



Technology Executive Committee

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Concept note on possible work by the TEC on innovative financing and investment options at different stages of the technology cycle

Cover note

I. Introduction

A. Background

1. As per activity 6 of the thematic area of Support of its rolling workplan for 2019–2022, the TEC is to prepare a concept note, including mapping, on innovative financing and investment options at different stages of the technology cycle. In this context the TEC agreed to prepare a concept note for the TEC to consider and decide on scope of the issues for possible work by the TEC on this matter, for consideration at TEC 22.¹

B. Scope of the note

2. The annex to this note contains the concept note referred to in paragraph 1 above.

C. Possible action by the Technology Executive Committee

3. The TEC will be invited to consider the concept note and provide guidance on further work on this issue.

¹ See workstream E. Support, activity 6, deliverable a.: <https://bit.ly/3uT7x7y>.

Annex

Concept note on possible work by the TEC on innovative financing and investment options at different stages of the technology cycle

I. Introduction

A. Background

1. Recently, several major greenhouse gas (GHG) emitting economies around the globe committed themselves to achieving net-zero GHG emissions by mid-century, whilst many more countries substantially increased their ambition to tackle climate change via their updated Nationally Determined Contributions (NDCs). For these ambitious goals, about US\$ 1.4 trillion per year for the period 2020-2024 in global investments are projected to be necessary in order to facilitate the needed system transitions in economies.² According to the IPCC special report on the impacts of global warming of 1.5°C, these transitions can be accelerated by an increase of adaptation and mitigation investments, policy instruments and the scaling up of technological innovation.³ Therefore, innovative financing and investment as well as climate technologies are expected to play a key role on the path to achieving the goals of the Paris Agreement.

2. The Paris Agreement states that support, including financial support, shall be provided to developing country Parties, including for strengthening cooperative action on technology development and transfer at different stages of the technology cycle.^{4 5} The Technology Framework also calls for identifying and promoting innovative finance and investment at different stages of the technology cycle.⁶

3. In this context, several questions could be raised. What (innovative) financing and investment options are available for providing support? Which of these options are effective at the different stages of the technology cycle? Which policy measures are effective in supporting the use of innovative financing and investment for mitigation and adaptation actions at different stages of the technology cycle, in particular in developing countries? Who are the key actors in providing finance and invest in the different stages of the technology cycle?

4. The TEC has already undertaken various activities in this area, including the publication of a TEC Brief on 'Enhancing Access to Climate Technology Financing',⁷ publication of a working paper on enhancing financing for the research, development and demonstration of climate technologies⁸ and a publication on innovative approaches to accelerating and scaling up climate technology implementation for mitigation and adaptation.⁹ As per activity 6 of the thematic area of Support of its rolling workplan for 2019–2022, the TEC agreed to prepare a concept note for the TEC to consider and decide on scope of the issues for possible work by the TEC on innovative financing and investment options at different stages of the technology cycle, for consideration at TEC 22.¹⁰

² Future Earth, The Earth League, WCRP (2021). 10 New Insights in Climate Science 2020. Stockholm. Available at: <https://futureearth.org/10-insights-2020>.

³ de Coninck H, Revi A, Babiker M, Bertoldi P, Buckeridge M, Cartwright A, Dong W, Ford J, et al. (2018). Chapter 4: Strengthening and implementing the global response. In: Global Warming of 1.5 °C an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change. Intergovernmental Panel on Climate Change.

⁴ As defined in the Cancun Agreements, the technology cycle can be distinguished into five stages: research and development, demonstration, deployment, diffusion and transfer of technology.

⁵ Article 10, para 6 of the Paris Agreement.

⁶ Decision 15/CMA, Annex, para 25 (b).

⁷ Available at:

https://unfccc.int/ttclear/misc/_StaticFiles/gnwoerk_static/TEC_documents/5be1bf880cc34d52a4315206d54a711b/c9efe76199fb43bc8cfc8dee1e5c2863.pdf.

