

## Eleventh meeting of the Technology Executive Committee

United Nations Campus (AHH building), Bonn, Germany  
7-11 September 2015

### Background note

## Possible work of the Technology Executive Committee on climate technology innovation indicators

### I. Introduction

#### A. Background

1. As part of its 2014-2015 rolling workplan, the Technology Executive Committee (TEC) agreed to initiate consideration of further work on enabling environments and barriers, taking into account the outcomes of the workshop on national systems of innovation (NSI).<sup>1</sup> The TEC decided to undertake this activity in the second half of 2015.

#### B. Scope of the note

2. This note summarizes outcomes relevant to the TEC from three recent TEC activities on NSIs. It then outlines guiding questions that may support the TEC to identify further work on enabling and barriers, taking into account the outcomes of the NSI workshop.

#### C. Possible action by the Technology Executive Committee

3. Drawing on the information contained in this note, the TEC may wish to:
- Agree on any follow up action arising from the background note;
  - Determine any further work on enabling environments and barriers that could be considered as possible elements for the rolling workplan of the TEC for 2016-2017.

### II. Possible work on climate technology innovation indicators

#### A. Outcomes of the workshop on national systems of innovation

4. The TEC's *Summary of the workshop on national systems of innovation of the TEC*<sup>2</sup> notes that strengthening NSIs for climate technologies in both developing and developed countries is key to enhancing national and international action on climate change.<sup>3</sup> It further notes that a strong NSI creates an environment which stimulates enhanced climate technology development and transfer.<sup>4</sup> The summary highlights that there is an urgent need to support NSI strengthening and create breakthrough innovations in both developing and developed countries, to ensure that Parties achieve the ultimate objective of the Convention.<sup>5</sup>

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<sup>1</sup> Activity 4.2 of the workplan. See <<http://goo.gl/1Ihr98>>.

<sup>2</sup> Document TEC/2015/10/9, see <<http://goo.gl/VNUoYf>>.

<sup>3</sup> TEC/2015/10/9, paragraph 62.

<sup>4</sup> TEC/2015/10/9, paragraph 63.

<sup>5</sup> TEC/2015/10/9, paragraph 85.



5. With regards to possible follow up actions by the Technology Mechanism, the summary notes that the Technology Mechanism may have a role in identifying gaps which need to be addressed to promote collaboration between all actors supporting the strengthening of developing country NSIs. It could also showcase the challenges, good practises and lessons learned of different countries and regions with regards to NSIs.<sup>6</sup>

## B. Draft TEC Brief on national systems of innovation

6. The draft TEC Brief on NSIs<sup>7</sup> examines the state-of-play of developing country NSIs. It also highlights measures that may be taken by national actors, the international community and the Technology Mechanism to support enhanced NSI strengthening. While still a draft, the brief's highlight section notes that, i.e.:

- (a) "There is a need to conduct further analysis on the state of NSIs in developing countries. The Technology Mechanism and key stakeholders are encouraged to play significant roles in developing an enhanced understanding of the state-of-play of the NSI of developing countries."
- (b) "There is the need to enhance the sharing of experiences, good practices and lessons learned from initiatives supporting the strengthening of developing country NSIs. The Technology Mechanism and other key stakeholders are encouraged to enhance efforts to communicate such experiences, good practices and lessons-learned."

## C. Submission of the Global Innovation Index to the Technology Executive Committee

7. At TEC 10, the TEC task force on enabling environments and barriers invited key organizations to provide information on the state-of-play of climate technology NSIs. It called for this information to support it in drafting a TEC Brief on NSI, in accordance with its 2014–2015 rolling workplan.<sup>8</sup>

8. Following TEC 10, the Global Innovation Index (GII) responded to the TEC's invitation, and its complete input is contained in the annex. On the GI, the *Global Innovation Index 2014* notes that the GI 2014 "uses 81 indicators across a range of themes" and presents a "dataset to analyse for global innovation trends." In its input to the TEC, the GI notes that:

