Framework Convention on Climate Change

TEC/2022/24/9

Technology Executive Committee

08 March 2022

Twenty-fourth meeting

22-25 March 2022 and 28 March 2022 (TEC-CTCN joint session)

Experiences, lessons learned and good practices from GCF and GEF's support for technology

Cover note

I. Background

1. As per activity 5 of the thematic area of Support of its workplan for 2019–2022, the TEC is to undertake an analysis of the experiences, lessons learned and good practices from the support provided by the Green Climate Fund (GCF) and Global Environment Facility (GEF), with a view to enhancing collaboration with the Financial Mechanism.

2. At TEC 22, the TEC considered a concept note,[1] prepared by the task force on support, on experiences and lessons learned from support for climate technologies provided by the operating entities of the Financial Mechanism and provided guidance to the task force on support for preparing the technical paper.

3. At TEC 23, the TEC considered the draft technical paper on experience and lessons learned in relation to support for climate technologies provided by the operating entities of the Financial Mechanism. The TEC provided suggestions for improving the paper and requested the task force to revise the technical paper taking into account the comments and guidance provided by the TEC at the meeting, for consideration at TEC 24.

II. Scope of the note

4. The annex to this note contains the draft technical paper on experiences and lessons learned from support for climate technologies provided by the operating entities of the Financial Mechanism, prepared by the TEC task force on support.

III. Expected action by the Technology Executive Committee

5. The TEC will be invited to consider the draft technical paper and provide guidance to the Support taskforce for further improvement and finalization of the technical paper after TEC 24.

[1] Available at https://bit.ly/3toOkKW.

Annex

Draft technical paper on experiences and lessons learned from support for climate technologies provided by the operating entities of the Financial Mechanism

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List of Tables and Figures

Primary Evidence used for Developing this Technical Paper

This Technical Paper draws on the experience of **a very small set of projects** funded by the Global Environment Facility (GEF) and the Green Climate Fund (GCF).

A total of 42 projects were reviewed (refer to **Annex 4**):

- 18 GEF-funded projects, many of which were designed before 2010
- 24 GCF-funded projects, several of which are readiness proposals

For the GEF-funded projects, the author relied on their Terminal Evaluation Reports or in their absence, Mid-Term Reviews, which address Relevance, Effectiveness, Efficiency, Sustainability of Results. While independently prepared, these Evaluation Reports were not designed to address the specific questions of this Technical Paper.

For the GCF-funded projects, the author relied on their 2019 Annual Performance Report, which has been prepared by their implementing entity and mainly report on the progress and achievement of planned outputs and outcomes, and the perceived risks and barriers at that particular moment in time, with little to no discussion about lessons learned and good practices.

Additionally, 17 stakeholders were interviewed, who were involved in the funding or implementation of these projects. This is not a statistically significant sample. Their insights have been included to deepen understanding of the aspects discussed in this Technical Paper.

Disclaimer

Due to the infancy of GCF-supported projects, many of which are still in early stage implementation with only recent annual project performance reports available which focus on achievement of outputs (therefore containing limited, if any, discussion of lessons learned), there is an over-representation of examples and citations from GEF-supported projects, the bulk of which have been completed or are near completion (with independently prepared Terminal Evaluations and/or Mid-Term Reviews available as evidence, together with lessons learned and recommendations).

The TEC has not quality-assured or fact-checked the statements by the 17 stakeholders who were interviewed. Their observations and input are seen as informative and complementary to the evaluation reports, but not fully representative of the entire body of stakeholders that could have been consulted for the development of this Technical Paper, had additional resourcing and time been available. The statements quoted in this Technical Paper are not expressions of the views of the TEC nor endorsed by the TEC

UNEP-DTU, the GEF, and the GCF have been given the opportunity to review this Technical Paper and their feedback has been addressed and incorporated in its finalization.

Acronyms and Abbreviations

ADB	Asian Development Bank
AE(s)	Accredited Entity(ies)
AfDB	African Development Bank
CO_2	Carbon dioxide
COP	Conference of the Parties (to the UNFCCC)
CSO(s)	Civil Society Organization(s)
CTCN	Climate Technology Centre and Network
EBRD	European Bank for Reconstruction and Development
EE	Energy efficiency
EST	Environmentally Sound Technology
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	Greenhouse gas
ICT	Information and Communications Technology
IDB	Inter-American Development Bank
IRMF	Integrated Results Management Framework
(I)NDC	(Intended) Nationally Determined Contribution
IP(R)	Intellectual property (rights)
LDC	Least Developed Country
MDB	Multilateral Development Bank
MTR	Mid-Term Review
NDA	Nationally Designated Authority
NDE	Nationally Designated Entity
NGO(s)	Non-governmental organisation(s)
Parties	Means Parties to the UN Framework Convention on Climate Change (UNFCCC)
PCCB	Paris Committee on Capacity-Building
PSP	Poznan Strategic Programme on technology transfer
PV	(Solar) Photovoltaics
RE	Renewable energy
RPSP	Readiness Preparatory Support Programme
SCCF	Special Climate Change Fund
SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
STAR	(GEF's) System for the Transparent Allocation of Resources
TE	Terminal Evaluation (of a project or programme)
TEC	Technology Executive Committee
TNA	Technology Needs Assessment
ToR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organisation
USD	US dollar