⁸ Available at: https://unfccc.int/ttclear/docs/TEC_RDD%20finance_FINAL.pdf.

⁹ Available at: <https://unfccc.int/ttclear/tec/innovativeapproaches>.

¹⁰ See workstream E. Support, activity 6, deliverable a.: <https://bit.ly/3uT7x7v>.

B. Purpose of the paper

5. This concept note aims to provide an overview of possible work that the TEC may undertake on innovative financing and investment options at different stages of the technology cycle. It is based on a literature review, expert interviews and an exploration of work in this field. Provided information includes:

- What is meant by innovative financing and investment and why it is important;
- Brief overview of existing knowledge on innovative financing and investment options at different stages of the technology cycle;
- Who the key actors are that work on innovative financing and investment options and their role in promoting innovative financing and investment options, and;
- What work the TEC could undertake on innovative financing and investment options at different stages of the technology cycle and possible next steps.

II. Innovative financing and investment options at different stages of the technology cycle

1. Why focus on innovative financing and investments options for different stages of the technology cycle?

6. The importance of enhancing financing and investment for climate technologies has been emphasized by several international organizations. Besides the IPCC and the Earth League, as referred to in paragraph one above, other publications, such as the UNEP Emissions Gap Report 2020¹¹ and the UNEP Adaptation Gap Report 2020, have highlighted this.¹² In addition, several publications of the TEC have emphasized the importance of enhancing access to financing and investment for climate technologies to achieve the goals of the Paris Agreement.¹³ In this context, identifying innovative financing and investment options at different stages of the technology cycle has significant potential to accelerate and scale up the global response to climate change.

7. However, as stated by the International Energy Agency in its ‘Clean Energy Innovation Report 2020’,¹⁴ there is a strong disconnect between current ambition pledges by countries and the current state of climate technology diffusion, both for mitigation and adaptation. Even though many of the already available climate technologies can deliver a significant amount of the needed change, their uptake and diffusion shows great potential to be further increased. And despite the availability of many climate technologies, much of the to-be-reduced GHG emissions come from sectors where the technology options for mitigation are limited (such as shipping, trucks, aviation and heavy industries). Hence, decarbonising these sectors will largely demand the development of new mitigation technologies not yet in use, the same holds true for adaptation technologies. Further, many of the mitigation and adaptation technologies available today need more work and especially financial resources to bring down costs and accelerate deployment.

8. Developing countries, in particular, face challenges in mobilizing the financial resources for the development and deployment of the needed climate change adaptation and mitigation measures. Large finance and support gaps exist for a broader range of less well-known technologies, for adaptation technologies and for the commercialization stage when many technologies face the ‘valley of death’.¹⁵ This has been confirmed by the findings of the fourth synthesis report of technology needs identified by non-Annex I Parties. The report revealed that the most commonly reported economic and financial barriers are the lack of or inadequate access to financial resources and inappropriate financial incentives.¹⁶

¹¹ Available at: <https://wedocs.unep.org/handle/20.500.11822/34426>.

¹² Available at: <https://www.unep.org/resources/adaptation-gap-report-2020>.

¹³ See for example: <https://bit.ly/3vC04Kc>.

¹⁴ Available at: <https://www.iea.org/reports/clean-energy-innovation>.

¹⁵ The “valley of death” is a term used in the company startup contexts, referring to the difficulty of covering the negative cash flow in the early stages of a startup/ product, before their new product or service is generating revenue from customers.

¹⁶ Synthesis of technology needs identified by Parties not included in Annex I to the Convention, UNFCCC 2020. Available at: https://unfccc.int/sites/default/files/resource/sbi2020_inf.01.pdf.

9. Considering the scale of financing and investments needed to accelerate and scale up the development, deployment and diffusion of climate technologies to support action on mitigation and adaptation around the globe, it is relevant and timely that the TEC considers innovative financing and investment options at different stages of the technology cycle.

