



Technology Executive Committee

07 March 2023

Twenty-sixth meeting

21–23 March and 24 March 2023 (TEC-CTCN Joint session)

Identifying potential areas for future work of the TEC on emerging and transformational adaptation technologies

Background note

I. Introduction

A. Background

1. During the course of its rolling workplan for 2019–2022, the TEC produced a mapping of emerging climate technologies¹ in sectors with potential for climate change mitigation and adaptation, such as energy supply, transport and agriculture, as well as technologies relevant to multiple sectors such as carbon removal and digital technologies. Further to this exercise, the TEC conducted technical work on emerging technologies in the energy supply sector² and transport sector,³ while noting that other sectors may be considered for future work.

2. In 2022, the TEC developed its rolling workplan for 2023–2027,⁴ as part of the joint work programme of the Technology Mechanism.⁵ Since the launch of its rolling workplan for 2023–2027 at COP27, the TEC has engaged with more than 20 potential partners, with a view to facilitating the full and effective implementation of its activities.

3. As per activity A.3.1 of the TEC rolling workplan for 2023–2027, the TEC is to engage with potential partners in 2023 to identify areas for collaboration, with the aim of identifying and analysing emerging and transformational technologies for adaptation (e.g. early warning systems and disaster risk management), including the role of finance and the private sector in supporting their deployment. A related knowledge product is expected to be published in 2024.

4. The Chair and the Vice-Chair of the TEC, on behalf of the TEC, engaged in bilateral exchanges with potential partners, including the VITO as the main organizer of the Global Sustainable Technology and Innovation Community (GSTIC) conference, to seek potential collaboration on this activity.

5. In February 2023, the TEC organized a deep-dive discussion on early warning systems⁶ at the 2023 GSTIC conference, as a scoping activity to gather views of stakeholders and potential partners on its future work on emerging and transformative adaptation technologies, and in particular early warning systems.

B. Scope of the note

6. This note aims to provide an indicative list of potential focus areas for further work of the TEC on emerging and transformational adaptation technologies, informed by previous work of the TEC on emerging climate technologies and the engagement of the TEC with potential partners on

¹ For more information and background see [TEC/2020/21/5](#).

² See the work in the [energy supply sector](#).

³ See the work in the [transport sector](#).

⁴ [TEC rolling work plan 2023–2027](#).

⁵ [Joint Work Programme of the UNFCCC Technology Mechanism for 2023–2027](#).

⁶ More information available on the [event webpage on TT:CLEAR](#).

the topic. This includes the summary of the deep-dive session mentioned in paragraph 5 above, organized by the TEC in collaboration with the UNFCCC Children and Youth Constituency (YOUNGO) at GSTIC Rio, contained in the annex.

C. Possible action by the Technology Executive Committee

7. The TEC will be invited to consider the information presented, and provide guidance for further work on this matter, specifically with regard to:

- (a) Agreeing on a sectoral focus i.e. from the list of options presented in section II.A;
- (b) Defining the topic i.e. from the list of options presented in section II.B;
- (c) Identifying relevant partners for pursuing collaborative efforts.

8. While discussing this matter, the TEC may wish to take into account additional information provided in section II.C.

II. Indicative list of potential focus areas for the TEC work on emerging and transformational adaptation technologies

9. Through the scoping efforts of the TEC, referred to in the background section of this document, a range of emerging and transformational technologies were highlighted as indicative examples of those with high potential for climate change adaptation, for example earth observation and space technologies,⁷ digital transformation technologies including internet of things⁸ and big data, and nature-based and nature-inclusive solutions.⁹

10. Section A and B below provide a number of options to choose from, with regard to sectoral focus and topic of the TEC work on emerging and transformational adaptation technologies. Section C provides additional information to inform the discussions of the TEC on this matter.

A. Sectoral focus

11. The following sectors are identified as suitable options for future work of the TEC on emerging and transformational adaptation technologies,¹⁰ in collaboration with respective partners:

- (a) Agriculture and forestry, which was particularly highlighted in discussions with the Food and Agriculture Organization of the United Nations (FAO) and Group on Earth Observations (GEO) as common areas of interest/work.
- (b) Water resources and coastal regions, which was particularly highlighted in discussions with the International Union for Conservation of Nature (IUCN) and Ocean Visions as common areas of interest/work.
- (c) Cities and human settlements, which was particularly highlighted in discussions with the European Institute of Innovation and Technology Knowledge and Innovation Community (EIT Climate-KIC), the Solar Impulse Foundation and the Adaptation Fund, in the context of transformative locally-led innovation for climate change adaptation.