1 Background

1.1 Mandate

1) With the 2015 adoption of the Paris Agreement[1], technology development and transfer were recognized as key enablers to contribute towards holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuant to efforts to limit the temperature rise to 1.5°C. The Technology Framework[2] adopted by the Parties in 2018, provides overarching guidance to the work of the Technology Mechanism to support the Parties in improving resilience to climate change and reducing greenhouse gas (GHG) emissions. Key aspects of the Technology Framework relate to: (i) enhancing collaboration between the Technology Mechanism and Financial Mechanism to strengthen support for technology development and transfer;[3] and (ii) providing enhanced technical support to developing country Parties, in a country-driven manner, facilitating their access to financing for innovation (including for R&D), enabling environments and capacity-building, developing and implementing the results of Technology Needs Assessment (TNA), and collaboration with stakeholders including organizational and institutional support[4]. In this context, the TEC agreed to undertake an analysis of the experiences, lessons learned and good practices from GCF's and GEF's support for technology development and transfer. This Technical Paper was prepared in the context of the TEC's rolling workplan for 2019-2022.[5] It follows the guidance outlined in an earlier Concept Paper developed by TEC22[6].

2) This Technical Paper builds on two earlier initiatives mandated by the UNFCCC to review support for technology development and transfer[7] and finance provided in relation to the GEF's Poznan Strategic Programme on Technology Transfer (PSP; see ¶12): i) In 2015 – analysis of PSP's relevance, effectiveness, and efficiency in meeting Party needs and its prospects for modelling effective change[8]; ii) In 2019 –update of the initial review, based on availability of Mid-Term Review (MTR) reports, which were the key source of information for the assessment[9].

3) Prepared as an input to the TEC23 meeting (6-10 September 2021) and TEC 24 (22-25 March 2022), this Technical Paper is expected to be used as a foundation for the subsequent preparation of a TEC Policy Brief and recommendations to the COP/CMA, as appropriate.

4) In updating the 2019 PSP review, this Technical Paper assesses the experience, lessons learned and good practices from the support for climate technologies provided by the Financial Mechanism's Operating Entities, with a view to enhance operation of the Technology Mechanism and collaboration between the Technology Mechanism and the Financial Mechanism.

1.2 Scope and Methodology

5) Following the ToR's guidance, the Technical Paper assesses:
- Support provided under relevant replenishment cycles, for climate technologies related to PSP implementation (GEF) and climate change projects with technology elements (GCF);
- GCF readiness support with a focus on those projects using the Technology Mechanism's operational arm, i.e. the Climate Technology Centre and Network (CTCN), as delivery partner;
- Projects for which Terminal Evaluations (TEs), Mid-Term Reviews (MTRs), or recent reporting was available

[1] As contained in COP Report on its 21st session, FCCC/CP/2015/10/Add.1 https://unfccc.int/files/home/application/pdf/paris_agreement.pdf

[2] Decision 15/CMA.1. The Technology Framework highlights enhancing collaboration of the Technology Mechanism and Financial Mechanism in ¶25a Available from https://unfccc.int/sites/default/files/resource/cma2018_3_add2_new_advance.pdf#page=4

[3] Decision 15/CMA.1, Annex, para. 25 (a)

[4] Decision 15/CMA.1, Annex, para. 25 (c)

[5] The TEC extends its appreciation to Dr. Joyce Miller for her support in developing this Technical Paper. Appreciation is also extended to representatives of observer organizations participating in the TEC Task Force for the inputs provided throughout its preparation.

[6] https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/954b204c918f45629fcac696f7c0341d/8973108d71eb4d20b3d570eff56026e3.pdf

[7] Referring to voluntary technology transfer on mutually-agreed terms

[8] TEC (December 2015) by S. Nakhooda: Evaluation of the Poznan Strategic Programme on Technology Transfer: Final Report by the Technology Executive Committee https://unfccc.int/resource/docs/2015/sbi/eng/16.pdf

[9] TEC Report (April 2019) by A.M. Verbeken: Updated Evaluation of the Poznan Strategic Programme on Technology Transfer https://unfccc.int/sites/default/files/resource/7e.pdf

(as opposed to initiatives that are still at the planning stage or in initial implementation), including support to Least Developed Countries (LDCs[10]) and Small Island Developing States (SIDS[11]).

6) This Technical Paper was developed by drawing on evaluation reports of the reviewed projects, which contain mainly qualitative data regarding their Relevance, Effectiveness, Impact, Mainstreaming of Gender, Stakeholder Engagement, Sustainability of Results, Potential for Replication and Scaling-up as well as fundamental strengths, shortfalls, enabling conditions, and key challenges related to accelerating action on climate change through the provision of support for climate technologies. Stakeholders involved in their implementation were also interviewed. Although limited in number (due to the resourcing of this mandate), their selection was highly considered – aiming to drawing on illustrative, insightful, and provocative perspectives to deepen understanding of the questions posed. Their input is also considered as core evidence. Please note that the over-representation in the evidence cited of GEF-funded experiences reflects the fact that most PSP-related projects have reached completion, with independent assessment available (e.g. TEs, MTRs) while the GCF-funded projects considered in this review are mostly in their infancy, without independent assessment available. The project progress reports made available to the Consultant tend to focus on achievement of activities/outputs and their risks/barriers, not highlighting lessons learned and good practices.

7) To anchor and triangulate the findings, data was drawn from varied sources:

- Interviews: with 17 stakeholders (see **Annex 1**) representing perspectives from the Technology Mechanism (CTCN, TEC), the Financial Mechanism's Operating Entities, their Implementing Agencies, GCF Accredited Entities (AEs), Multilateral Development Banks (MDBs), national-level recipients of support provided by the Operating Entities (represented by GEF Operational Focal Points, Nationally Designated Authorities (NDAs), Nationally-Designated Entities (NDEs), and independent consultants with relevant contributions. Interviews were carried out remotely, supported by a protocol (see **Annex**);

- Desk review: of key documentation supplied by the UNFCCC Secretariat, including previous reviews of the PSP; Operating Entities' presentations to the TEC; Operating Entities' annual reports submitted to the COP; recent annual reports of the GEF and GCF; relevant programming directions of the GEF and GCF; project preparation guidelines, working papers, policy briefs, factsheets, technical papers, etc. See **Annex 2**.

