Technology Executive Committee

24 August 2021

Twenty-third meeting

Virtual meeting, 7-10 September and 13 April 2021 (TEC-CTCN Joint session)

Compilation of good practices and lessons learned of setup and implementation of national system of innovation

Concept note

I. Background

1.   The technology framework adopted in Katowice in December 2018 identifies among actions and activities to be implemented by the TEC in the area of innovation the following:

(a)   Supporting countries in incentivizing innovation by improving the policy environments, strategies, legal and regulatory frameworks, and institutional arrangements for establishing and/or strengthening their national systems of innovation (NSI).[1]

2.   In incorporating the technology framework guidance into its rolling workplan for 2019-2022, the Technology Executive Committee (TEC) agreed to explore the setup of NSI in different countries and regions and analyse ways to incentivize innovation of mitigation and adaptation technologies. This is activity 1 of the area of innovation under the rolling workplan.[2]

3.   The activity builds on previous work of the TEC, including on climate technology incubators and accelerators.

4.   The final outputs of this activity are:

(a)   A compilation of good practices and lessons learned of NSI setup and implementation;

(b)   Recommendations on how to incentivize innovation and/or an update of the TEC brief on NSI.

II. Purpose

5.   This concept note aims to provide information for the TEC to provide guidance on the development of the compilation of good practices and lessons learned of setup and implementation of NSI.

6.   The information contained in this note is based on a brief literature review and inputs receive from members of the innovation task force. The note provides basic information on:

(a)   Concept of NSI;

(b)   Previous work of the TEC on NSI;

(c)   Elements and questions that may guide TEC's considerations on the development of the compilation.

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[1] Decision 15/CMA.1.
[2] https://bit.ly/3Aimemw.

III. Possible action by the Technology Executive Committee

7. The TEC will be invited to consider the concept note and provide guidance to the innovation task force for the development of the compilation.

IV. Concept of national system of innovations

8. The concept of NSI rests on the premise that understanding the linkages among the actors involved in innovation is key to improving technology performance. Innovation and technical progress are the result of a complex set of relationships among actors producing, distributing and applying various kinds of knowledge. The innovative performance of a country depends to a large extent on how these actors relate to each other as elements of a collective system of knowledge creation and use as well as the technologies they use. These actors are primarily private enterprises, universities and public research institutes and the people within them. The linkages can take the form of joint research, personnel exchanges, cross-patenting, purchase of equipment and a variety of other channels.

9. There is no single accepted definition of a NSI. A NSI has been defined in various ways, as follows:

(a) " .. *the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies.*" (Freeman, 1987);[3]

(b) " .. *the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state.*" (Lundvall, 1992);[4]

(c) "... *a set of institutions whose interactions determine the innovative performance ... of national firms.*" (Nelson, 1993);[5]

(d) " .. *the national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country.*" (Patel and Pavitt, 1994);[6]

(e) ".. *that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies.*" (Metcalfe, 1995).[7]

10. The TEC brief "Strengthening national system of innovation to enhance climate action on climate change" states that an NSI consists of:

(a) **Actors**: organizations that participate in technology development and transfer, e.g. technology firms, universities and financiers;

(b) **Institutional context**: norms, cultural practices and laws that shape actor efforts, e.g. government policies that affect how the private sector invests in a particular sector;

(c) **Linkages**: Interactions and relations between the actors and the institutional context, e.g. flows of information and knowledge, and collaboration between firms, universities and research institutes

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[3] Freeman, C. (1987), Technology and Economic Performance: Lessons from Japan, Pinter, London.

[4] Lundvall, B-Å. (ed.) (1992). National Innovation Systems: Towards a Theory of Innovation and Interactive Learning, Pinter, London.

[5] Nelson, R. (ed.) (1993), National Innovation Systems. A Comparative Analysis, Oxford University Press, New York/Oxford.

[6] Patel, P. and K. Pavitt (1994), "The Nature and Economic Importance of National Innovation Systems", STI Review, No. 14, OECD, Paris.

[7] Metcalfe, S. (1995), "The Economic Foundations of Technology Policy: Equilibrium and Evolutionary Perspectives", in P. Stoneman (ed.), Handbook of the Economics of Innovation and Technological Change, Blackwell Publishers, Oxford (UK)/Cambridge (US)

11.   For policy makers, an understanding of the national innovation system can help identify leverage points for enhancing innovative performance and overall competitiveness. It can assist in pinpointing mismatches within the system, both among institutions and in relation to government policies, which can thwart technology development and innovation.