- (a) "We [the GI] propose to identify possible additional indicators ... providing additional data specific to innovation and climate change technologies. To this end we would also propose that there may be value for the TEC in establishing a small virtual working group to further identify and refine such indicators."
- (b) "... the UNFCCC may wish to consider developing some of the GI indicators to provide a framework with a focus on climate change innovation."<sup>9</sup>

9. The GI also provided a table highlighting how these indicators may be developed. An excerpt from the table is included in figure 1.<sup>10</sup>

**Figure 1**  
Possible indicators on climate innovation

GII Pillar	GII Indicator 2014	Possible GII Climate Change Indicator/Suggestion
2. Human Capital and Research Pillar	2.2.2. Graduates in science and engineering	An additional indicator for graduates in environmental sciences/environmental technology studies
	2.3.2. Gross expenditure on R&D, % GDP	An additional indicator breaking this down to include gross expenditure on environmental sciences/technology R&D
4. Market Sophistication	4.2. Investment	An additional indicator pointing at green field or venture capital investment in green technologies.
	4.3. Trade and competition	An additional indicator to show trade in "green technology" goods and services.

<sup>6</sup> TEC/2015/10/9, paragraph 79.

<sup>7</sup> Document TEC/2015/11/12.

<sup>8</sup> Activity 4.1 of the workplan.

<sup>9</sup> Citations are extracted from the original Global Innovation Index input to the TEC. This input is contained in the annex.

<sup>10</sup> The complete table is included in the annex.

### III. Guiding questions

10. In considering further work on enabling environments and barriers, the TEC may wish to consider the following guiding questions:

- (a) What could the TEC do to enhance understanding on the state-of-play of developing country NSIs?
- (b) Could work on climate innovation indicators support such efforts?
- (c) What could the TEC do to identify gaps which need to be addressed to promote collaboration for strengthening developing country NSIs?
- (d) What could the TEC do to enhance the sharing of experiences, good practices and lessons-learned regarding the strengthening of developing countries NSIs?
- (e) Who could the TEC collaborate with on the above efforts?

## **Annex: Input of the Global Innovation Index to the Technology Executive Committee on the state-of-play of national systems of innovation in developing countries**

*Input received May 6 2015.*

### **UNFCCC TEC BRIEF ON NATIONAL SYSTEMS OF INNOVATION**

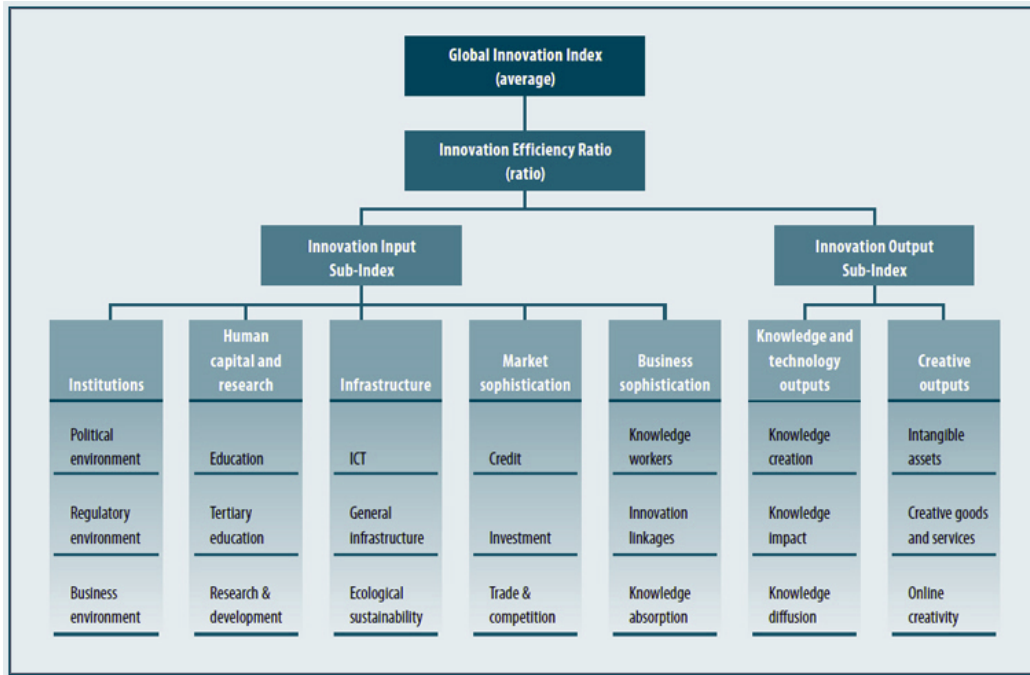
#### **Global Innovation Index Contribution**