  A total of 42 projects were included in this review (see **Annex 4**), using the following documentation:
  - GEF Evaluation Reports: 18 projects were identified as relevant for the scope of this inquiry. The latest evaluation report (be that a TE or MTR) was used as the primary data source[12];
  - GCF Annual Performance Reports (only for 2019): 24 projects were identified as relevant, i.e. providing support for climate technologies through GCF's climate change portfolio (11 in LDCs, 4 in SIDS) and its readiness programme (6 in LDCs, 3 in SIDS), with CTCN as the delivery partner.

[10] The list of LDCs (as of 11 February 2021) is drawn from this source: https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/ldc_list.pdf

[11] The list of SIDS is drawn from this source: https://www.un.org/ohrlls/content/list-sids

[12] The GEF reported to TEC22 (20-23 April 2021) the latest status regarding its long-term plan for implementing the PSP according to its 5 elements:

i) **Climate Technology Centres and Climate Technology Network**
- As part of this, GEF supported a CTCN sub-project, implemented by UNIDO, described as "operationalising linkages between the Technology and Financial Mechanisms under the Climate Convention, and "a response to COP decisions on the matter" (p2, UNIDO GEF Annual Monitoring Report FY 2018, referring to COP decision 1/CP.16)
- Supported projects implemented by MDBs, related to 4 regional centres: Africa [hosted by African Development Bank (AfDB)], Asia and Pacific [established by Asian Development Bank (ADB) and UNEP], Latin America and Caribbean hosted by Inter-American Development Bank (IDB); Eastern Europe and Central Asia [hosted by European Bank for Reconstruction and Development (EBRD)]
  Project Status: 3 closed; 2 extended: AfDB's ACTFCN to complete in July 2022; EBRD's FINTECC to complete in December 2022

ii) **Piloting technology projects**
- 14 pilot projects supporting technology transfer have been implemented with respect to:
  Mitigation: renewable energy, energy efficiency, transport, composting)
  Adaptation: irrigation, flood- and drought-resistant crops, sustainable land practices
  Project Status: 8 closed; 3 still under implementation, 3 cancelled

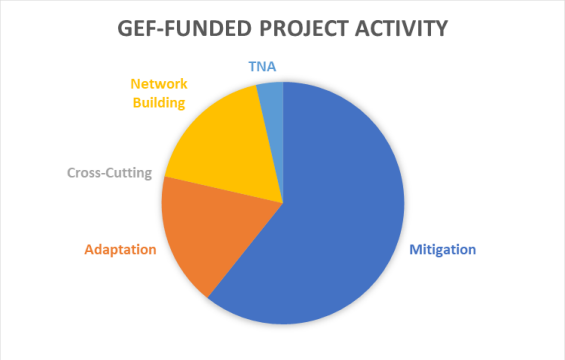
iii) **Technology needs assessments**
- 4 phases of TNA global project have been funded with ~USD 27 million in 100+ countries

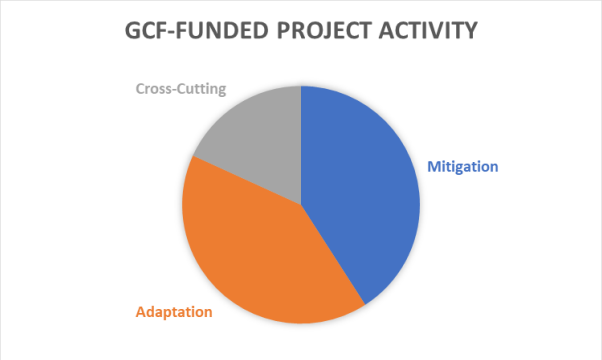
iv) **Public-private partnership for technology transfer.** No status reported

v) **GEF as a catalytic supporting institution for technology transfer.** No status reported

The set of projects reviewed reflect primary themes of Mitigation, Adaptation, Networking Building, and Technology Needs Assessment. **Figure 1** shows the breakdown of these projects, by funder. Four projects within the set (funded by GCF) are cross-cutting, i.e. reflecting both Mitigation and Adaptation themes. One GEF-funded project contained 10 sub-projects, bringing the total number of reviewed projects to 50[13].

Figure 1: Key Orientation of Reviewed Project Activity





	GEF-funded project activity	GCF-funded project activity	Total
Mitigation	17	9	26
Adaptation	5	9	14
Cross-Cutting		4	4
Network Building	5	0	5
TNA	1	0	1
Total	28	22	50

8) To enhance freedom of expression, stakeholders were: i) assured confidentiality of their input; ii) engaged in a manner that promoted balanced reflection, using a retrospective lens; iii) stimulated to identify unaddressed needs, areas for future focus, and contextually-relevant recommendations. This approach sought to build appreciation of different ways to view the performance of Operating Entities' support, facilitated triangulation, and aimed to stimulate interest in the Technical Paper's findings, conclusions, and key messages.

2 Financial Mechanism's Operating Entities' Support for Climate Technologies

9) Serving as an Operating Entity of the Financial Mechanism since the UNFCCC entered into force in 1994, the GEF funded the PSP under its 4th replenishment cycle (GEF-4, July 2006-June 2010) with USD 50 million; USD 30 million came from GEF Trust Fund country allocations, USD 5 million from GEF Trust Fund set-aside, USD 15 million from the Special Climate Change Fund (SCCF)[14], complemented by USD 228.8 million in co-financing[15].

