-term in focus and thus present a different set of questions with regards to enhancing technological innovation for addressing climate change. In this context, the focus is on exploring how to catalyse transformational change. For this, as noted by various participants, the challenge that countries face is on how to build national systems of innovations that nurture

[7] http://unfccc.int/ttclear/docs/TEC_RDD%20finance_FINAL.pdf

transformational technological innovation. Questions arise such as, as raised by Ms. Levina, how can we strengthen the capacity of actors and institutions to facilitate and participate in national, regional and international processes of innovation? As other participants noted, how can we consolidate effective transfer of knowledge flows in South-South, North-South and South-North directions? Furthermore, as Mr. Campbell noted, how can we effectively involve all stakeholders in the process, and as Mr. Mungai said, incorporate local and indigenous knowledge? Finally, part of this puzzle is in understanding how we may facilitate effective domestic and external financing which develops national ownership whilst addressing climate and development needs.

43. In conclusion, enhancing technological innovation efforts for implementing NDCs and mid-century strategies is complex and multi-dimensional, related to two intertwined focuses of short- and long-term. But this complexity should not be a deterrent to action. As Mr. Mungai noted, climate change should be seen as an opportunity. And indeed, Mr. Romisher, Mr. Brown, Mr. Okabe and Ms. Duan presented innovative technologies which are supporting countries to address development issues while at the same time reaping climate and other co-benefits. Mr. Uosukainen highlighted the CTCN's efforts to also support developing countries in these endeavors. But these examples are only a beginning, and highlight that the road to achieving the vision laid out in the Paris Agreement and the Agenda on Sustainable Development will not be straight forward. However, while there may not be a one-size-fits-all approach for achieving this, the desired outcome is shared by all.