2. Defining innovative financing and investment

10. The literature review revealed several definitions to describe ‘innovative financing and investment’. According to the Rockefeller Foundation, innovative finance represents a “set of financial solutions that create scalable and effective ways of channelling private money from the global financial markets towards solving pressing global problems”.¹⁷ These financing solutions take a variety of forms across sectors and geographies, from insurance-linked securities and pay-for-success structures to advanced market commitments.

11. The World Bank defines innovative finance as mechanisms that fulfil any of the following:¹⁸

(a) Generate additional development funds by tapping new funding sources or by engaging new partners e.g. socially responsible investing, solidarity taxes, carbon finance;

(b) Enhance the efficiency of financial flows by reducing delivery time and/or costs e.g. frontloading of development aid, index-based risk financing, partial risk financing;

(c) Make financial flows more results-oriented with better link to measurable performance e.g. results-based financing, advance market commitments.

12. The Global Green Growth Institute (GGGI) proposes the following as a definition of innovative financial mechanisms and a summary of their main characteristics: “A novel structure or combination of traditional financial instruments that leverages greater investment from multiple investors (both private and public) by lowering the cost of capital through measures that mitigate one or more investment risks.”¹⁹

Innovative financial mechanisms must, at a minimum, meet the following three characteristics:

1. Blended Instruments: Most climate projects are still funded through traditional financial instruments, mostly equity and loans. Conversely, innovative financial mechanisms combine different de-risking instruments – often including grants, guarantees, and insurance – to achieve a blended capital structure. The outcome is a lower overall capital cost for the project and blended returns for investors.

2. Risk Reduction: Innovative financial mechanisms are designed to reduce investment risks. A similar approach is used in traditional project finance, where risks are allocated to stakeholders best suited to meet that risk, effectively structuring the project deal to address each investor’s distinct risk-return expectations.

3. Leverage Achieved: Innovative financial mechanisms achieve leverage by unlocking additional financing for projects from different capital sources, both public and private.

13. Based on the above definitions, a number of common elements of innovative financing and investment may be identified, including risk management, leveraging of scarce financial resources from the public sector and engagement of new partners.

3. Brief overview of existing knowledge on innovative financing and investment options at different stages of the technology cycle

14. A robust body of literature is available answering some of the questions raised in paragraph 3 above. In the following, a non-exhaustive overview of literature on the wider topic is provided with a view to identify possible work of the TEC in this area.

¹⁷ Foreign Affairs (2017), The Innovative Finance Revolution: Private Capital for the Public Good, “Closing the Funding Gap – Development in the 21st Century is About Financing, Not Giving”, Judith Rodin and Saadia Madsbjerg, The Rockefeller Foundation, https://www.rockefellerfoundation.org/wp-content/uploads/FARockefellerFinalPDF_1.pdf.

¹⁸ The World Bank (2010), Innovative Finance for Development Solutions: Initiatives of the World Bank Group, <http://pubdocs.worldbank.org/en/335011444766662755/e-book-Innovative-Financing-for-Development.pdf>.

¹⁹ GGGI (2016). Mind the Gap: Bridging the Climate Financing Gap with Innovative Financial Mechanisms. Seoul, South Korea: Global Green Growth Institute. http://ggi.org/wp-content/uploads/2017/03/Mind-the-Gap_web.pdf.

Work undertaken outside the Convention

15. In their ‘sustainable finance progress report 2019’, UNEP analyzes trends in sustainable finance policy and sustainable financial markets.²⁰ It synthesizes concrete policy actions taken by different countries in order to enhance sustainable financing and investment. The report highlights that ‘within the policy arena, there is growing evidence that sustainable finance policy has been characterized by strong growth, increased scope, and greater maturity.’ Yet, the report does not emphasize sustainable finance policies for climate technologies.