10) Adopted at the end of 2011 as an Operating Entity of the Financial Mechanism, GCF shares a commitment with the GEF to address the climate emergency and support developing countries to raise and realise their climate ambitions. In the context of sustainable development, GCF promotes paradigm shift towards low-emission, climate-resilient development pathways by providing support to developing countries to limit or reduce their GHG emissions and adapt to the impacts of climate change, taking into account the needs of those developing countries particularly vulnerable to the adverse effects of climate change[16]. Accordingly, GCF provides support through its Readiness Preparatory Support Programme (RPSP)[17] and its climate change portfolio. The former

[13] This number is larger than the reviewed set of 42 projects because one UNIDO-implemented project contained 9 sub-projects, which was each mapped to a sectoral technology benchmark indicator. Furthermore, the projects related to network building and TNA were not relevant to include in this figure. Details regarding the included projects are shown in Annex 4.

[14] The SCCF was created at COP7 in 2001 to help vulnerable nations address negative impacts of climate change. It is managed by the GEF Secretariat and operates in parallel with the Least Developed Countries Fund (LDCF), both of which serve the 2015 Paris Agreement https://www.thegef.org/what-we-do/topics/special-climate-change-fund-sccf

[15] TEC PSP Review (December 2015) by S. Nakhooda https://unfccc.int/resource/docs/2015/sbi/eng/16.pdf refers to the Technology Framework adopted by COP7. The more recent reference to the Technology Framework adopted by COP24/CMA1 (Decision 15/CMA1) is also relevant.

[16] p2, GCF's Governing Instrument https://www.greenclimate.fund/sites/default/files/document/governing-instrument.pdf

[17] https://www.greenclimate.fund/readiness/process

refers to a process for accessing funding that begins from assessing a country's technology needs, including, but not limited to, technology development and transfer, led by a Nationally Designated Authority (NDA). The latter consists of projects whose investments are characterized as "intending to support paradigm shifts in both mitigation and adaptation"[18].

11) Both Operating Entities have endeavoured to rise to the challenge, offering strategic support to developing countries to limit and reduce GHG emissions and helping vulnerable societies adapt to impacts of climate change. This is evident in the ambition level, scope, and system-level and integrated approaches reflected in their programming directions[19], in the case of the GEF. From the GCF's side, its Updated Strategic Plan (USP)[20] set out to strengthen collaboration with the Technology Mechanism by identifying where GCF support could be used to unblock bottlenecks in value chains for technology innovation, diffusion and transfer at different stages of the technology cycle, including using readiness funding to support national innovation systems and local technology production[21]. As well, the GCF had implemented an Integrated Results Management Framework (IRMF) to assess how its investments deliver climate results and how its results contribute to the desired paradigm shift towards low-emission and climate-resilient development pathways[22].

2.1 GEF's Support for Technology Transfer.

12) Following the COP13 (Bali, 2007) request to scale-up investment for technology transfer to assist developing countries in addressing their needs with respect to technology development and transfer[23],the GEF established the PSP in 2008, operationalised through three funding windows; for: i) TNA; ii) pilot priority technology projects linked to TNA; and iii) dissemination of GEF's experience and successfully demonstrated Environmentally-Sound Technologies (ESTs).

13) Following the PSP's implementation, the GEF incorporated long-term elements of the PSP into its Long-Term Program on Technology Transfer to scale up technology transfer activities supported under the original PSP. This program included several elements: (i) Support for climate technology centers and a climate technology network; (ii) Piloting priority technology projects to foster innovation and investments; (iii) Public-private partnership for technology transfer; (iv) Technology needs assessments; and (v) GEF as a catalytic supporting institution for technology transfer. Technology transfer is encapsulated in both the current and forthcoming strategy and programming directions for both CCM (Objective 1) and CCA (Objective 1); and the GEF Secretariat has integrated the five above-mentioned elements as part of its long-term implementation of the PSP.

14) The transfer of low-emission and climate-resilient technology has been a key cross-cutting theme for the GEF since its establishment, building on the notion that "technology transfer and innovation are key enablers of sustainable development for LDCs", according to GEF's latest briefing to the TEC (April 2021)[24]. The GEF-7 replenishment package adopted in June 2018 contained a climate change mitigation funding envelope of USD 802 million (of the total USD 4.1 billion replenishment package), which included a STAR set aside of USD 291 million to finance: (1) EAs and CBIT [USD 165]; (2) Integrated Programming [USD 108 million]; and (3) regional/global programs [USD 18 million][25].LDCs and SIDS were eligible to access set aside resources for funding TNAs, should they wish to do so.

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[18] https://www.greenclimate.fund/projects

[19] https://www.thegef.org/sites/default/files/council-meeting-documents/2021_04_22_First_Meeting_GEF-8_PDs_Presentation.pdf

[20] https://www.greenclimate.fund/document/updated-strategic-plan-green-climate-fund-2020-2023

[21] Slide 16, Presentation by Emerson Resende (9 Sept 2021) GCF Support to Climate Technologies, TEC23 https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/d1500c56909f438c84888fc709715c4c/ae04d9c9e736457fab3e7e8aded1b4a7.pdf

[22] Section 4.1, ¶10, GCF (June 2021), Integrated Results Management Framework https://www.greenclimate.fund/sites/default/files/document/gcf-b29-12.pdf

[23] Decision 4/CP.13.