⁷ Highlighted by the World Meteorological Organization (WMO) and Group on Earth Observations (GEO), among others.

⁸ Highlighted by the Global System for Mobile Communications (GSMA) Foundation, among others.

⁹ Highlighted by International Union for Conservation of Nature (IUCN) and Ocean Visions, among others.

¹⁰ The WIPO's [Green Technology Book 2022 Solutions for climate change adaptation](#), the [Solutions Guide for Cities, An Overview](#) by the Solar Impulse Foundation, the Adaptation Committee's paper on [Technologies for adaptation: innovation, priorities and needs in agriculture, water resources and coastal zones](#), and the UNFCCC Nairobi Work Programme's expert groups were highlighted as useful resources that may inform the work of the TEC on the topic.

B. Topic

12. The following options present potential topics for future work of the TEC on emerging and transformational adaptation technologies:

(a) Continuing the work on early warning systems (e.g. in a sector identified in section II.A.) across one or more pillars of the action plan for early warning for all initiative:¹¹ disaster risk knowledge, observations and forecasting, preparedness and response, and communication of early warnings;

(b) Initiating work on examining emerging technologies in climate services (e.g. in a sector identified in section II.A.), including those powered by digital transformations to advance the accessibility and application of action-able insights for policy-makers and end-users;

(c) Focusing on nature-based and nature-inclusive solutions and systems for transformational adaptation (e.g. in a sector identified in section II.A.).

C. Additional information

13. Additional information that may inform the deliberations of the TEC on defining its future work on Activity A.3.1 of its rolling workplan for 2023-2027 include:

(a) The interest expressed by the GEF and GCF to provide experiences and lessons learned and gain insights from the work of the TEC on transformative financing solutions and accelerating adaptation innovation, including through incubators and accelerators focused on adaptation technologies;

(b) The interest expressed by other UNFCCC bodies and processes to the TEC, including: the suggestion by the Adaptation Fund for potential joint efforts at the Adaptation Futures Conference 2023 (October 2-6, 2023, in Montreal, Canada); the call by the PCCB for contribution to the topic of capacity-building for adaptation, particularly in the context of NAPs; and the interest of the LCIPP FWG for sharing examples and lessons learned from technologies and transformative adaptation practices applied by local communities and indigenous peoples;

(c) Potential linkages to and alignment with relevant UN initiatives and activities, in particular the work the Technology Facilitation Mechanism (TFM), including the Multi-stakeholder Forum on Science, Technology and Innovation for the SDGs (STI Forum). The theme of the STI Forum in 2030, to be held from 3 to 4 May 2023 is: “Science, technology and innovation for accelerating the recovery from the coronavirus disease (COVID-19) and the full implementation of the 2030 Agenda for Sustainable Development at all levels”.

¹¹ The “[Early Warnings for All](#)” initiative was launched by United Nations Secretary-General António Guterres in 2022.

Annex I

Event summary report: ‘Emerging and transformational climate adaptation technologies: A deep-dive into early warning systems’

I. Event information

1. The deep-dive session on ‘early warning systems’¹ was organized by the TEC in collaboration with YOUNGO as part of the GSTIC Rio programme, in continuation of previous engagements of the TEC at the GSTIC conferences. The session was held on February 14, 2023 in the EXPO MAG Convention Center, Rio de Janeiro. The session was conducted in English, webcast through the conference platform, and simultaneously translated to Portuguese and sign language.

2. The session was chaired by the TEC Chair and moderated by a representative of the GSTIC. The speakers (3 female, 2 male) represented a diverse range of perspectives from the national governments (i.e. Belize) and intergovernmental processes at the regional (i.e. the Americas and Caribbean region) and global levels (i.e. under the UNFCCC); local governments (i.e. City of Niterói, Brazil); the private sector (i.e. GSMA Foundation); UN agencies (i.e. WMO) and international organizations (i.e. IFRC); and youth networks and international initiatives. More than 20 experts and practitioners from the GSTIC community participated in the event (60 percent male).

II. Objectives

3. The session aimed to provide an engaging space for exchange of information and views among various stakeholders to shed light on:

(a) Emerging and transformative technologies for advancing Multi-Hazard Early Warning Systems, particularly in the context of the early warning for all initiative;²

(b) Challenges, opportunities, and good practices for the deployment of climate technologies for early warning, including with regarding to financing and scaling up of such technologies; and

(c) Ensuring people-centred and inclusive approaches in deploying technologies for early warnings, including persons with disability, women, children, elderly and other vulnerable groups, leaving no one behind.