16. The above cited report ‘Mind the gap – bridging the Climate Financing Gap with Innovative Financial Mechanisms’, published in 2017 by the GGGI,²¹ elaborates on current and future supply of climate finance, investment risks and investor expectations for climate projects, as well as presenting innovative financial mechanisms at different project development stages and illustrative case studies on mitigation finance.

17. The World Bank Group published a report in 2012 analyzing the policy environment for financing innovation. In ‘Financing Business Innovation – a review of external sources of funding for business and public policies to support them’,²² the main categories of external funding are described, as well as types of public intervention. However, these were not differentiated by mitigation or adaptation actions.

18. An article of the Organization for Economic Cooperation and Development (OECD) ‘innovative financing for development mechanisms’,²³ released in 2011, aims to offer an OECD benchmark for regular monitoring and assessment of innovative financing for development, taking the perspective of both policy makers and investors. It presents information about mechanisms that generate and mobilize new resources for development, aiming therefore at financing mechanisms in developing countries, yet not differentiated by mitigation or adaptation actions.

19. An elementary paper published by UNEP (2008) presents findings about the need for Public Finance Mechanisms and the role of institutional investors along the technology cycle. In ‘Catalyzing low-carbon growth in developing economies: Public Finance Mechanisms to scale-up private sector investment in climate solutions’,²⁴ the authors analyze how appropriate Public Financing Mechanisms vary with technological maturity.

20. Besides international organizations, a number of international researchers conducted work in this field. Pauw (2015) analyzed ‘private sector engagement in adaptation and adaptation finance in developing countries’.²⁵ In the article, he analyses the potential of private-sector engagement in adaptation and adaptation financing in developing countries by conceptualizing the private sector's roles and motivation therein. A more mitigation-oriented perspective is taken by Mazzucato et al. (2017),²⁶ who in their paper ‘financing renewable energy: Who is financing what and why it matters’ provide an analysis of investments by financial actors into renewable energy technologies of varying risks, as well as shedding light on the role of public actors in the innovation landscape.

Work undertaken by the TEC

21. The TEC in its TEC Brief #6 elaborated on the positioning of public and commercial finance mechanisms to address financing gaps in the technology cycle (figure 1).²⁷

²⁰ Available at: http://unepinquiry.org/wp-content/uploads/2019/03/Sustainable_Finance_Progress_Report_2018.pdf.

²¹ Available at: http://gggi.org/wp-content/uploads/2017/03/Mind-the-Gap_web.pdf.

²² Available at: <https://openknowledge.worldbank.org/bitstream/handle/10986/23140/91713.pdf?sequence=2&isAllowed=y>.

²³ Available at: https://www.oecd-ilibrary.org/economics/mapping-innovative-finance-for-development-mechanisms_gen_papers-2010-5kgc6cl2x95d.

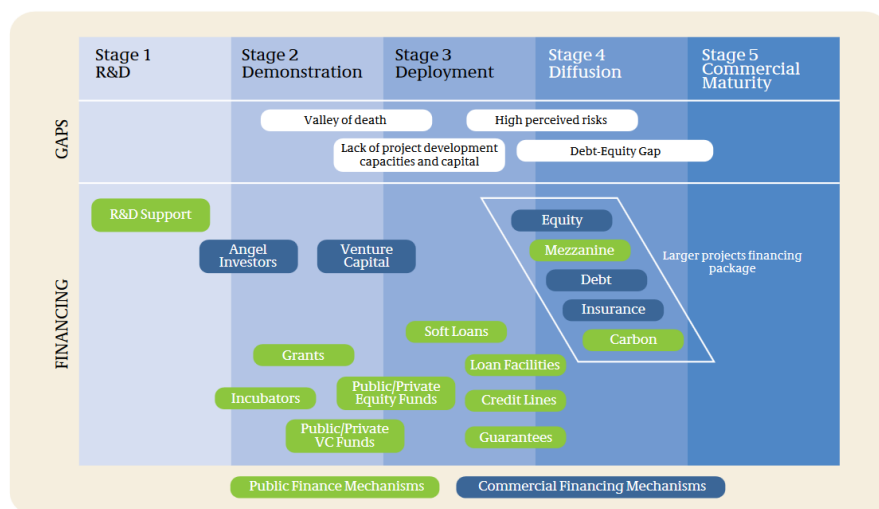
²⁴ Available at: <https://www.uncclearn.org/wp-content/uploads/library/unep141.pdf>.