[24] Presentation by the GEF into TEC 22 meeting: GEF Support for Technology Transfer https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/8fd01c60c1114246a64736b75af13701/870af041e1d845fba48da898d14aebe9.pdf

[25] Summary of Negotiations of the Seventh Replenishment of the GEF Trust Fund (24-26 June 2018, 54th GEF Council Meeting) https://www.thegef.org/sites/default/files/council-meeting-documents/EN_GEF.C.54.19.Rev_.03_Replenishment.pdf Note: Actual GEF-7 funding levels for Climate Mitigation Focal Area and the set-aside described here may differ from what was agreed to in 2018

2.2 GCF's Support for Technology Transfer

15) The GCF pursues its transformational goal by investing in four transitions (energy and industry; human security, livelihoods and well-being; the built environment; and land-use, forests and ecosystems), through 4 prongs[26]:

- Transformational planning and programming: by promoting integrated strategies, planning and policymaking to maximise the co-benefits between mitigation, adaptation and sustainable development;
- Catalysing climate innovation: by investing in new technologies, business models, and practices to establish a proof of concept;
- De-risking investment to mobilize finance at scale: by using scarce public resources to improve the risk-reward profile of low emission climate resilient investment and crowd-in private finance, notably for adaptation, nature-based solutions, LDCs and SIDS;
- Mainstreaming climate opportunities into investment decisions: to align finance with sustainable development by promoting methodologies, standards, and practices that foster new norms and values.

16) As of 1 March 2022[27], the GCF had approved 190 projects representing USD 10 billion in GCF funding, with co-financing of USD 27.2 billion mobilized. These projects were expected to abate 2 billion tonnes of carbon dioxide equivalent of GHG emissions and reach 612 million beneficiaries, based on estimates provided by GCF's accredited entities (AEs). Private and public sectors accounted for 34% and 66% of the GCF funding, respectively. In grant equivalent terms, GCF's portfolio allocation stood at 48% for adaptation and 52% for mitigation. It had received 35 readiness requests submitted by NDAs and focal points with CTCN as delivery partner (26 by UNEP/CTCN/; 9 by UNIDO/CTCN). Of these, 30 were approved, representing USD 10.4 million. As of 1 March 2022, 56 readiness support for technology requests had been approved (representing USD 28.6 million) to be implemented in Africa (25), Asia-Pacific (14), Latin America and Caribbean (16), Eastern Europe (1) with delivery partners: UNEP-CTCN (22), UNIDO-CTCN (8), UNEP (5), UNIDO (4), and other partners (17).

17) In strengthening knowledge management, the GCF had developed an internal taxonomy tool, which is used to continuously scan its entire portfolio; for example, the tool identifies which technology elements have been approved by its Board. A recent scan identified 265 technology-related terms, with about 65% of approved funding proposals with technology relevance. Within this, Mitigation accounts for a 43% share; Adaptation, 30%; and Cross-Cutting, 35%.

3 Lessons Learned from Project Implementation

18) The experience, good practices, and lessons from support for climate technologies (especially to LDCs and SIDS) provided by the Financial Mechanism's Operating Entities have been distilled using six lenses to view the ways in which the CTCN, regional centres, and pilot projects supported under the PSP (funded by GEF) and the readiness support programme and projects with technology elements funded by GCF have contributed to scaling up the level of investment in climate technologies.

3.1 Relevance and Impact of Support Provided

Climate Technology Centre and Network (CTCN)

19) As the implementation arm of the Technology Mechanism, with support from multiple (mainly bilateral) sources, the CTCN is hosted by UNEP and UNIDO and accountable to the COP and CMA through the Advisory Board of the CTCN. A GEF-supported, UNIDO-implemented CTCN sub-project, *Promoting Accelerated Transfer and Scaled-up Deployment of Mitigation Technologies through the CTCN*, was approved in June 2015 with USD 1.8 million in GEF grant funds and USD 7.2 million in co-financing. This sub-project reached completion in December 2020. The GEF provided significant additional funding for the regional centres; for example, the Asia-Pacific Climate Technology Network received USD 10 million from the GEF Trust Fund (see **Table 1**).

20) According to the TEC's 2019 PSP Review, the CTCN and pilot regional centres operate as "project accelerators" for technology development and transfer and "builders of a climate innovation system" – connecting

[26] https://www.greenclimate.fund/about

[27] https://www.greenclimate.fund/projects/dashboard

climate/finance/policy actors, technology, creating synergies, supporting capacity development, and catalysing learning and knowledge. The added value of this demand-driven mechanism, "which has institutional legitimacy under the UNFCCC, is recognized by stakeholders, as are its strong sectoral expertise, agility and responsiveness, and strength in filling a gap by supporting small projects, without any competition from similar centres or initiatives"[28]. The CTCN actively maintains a 'red thread' to the country's NDC through provisions contained in technical assistance (TA) requests. For countries to be eligible for this support, they need to explicitly demonstrate alignment with national plans and NDCs, as formalized in the TA request form. It is understood that GEF-7 PIFs ask the question, "how will this be relevant for the country's NDC and national communications?". Where not described, this gets flagged in the project design review as part of oversight.

21) In GEF's Report to COP26, GEF's implementing agencies affirmed there is significant demand from developing countries for CTCN services (reflected by the increasing number of TA requests – which is seen as complementary to other mechanisms/initiatives), asserting that the CTCN contributes to early-stage support of technology development and transfer[29]. Informants identified further assets of the CTCN in its ability "to be fast and provide tailored hand-holding", and "be more risk-prone" due to dealing with relatively small sums (compared to GEF, GCF). A stakeholder felt these aspects could be further enriched by adopting a broader experimental setting, equating this to "being risk prone", "doing more things of lower value than fewer things of higher value" and making the CTCN an "even more forceful and persuasive advocate of capacity-building, networking, cheerleading, and institutional strengthening" that forms the basis for effective technology transfer and use. Other stakeholders mentioned that that "it would be nice to see stronger ties" between the GEF and the CTCN.