V.   Previous work of the TEC on national systems of innovation

12.   The TEC started its work on NSI in 2014 with the organization of the **workshop "Strengthening national systems of innovation in developing countries, covering the entire technology cycle for climate technology"**.[8] The aim of the workshop was to identify policy interventions that could strengthen NSI in developing countries to enhance climate technology development and transfer. Key outcomes of the workshop are:

(a)   A strong NSI creates an environment which stimulates enhanced climate technology development and transfer. It has a key role in stimulating economic growth;

(b)   Technologies are developed and transferred by human beings. Education and training which develops a skilled human capital is central to strengthening a NSI;

(c)   The national government has a central role to play in strengthening its NSI. This role may include coordinating, promoting and overseeing the NSI at the national level. These activities support the development of a structured and coherent NSI that functions in accordance with national priorities;

(d)   An effective NSI is dependent on strong linkages between key stakeholders at the local, national, regional and international level.

13.   To further elaborate on the workshop outcomes, the TEC produced in 2015 the **policy brief "Strengthening national systems of innovation to enhance action on climate change"**.[9] The brief outlines the state of NSI in developing countries and highlights how developed countries and the international community may work together to support these countries in strengthening their NSI, enhancing both national climate action and sustainable development.

14.   Further to the policy brief, in 2015, the TEC also produced **key messages and recommendations to Parties** on NSI,[10] which *inter alia* encourage organizations and all relevant stakeholders to undertake analyses to develop an enhanced understanding of the state of play of developing countries' NSIs and to enhance the sharing of experiences, good practices and lessons learned from initiatives supporting the strengthening of developing countries' NSI.

15.   The key role play by NSI in fostering technology development and transfer has been further stressed in other works of the TEC that analysed how we can accelerate and scale up technological innovation in order to achieve the purpose and goals of the Paris Agreement and the Sustainable Development Goals. The outcomes of this work are reflected in a series of publications on topics such as enhancing financing of technology research, development and demonstration as well as incubators and accelerators for climate technologies.[11,12]

16.   The work on incubators and accelerators underlined that the entrepreneurial ecosystem and its support for new ventures and existing ventures generating and diffusing climate technologies rests on the foundation of the broad institutional foundation in a country. This institutional foundation includes NSI, which are important contributors to the entrepreneurial ecosystem. This is important to note, because attempts to strengthen the entrepreneurial ecosystem will depend on the broader NSI.

17.   Recent findings on NSI were obtained through the three surveys that the TEC conducted to capture information on needs, gaps, enablers, challenges, and measures to develop and enhance endogenous capacities and technologies. The surveys asked about the extent to which institutional and organizational issues, including policies, programmes, and organizational structures, can

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[8]   See https://unfccc.int/ttclear/events/2014_event5.

[9]   https://bit.ly/3xsOAZe

[10]   http://unfccc.int/resource/docs/2015/sb/eng/01.pdf#page=25

[11]   https://unfccc.int/ttclear/docs/TEC_RDD%20finance_FINAL.pdf

[12]   https://unfccc.int/ttclear/incubators/

enhance enabling environments. Respondents cited challenges relating to research or innovation systems, lack of country encouragement for development of technologies, and lack of research or support for research, development and demonstration of climate technologies. The report concluded *inter alia* that the findings of the study should feed into the future work of the TEC on NSI since endogenous capacities are crucial building block to creating an effective NSI.[13]

VI. Possible elements of the compilation and next steps

18.   In considering the development of the compilation of good practices and lessons learned of setup and implementation of NSI and taking into consideration the information provided in the sections above, the TEC may wish to consider the following guiding questions:

(a)   What should be the overall objective of the compilation? What information should the compilation eventually provide to policymakers and other relevant stakeholders?

(b)   What principles should guide the development of the compilation and the identification of the case studies (e.g. regional distribution balance, mitigation adaptation balance, implementation status of NSI, etc.)? How many case studies should be identified?

(c)   Should the compilation have any particular focus (e.g. sectoral focus, LDCs and SIDS focus, etc.)?

(d)   What particular elements should be considered by the analysis of the case studies (e.g. institutional context, public and private actors' involvement, linkages between actors, etc.)?

(e)   What criteria and indicators should be used to assess the innovation capacity of the identified NSI? Should the TEC explore criteria elaborated in this regard by other organizations (e.g. UNIDO, OECD, etc.)?

19.   The TEC may also like to consider whether to gather inputs and additional information on NSI by means – for example - of a call for inputs or a thematic dialogue, before proceeding with the development of the compilation. This may include reaching out to national designated entities and outlining their role in the respective NSI.

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[13] See https://unfccc.int/ttclear/endogenous/index.html.