##### **I. Introduction**

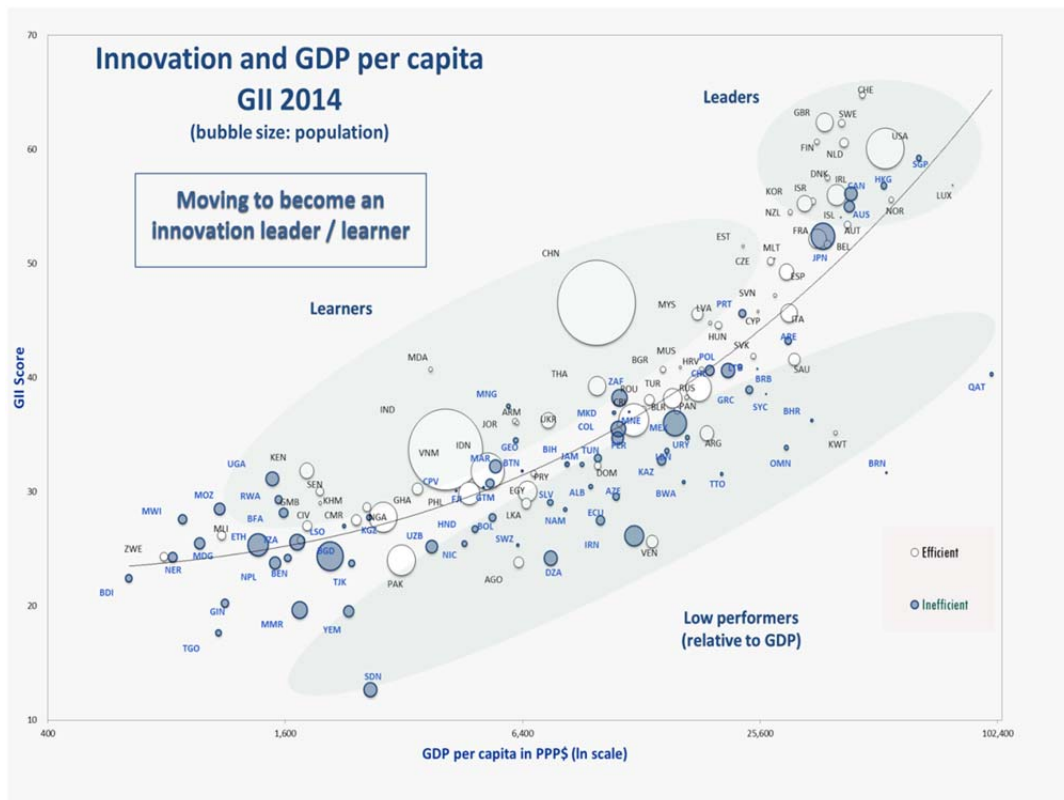
The Global Innovation Index 2014 (GII) is co-published by Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO). The core of the GII Report consists of a ranking of world economies' innovation capabilities and results, covering 143 countries. Over the last seven years, the GII has established itself as a leading reference on innovation. Recognizing the key role of innovation as a driver of economic growth and prosperity, and the need for a broad horizontal vision of innovation applicable to developed and emerging economies, the GII includes indicators that go beyond the traditional measures of innovation such as the level of research and development. The GII provides a tool for assessing the performance of national systems of innovation. It is not specific to a single technology sector but rather looks at the broad range of policies and factors that make up the innovation eco-system. In the case of "climate change technologies" this term in itself covers a potentially very wide range of technologies such as for both climate change mitigation and adaptation. We recommend assessing the innovation system more broadly via the GII, rather than trying to assess particular technologies. The reasons being, firstly, technologies constantly change. Secondly, analyzing an innovation system for particular climate change technologies will often be challenging due to missing data. Finally, analyzing innovation from a sectoral perspective also, in our view, benefits first from an assessment of the national innovation system as the bedrock for specialization in any particular technology area such as "climate change technologies". What we propose below is to use the GII as the basis for that assessment. In a complementary but separate effort, we propose to identify possible additional indicators which complement this by providing additional data specific to innovation and climate change technologies. To this end we would also propose that there may be value for the TEC in establishing a small virtual working group to further identify and refine such indicators. WIPO would be happy to provide input to the work of such a group as many relevant indicators, e.g. Pitchbook data on global venture capital investments in green technologies, have been tested and assessed in the recent years.