22) In terms of on-the-ground learning from CTCN's operations, the review of GCF-funded readiness support:

- Shows that the consistent, step-wise path from first establishing and strengthening a recipient country's institutional set-up to enable continued engagement with the GCF followed up by the provision of country programming support that serves to operationalize that machinery through a relatively modest request, typically for TA, has been a valuable capacity-building approach – as seen in The Bahamas with developing a national-level Monitoring, Reporting and Verification System (MRVS) for tracking climate finance inflows and public expenditures; in Mauritius, for the vulnerability assessment of the Port of St. Louis to build its resilience to climate change effects; in Myanmar, for strengthening drought and flood management through a web-based portal to facilitate adaptation to climate variability; and in Timor-Leste, where TA provided through the CTCN extended the use of solar photovoltaics (PV) in remote areas.
- Demonstrates the synergy that can be realised by adopting a programmatic approach, illustrated by the "National Framework for Leapfrogging to Energy Efficient Appliances and Equipment" implemented through readiness support launched in 3 geographies (Lesotho, Malawi, Zambia). Approaches that work in Country A, that work in others with minor adjustment, are key to scaling up action on technology development and transfer. Another asserted that such a 'cookie-cutter' approach, combined with the inherent opportunity to crowd-in intelligence to the same topic, is highly worthwhile for driving impact.
- Suggests that CTCN activities have systemic impact that inform, shape, and influence the NDC, NAPs, and other national climate strategies and plans. The recent independent review of the CTCN indicates that while its interventions trigger systemic change, this is not instantaneously visible. While a new monitoring and evaluation system is expected to help capture CTCN impacts, at the time that the CTCN independent review was conducted (2021), there was not yet a clear timeline or intermediary steps put in place to realise the envisaged outcomes[30].

23) An interviewed stakeholder asserted that national level coordination across actors needs to be improved, particularly in light of initiatives that generate the creation of even more touch points; stakeholders mentioned current discussion about creating focal points for the Santiago Network on Loss and Damage as well as the NDC

[28] p18, ¶61(a) UNFCCC (20 August 2021) Report on the Second Independent Review of the Effective Implementation of the Climate Technology Centre and Network https://unfccc.int/sites/default/files/resource/cp2021_3_AV.pdf

[29] p102, as reported in Annex 4 of the GEF Report to COP26 (30 September 2020), by GEF Agencies based on data gathered in response to a survey circulated by the GEF in April 2020 https://www.thegef.org/documents/report-gef-26th-session-cop-unfccc

[30] Ibid, pp14-15, Described under Impacts and Sustainability

Partnership Focal Points that have been created, described as "working on their own and trying to coordinate with everyone". In countries where focal points share the same hats and/or sit in the same ministry", stakeholders reported that "it is more effective". Reaching back to 2015[31], a recommendation was already put forward to the TEC to encourage countries to strengthen links between focal points of the various national entities on the landscape, with a clear suggestion that the NDE should play a role in coordinated national technology efforts and engaging with the focal points of the Financial Mechanism's Operating Entities. Another idea mentioned was that the NDE must be seen as a National Centre of Excellence for Technology for development, not restricted to climate change and not just for the CTCN or for the Technology Mechanism, reflecting the embedding of climate change within development and system-level notions (¶80).

24) While the programmatic approach illustrated with the above-mentioned field examples could provide ground for the NDEs to exchange experiences across countries, many of those interviewed for this Technical Paper identified that a bigger gap still exists in the limited collaborative work between NDEs, (CTCN) Network Members, GEF Operational Focal Points, and GCF NDAs (although reportedly to a lesser extent with the latter, thanks to the increased number of CTCN readiness projects). This was explained by different strategic views and limited interpersonal knowledge (partly attributable to administrative turnover), despite networking events organised by the CTCN. Considering its broad scope of services, one of CTCN's main challenges to ensure effective collaboration has been attributed to its limited financial resources.

Regional Climate Technology Centres

25) The GEF Trust Fund provided USD40 million under its 5th replenishment cycle for 4 regional pilots to generate learning to inform the Technology Mechanism and the CTCN, and to facilitate cooperation on technology development and transfer, with additional support from the SCCF (see **Table 1**).

Table 1: GEF-Funded Pilot Projects for Regional Climate Technology and Finance Centres

Project	*Region*	*Implementing Agency*	*GEF Trust Fund (USD million)*	*GEF Special Climate Change Fund (USD million)*	*Co-financing (USD million)*
Pilot Asia-Pacific Climate Technology Network and Finance Centre (AP-CTNFC)	Asia and Pacific	ADB and UNEP	10.0	2.0	74.7
Pilot African Climate Technology Finance Centre and Network (ACTFCN)	Africa	AfDB	10.0	5.8	89.0
Finance and Technology Transfer Centre for Climate Change (FINTECC)	Europe and Central Asia	EBRD	10.0	2.0	77.0
Climate Technology Transfer Mechanisms and Networks in Latin America and the Caribbean	Latin America and the Caribbean	IDB	10.0	2.0	63.4

Source: GEF Report (13 November 2015) to the COP on Collaboration between CTCN and Regional Technology Transfer and Finance Centres

26) While reflecting a common underlying concept, these Regional Centres differ in scope and implementation modality, reflecting the varying approaches and capacities of the implementing entities (MDBs were asked to host these Centres, with a view "to harness their investment capacity" in their respective regions[32]). Through these projects a range of measures were rolled out to support mitigation activities, primarily in the Energy Sector, while also supporting adaptation-related technology transfer, particularly in the Water Sector. The ADB- (with UNEP) and EBRD-supported centres prioritized working with the private sector, while the AfDB- and IDB-supported initiatives put the emphasis on public sector investment.[33] A stakeholder confirmed, "these initiatives triggered a purpose; that was the objective. It's not about whether the Centre is working, or not. The biggest achievement is that the ideas have been mainstreamed into the Banks' daily operations".