4. The TEC also used this opportunity to gather views of stakeholders and potential partners on its future work on the topic, to advance its work under Activity A.3.1 of the rolling workplan for 2023-2027.

III. Highlights and key takeaways

5. The scene-setting presentation, delivered by WMO, provided an introduction to the ‘early warning for all’ initiative and its associated action plan. In addition to highlighting the role of technology in achieving the goals of the early warning for all initiative, the emphasis was put on the significance of international cooperation among all actors across the early warning value cycle.

6. With regard to examples of game-changing emerging and transformative adaptation technologies for early warning systems, the following were highlighted by the speakers:

(a) Use of artificial intelligence (AI) could help improve our ability to detect, monitor, and forecast events, and effectively communicate impending or ongoing disasters tailored to the needs of the target groups. For example, use of AI in generating maps and visual tools that could convey action-able climate-related information to the community level would enhance the impact and effectiveness of anticipatory action and disaster preparedness with reduced cost.

¹ More information available on the [event webpage on TT-CLEAR](#).

² The “[Early Warnings for All](#)” initiative was launched by United Nations Secretary-General António Guterres in 2022, and the associated Executive Action Plan is [spearheaded by the WMO](#) and partners, [announced at COP27](#).

(b) Use of remote-sensing and space technology, for example Lidar technique (Light Detection and Ranging), to establish baseline topographic data which improve the ability of countries to map and assess disaster risks and preparedness with higher spatial accuracy. Such technologies are also key for the development of prediction products and processes that are crucial for averting and minimizing climate-induced loss and damage.

(c) Use of cell-broadcast and location-based SMS help geo-locate messages in at-risk areas. They are compatible with most devices and support multi-language alerts. Cell-broadcast has the additional advantage of never being at risk of congestion and not requiring users have a subscription. Location-based SMS, however, allow for two-way communication and provide oversight on the number of users location in risk-areas.

(d) Use of the internet of things (IoT) could enhance the effectiveness of early warning systems for example by helping local authorities to issue extreme weather warnings in good time based on swiftly transmitted data from climate observation stations, or sending automatically-generated notifications to companies and citizens based on the information registered by sensors in their properties and communities.

7. With regard to the opportunities and recommended approaches in deploying transformative adaptation technologies for early warnings, the speakers highlighted the importance of:

(a) Standard operating procedures (SOP) increase the effectiveness of early warning systems while reducing cost of operations.

(b) Fostering innovation for transformative early warning technologies, for example through innovation grants (e.g. GSMA Innovation Fund), and empowering meaningful engagement of youth in the development and implementation of EWS projects in their communities.

(c) Local-level awareness raising (e.g. sensitization campaigns), education (e.g. easy-to-understand toolkits), and training (e.g. empowering youth at the local level to actively engage in and lead DRR) enhance the capacity of at-risk communities to utilize early warning systems for disaster preparedness and management.

(d) Coordination and alliance building among actors from the public (e.g. local governments) and private sector (e.g. mobile operators), the civil society (e.g. academia, social networks and community leaders), as well as countries across a region (e.g. the Caribbean Small Island Developing States) is key to ensuring the early warning systems are efficient, effective, fit for the local context, and beneficial to at-risk communities.

(e) Monitoring and evaluation of early warning systems and the embedded technological measures/means therein to improve their performance and effectiveness overtime, including through setting up feedback loops, iteration mechanisms and participatory processes.

(f) Integrating nature-based solutions in developing and improving technological solutions for transformative adaptation and disaster risk reduction.

8. With regard to key considerations for ensuring inclusiveness and human-centered design in the development and deployment of early warning technologies, the followings were highlighted:

(a) Localisation: Localised data on risks and geo-located warnings are important to ensure risks are captured accurately and information is disseminated to the right people and reaches the last mile.

(b) Inclusivity and actionability: Ensuring risk communications are inclusive and that everyone can both understand warnings and take action based on them.

(c) Accountability: It is crucial for technology providers and policy makers to improve and iterate solutions, collect feedback from the community and be responsive to local needs through 2-way communication. Solutions should be created not only for at-risk communities but with at-risk communities.

(d) Cross-sector collaboration: Bringing stakeholders together across sectors is key to leverage respective expertise and existing infrastructure/networks while increasing efficiency and decreasing cost.