##### **II. The GII – measuring and comparing the performance of national innovation systems**

The GII relies on two sub-indices, the Innovation Input Sub-Index and the Innovation Output Sub-Index, each built around pillars. Five input pillars capture elements of the national economy that enable innovative activities: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. Two output pillars capture actual evidence of innovation outputs: (6) Knowledge and technology outputs and (7) Creative outputs. Each pillar is divided into sub-pillars and each sub-pillar is composed of individual indicators (81 in total). Sub-pillar scores are calculated as the weighted average of individual indicators; pillar scores are calculated as the weighted average of sub-pillar scores. The framework is revised every year in a transparent exercise to improve the way innovation is measured.



The 81 indicators enable policy makers to identify areas of strength and weaknesses in their innovation systems and address these with appropriate policy interventions. The greatest value of the GII lies in the ability to benchmark and compare innovation performance with other countries across all 81 indicators. Furthermore, as illustrated in the graph below countries at different stages of development and with different income levels can compare innovation performance against peers. This enables countries to compare practices and identify what works best according to their national circumstances.



**Learners are 20 countries out-performing their peers relative to GDP per capita:** Czech Republic, Republic of Moldova, China, Kenya, Uganda, Mongolia, Viet Nam, India, Jordan, Mozambique, Armenia, Rwanda, Senegal, Malaysia, Malawi, Thailand, Gambia, Ukraine, Burkina Faso and Georgia.

### III. Linking national innovation systems to climate change technologies

An effective national innovation system provides the basis for the development, transfer and diffusion of technologies enabling innovative new approaches to address the challenges of sustainable development. The GII does not use data with specific reference to climate change technologies. However, as discussed at the TEC Workshop in October, the UNFCCC may wish to consider developing some of the GII indicators to provide a framework with a focus on climate change innovation. The table below indicates ways in which this might be done.

<b>GII Indicator 2014</b>	<b>Possible GII Climate Change Indicator/Suggestion</b>
<i>2. Human Capital and Research Pillar</i>	
2.2.2 Graduates in science and engineering	An additional indicator for graduates in environmental sciences/environmental technology studies
2.3.2 Gross expenditure on R&D, %GDP	An additional indicator breaking this down to include Gross expenditure on environmental sciences/technology R&D
<i>3. Infrastructure</i>	
3.3 Ecological Sustainability	An additional indicator to show the ratio of renewable energy use to non-renewable energy use (IRENA/IEA)
<i>4. Market Sophistication</i>	
4.2	An additional indicator pointing at green field or venture capital investment in green technologies.
4.3 Trade and competition	An additional indicator to show trade in "green technology" goods and services.
<i>5. Business sophistication</i>	
5.2 Innovation linkages	1. Indicator on joint ventures around "green" technologies. 2. Indicator on Patent families using the IPC Green Inventory
5.3 Knowledge absorption	Indicator on green technology imports
<i>6. Knowledge and technology outputs</i>	
6.1 Knowledge creation	1. Indicator on green patents filed - using IPC Green Inventory 2. Indicator on scientific publications in the field
6.3 Knowledge diffusion	Indicator on green tech imports (see 5.3 above and also 4.3)