27) The ADB-UNEP pilot in Asia-Pacific was the first to launch. Conceived with a notion to "*promote innovation and catalyze finance on a continuum*"[34], the AP-CTNFC project set out to test an approach whereby UNEP was to provide capacity building, TA, and policy advice to enhance the enabling environment for market

[31] p26, paragraph 97(d) TEC Report (December 2015) by S. Nakhooda: Evaluation of the Poznan Strategic Programme on Technology Transfer: Final Report by the Technology Executive Committee https://unfccc.int/resource/docs/2015/sbi/eng/16.pdf

[32] GEF's intention was characterized in this light (p10, paragraph 25) in the TEC's 2015 PSP Review, Report by S. Nakhooda, https://unfccc.int/resource/docs/2015/sbi/eng/16.pdf

[33] Documented in TEC's 2015 PSP Review: p10, paragraph 24

[34] Characterization of the project's innovative quality by a key respondent interview conducted by the Consultant, 14 November 2019

transformation while ADB was to facilitate financial investment. Together, this was expected to accelerate the adoption, deployment, and investment in climate mitigation and adaptation technologies. The extent to which this structure did hasten uptake of ESTs could not be determined through the TE (conducted in 2020)[35]. GEF's Report to COP26 acknowledged that "substantive joint work needs to be backed up by strong orientation and prioritization, as well as supported by relevant management and supervisory structures, together with incentives and enforcement"[36]. An interviewed stakeholder indicated that in providing TA services to ADB's operational departments, this project indeed helped to mainstream new climate technologies into the Bank's regular public sector operations. Now, all lending proposals are obliged to undergo a screening to assess the extent to which they enhance resilience, contribute to adaptation, reduce GHGs, and have an innovative design (i.e. "include a better technology compared to the baseline"). Furthermore, the USD 6 million of internal funds set aside to continue internal TA services is evidence that the project's benefits will be sustained.

28) AfDB's ACTFCN covering sub-Saharan Africa was extended for a third time, until July 2021 (reflecting institutional challenges in the set-up phase and effects from the Bank's restructuring), with another year anticipated to fully disburse project funds. AfDB's strategy of focussing mitigation resources exclusively on the Energy Sector, aligned with the Sustainable Energy for All initiative (SEforALL), has yielded excellent results, with most (90%) of the provided resources disbursed (attributed to "occurring at the beginning of the project cycle, at strategic level" and seen as "yielding good and much-needed benefits, like access to energy"), although arguably, there is quite a distance to go from the prospectuses prepared by the Bank and actually achieving access to energy. This project's efforts to mobilize added financing through an AfDB-managed instrument, Sustainable Energy Fund for Africa (SEFA), demonstrates an approach to building the enabling environment for mitigation activities and "bringing some investments all the way to financial close", which reportedly then provides the potential for capitalizing on other funds, thereby increasing the likelihood that technology transfer will actually take place. Through this architecture, AfDB/ACTFCN has used TA grants to fund studies in Zimbabwe, Democratic Republic of Congo, Kenya, and Lesotho that helped agree legal and procurement issues and improve the quality of environmental and impact assessment (e.g. for solar PV), with "actual investments taking place on the ground going into mitigation", although an external assessment has yet to verify these results. AfDB's internal trust fund (Africa Climate Change Fund[37]) was portrayed by stakeholders as building the capacity of African countries to access climate and energy funding.

29) While stakeholders pointed to positive effects from enhancing networks and knowledge transfer across countries that benefitted from AfDB/ACTFCN activities, disbursements for adaptation (which were mainstreamed into the Bank's regular operations, with a focus on policy reform and Water Sector[38]) have lagged (due to "difficulty in defining what is adaptation and its benefits", "requiring a certain (lacking) skillset for measuring"). Another facet of the challenge is that financiers in MDBs (and others) are presumably driven by profitability objectives, whereas adaptation is oriented towards improving livelihoods and well-being. In these domains, it is more difficult to make a business case for investment, which has resulted in an imbalance because climate adaptation projects that secure a community with water or food, while not profitable, are nevertheless essential. Observing the consequent hesitation to venture into adaptation-related activities, an interviewee suggested the option to make links between mitigation and adaptation. However, this could generate a risk of developing projects that fail to deliver on critical mitigation and adaptation priorities.