²⁵ Available at: <https://www.tandfonline.com/doi/full/10.1080/14693062.2014.953906>.

²⁶ Available at: <https://www.sciencedirect.com/science/article/pii/S0040162517306820>.

²⁷ TEC Brief #6: Enhancing Access to Climate Technology Financing (2015). Available at: https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TEC_documents/5be1bf880cc34d52a4315206d54a711b/c9efe76199fb43bc8cfc8dee1e5c2863.pdf.

Figure
Positioning public finance instruments to address financing gaps in the technology cycle (source: TEC, 2015)



22. Further, the TEC produced a technical paper on ‘innovative approaches to accelerating and scaling up climate technology implementation for mitigation and adaptation’, including a section and case study on innovative approaches to finance.²⁸ The TEC publication ‘catalyzing finance for incubators and accelerators’²⁹ examines the feasibility of the incubator and accelerator approaches for climate technology entrepreneurship in developing countries. It provides findings and recommendations on how such organizations can scale-up and speed-up technology innovation for addressing climate change, including how to finance climate technology entrepreneurship.

23. The Green Climate Fund published a paper in 2017 concerning ‘options for support for technology collaborative research and development’,³⁰ focusing in particular on the early stages of the technology cycle by explaining inter alia the application of financing instruments at these stages.

24. The literature review revealed a rich overview of concepts, options and case studies of innovative financing and investment for climate projects. However, not all publications cover innovative financing and investment options from a climate technologies perspective or by stage of the technology cycle. Although innovative financing and investment options are described in the literature, the publications that were reviewed in most cases did not differentiate between mitigation and adaptation climate technologies and their different financing and investment needs. More specific, most efforts in the literature that was reviewed, focus on financing and investment options for mitigation technologies, in particular in the energy sector. In addition, most of the financing and investment options described in the literature focused on developed countries and less on developing countries, in particular the most vulnerable ones.

4. Key actors

25. Many actors are engaged in providing or supporting innovative financing and investment at different stages of the technology cycle to make an impact on the ability of countries to combat climate change. Such actors, and their roles, include:³¹

- (a) **International Organizations** have the role of supporting climate technology capacity development and knowledge-sharing programmes, supporting the development of bankable climate technology projects, including at the early stages of the technology cycle, and testing of new business models.

²⁸ Available at: <https://unfccc.int/tclear/tec/innovativeapproaches>.

²⁹ Available at: <https://unfccc.int/tclear/incubators/#summary>.

³⁰ Available at: <https://www.greenclimate.fund/document/gcf-b18-12-add01>.

³¹ Building on TEC Brief #6: Enhancing Access to Climate Technology Financing (2015). Available at: https://unfccc.int/tclear/misc/_StaticFiles/gnwoerk_static/TEC_documents/5be1bf880cc34d52a4315206d54a711b/c9efe76199fb43bc8cfc8dee1e5c2863.pdf.

They act as connectors between technology, policy and investor communities and provide policy support, including for innovation and RD&D policies.

- (b) **Policymakers and government agencies** have a critical role of fostering innovation, and of creating the policy and regulatory frameworks that incentivize and support the development, commercialization and diffusion of climate technologies. Governments not only fund RD&D, which is the financially riskiest aspect of technology development in the early stages of the technology cycle, but may also invest in the commercialization stage of climate technologies.
- (c) **Donor community** may expand international support for revenue support instruments as well as expand the availability of grant funding and of risk capital, including for adaptation technologies. In addition, they may provide grant funding for technology demonstration/ pilot projects, technical assistance and capacity-building.
- (d) **International financial institutions** play a key role in developing, piloting and expanding the use of risk mitigation instruments tailored to climate technology investments. Further, they catalyse Venture Capital/Private Equity investments where appropriate and establish dedicated climate technology funds for riskier investments and for adaptation technologies.
- (e) **Private financial institutions**, such as national and international banks and pension funds, play a key role in enhancing access to climate technology financing, including through the creation of innovative financing options. Companies generally invest where they see business opportunities, but both established companies and entrepreneurs can play a more proactive role in the development and deployment of new climate technologies.
- (f) **Philanthropy foundations** address the contribution of an individual or group to other organizations that in turn work for the causes of a common good, e.g. combating climate change. Financing and investment from philanthropy could be used more flexibly than commercial investment, because no profitable returns are required.³²

III. Possible work and next steps of the Technology Executive Committee

26. As indicated above, different actors are involved in analyzing innovative financing and investment options at different stages of the technology cycle. Most of the reviewed literature describes the theoretic functionality of the different financing and investment options, illustrated by case studies describing their practical implementation.

27. Filling the gaps in literature and further analysis will enhance knowledge on innovative financing and investment options at different stages of the technology cycle to support policy making in climate change mitigation as well as adaptation. As such, particular focus could be given to:

(a) Differentiation of innovative financing and investment options for climate technologies for adaptation and mitigation, including experiences and lessons learned from the energy sector of relevance to other sectors, as this sector has been the focus of attention in the area of innovative financing and investment;

(b) Innovative financing and investment options at different stages of the technology cycle in developing countries, particularly in most vulnerable countries. Assuming that there is no 'one size fits all', circumstances for different countries, in different sectors, at different stages of the technology cycle might be very specific;

(c) Emerging innovative financing options resulting from digitalization, such as through crowdfunding and smartphones.

28. In this context, the TEC could complement research efforts by bringing together existing information produced by key actors to shed light on the potential role of innovative financing and investment options at different stages of the technology cycle in facilitating the global

³² Persson et al. (2009). Adaptation finance under a Copenhagen agreed outcome (Research Report). Available at: <https://gsdrc.org/document-library/adaptation-finance-under-a-copenhagen-agreed-outcome/>.

transformation to a low-emission and climate resilient world. Here especially of interest for the TEC could be to analyze experiences and lessons learned, including good practices, on innovative financing and investment options at different stages of the technology cycle, including mapping, with a particular focus on developing countries. Noting hereby that these are specific to local, national and regional contexts. This work may be undertaken drawing on inputs from and working in collaboration with, key actors in this space, including those identified in section II above.

TEC work on innovative financing and investment options at different stages of the technology cycle could thus include:

#	Activities	Timeline
1	<p>Prepare a technical paper on innovative financing and investment options at different stages of the technology cycle, including mapping, based on existing data and literature. Possible elements of this technical paper could include:</p> <p>a) Key innovative financing and investment options at different stages of the technology cycle. Synthesize experiences and lessons learned, including good practices, on innovative financing and investment options at different stages of the technology cycle, including mapping, with particular focus on developing countries.</p> <p>b) Key policy challenges related to innovative financing and investment options at different stages of the technology cycle. Noting that many challenges are often dependent on specific local, national or regional circumstances.</p> <p>c) Ways for policy makers to effectively support the use of innovative financing and investment options at different stages of the technology cycle.</p>	2022
2	Develop a TEC Brief and recommendations to the COP.	2022
3	Disseminate the TEC brief and recommendations to key stakeholders.	2022

Possible next steps:

29. The TEC is invited to consider the possible activities that it could undertake on innovative financing and investment options at different stages of the technology cycle, as listed in the table above. In this context, it is invited to agree on a way forward as part of the activities of its current rolling workplan.