30) EBRD's FINTECC (covering 17 economies in transition in Europe/Central Asia) is positioned as enabling the Bank "to invest in sustainable projects that improve living conditions and economic opportunities"[39]. Prioritizing engagement with Energy Ministries and Water Agencies, FINTECC offers TA and incentive grants that

[35] A key finding of this project's TE (p13) https://wedocs.unep.org/handle/20.500.11822/32547 was that no resources were allocated for joint design and preparation and no attempt was made at the project's inception to establish a common management structure that would incline regular interaction and joint implementation, indicating that enhanced GEF supervision was needed to more strongly signal, orient, and prioritize the collaboration

[36] GEF Annual Report to the COP (30 September 2020), p125 https://www.thegef.org/documents/report-gef-26th-session-cop-unfccc

[37] https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/africa-climate-change-fund

[38] p6, paragraph 19, TEC Report (April 2019) by A.M. Verbeken: Updated Evaluation of the Poznan Strategic Programme on Technology Transfer https://unfccc.int/sites/default/files/resource/7e.pdf

[39] EBRD FINTECC homepage: https://fintecc.ebrd.com/index.html

complement EBRD financing. The project's MTR (2017) asserted that (p14) "largescale transfer of technologies has a critical role to play in the global response to climate change challenges" and that "local capacity in much of the Region reflects the Soviet legacy of strong engineering skills, thereby providing fertile ground for such technology uptake". GEF's Report to COP26 conveys conviction in the power of its incentive grants. The project runs until December 2022, at which time, its TE may provide independent verification of the effectiveness of EBRD/FINTECC's strategy.

31) IDB's approach for Latin America and the Caribbean followed a different path: working with existing institutions (therefore mostly outside the Bank's operations) covering different sectors and working on policy with Ministries and Offices of Science, Technology and Climate Change in the region. Participating institutions carried out sectoral feasibility studies (fulfilling what was described as "the project's immediate objective"), developed technology roadmaps, then IDB implemented some ideas through Bank (financing). The fact that projects were financed was described as "an important result". While not replication, "some of these projects with technology elements moved forward". The GEF-funded project implemented by IDB in Chile (2013-2020) is evidence: it addressed bottlenecks to developing a local solar industry by promoting pilot projects and strengthening local manufacturers' capacity to produce solar panels and systems for the domestic market[40].

32) In view of the concern about the sustainability of these Regional Centres, IDB's partnering with developed country institutions at regional level has been described as a pragmatic response to ensure the continuity of programming after the PSP funding in GEF-5 ends[41]. In another move to sustain the results of its initiatives, the IDB group has used concessional resources from the GEF and GCF to mobilize financial intermediaries, state and private institution as well as Climate Investments Funds (CIF). See (¶50) under Section 3.2.

Technology Needs Assessment (TNA)

33) In light of commitments to promote technology development and transfer to developing countries that have been renewed at each COP meeting, TNA (described as a key element in the PSP's long-term implementation) plays a foundational role due to its country-driven nature, high level of stakeholder engagement, and capacity-building outcomes. The COP's guidance to the GEF to support TNA has proved vital for giving this process a higher level of importance in stakeholders' eyes. Informants highlighted the value its upfront capacity-building, networking, cheerleading, and institutional strengthening, while also pointing to a perception that "the real action is when money is involved and where there's investment in projects", whose dimensions are seen as easier to measure. To date, the GEF has supported four phases of the global TNA project, through which 103 countries have been able to fund their TNAs and TAPs. With extensive follow-up by the GEF and UNEP, to date, a majority of LDCs and SIDS now have TNAs. Some have even updated their TNAs, which include TAPs.

34) The resources provided for TNA in its Phase I-II implementation were seen as limited, in view of the need for softer upstream activities described by an interviewed stakeholder as those that "deal with changing mindsets and getting individuals empowered to actually make changes". In this initial phase, stakeholders grasped the intention of TNA to be used as an assessment tool for identification and prioritization of technology needs. One challenge that emerged in this period was that the TNA did not create "any permanent institutional integration", apart from a few cases (e.g. Lebanon, Uruguay, Armenia, Indonesia, Vietnam). Asked how to remedy the situation, a stakeholder asserted that countries "should start with TNA, roll it through an existing institutional structure, like the CTCN, and push national governments on how they are going to integrate TNA into the budget and criteria of projects that flow into their political decision-making processes". This best practice approach was confirmed in the 2019 assessment of TNA experience carried out for the TEC, which pointed to the importance of integrating TNA results into national-scale policy processes for development,

[40] p13, Mid-Term Review (2017) of "Promotion of Development of Local Solar Technologies in Chile" further indicates that this project was innovative for Chile because, despite its large solar potential, solar generation was virtually non-existent at the project's onset. This project was not related to the Regional Centre. It was part of the PSP pilot projects.

[41] Documented in TEC's 2015 PSP Review: p17, paragraph 61

climate, and finance in the post-TNA process[42]. Such a view privileges institutionalization as the key objective of the TNA exercise: where there is an objective for the government to take ownership, then TNA can presumably be driven in a more impactful manner, in alignment with NDC commitments. In any case, GEF projects are country-driven, and the GEF cannot influence countries to participate in processes, such as TNA, that they may choose to not prioritize, in light of perceived overlap between NDCs and TNAs.

35) The GCF also provides support for TNA through its Readiness and Preparatory Support Programme, encouraging countries to use readiness resources to enhance the deployment of climate technologies by establishing effective coordination between NDAs and NDEs; identifying/prioritizing appropriate climate technologies aligned with national strategies and plans for climate adaptation and mitigation (based on climate vulnerabilities and low emission pathways); conducting feasibility assessments of selected climate technologies for mitigation and adaptation and their incorporation into national processes; and strengthening market preparation and business planning for the deployment and scale-up of prioritized climate technology solutions[43]. As at July 2021, GCF had approved USD 338 million in readiness grants, spanning 140 countries[44]. Amongst the projects reviewed, GCF's assistance to the Cambodian government was used to enhance private sector engagement and guide a pipeline of projects aimed at decarbonizing development in its special economic zones[45]. In Mauritius, GCF readiness support was used to identify 15 adaptation measures (preventative, protective, and mitigating) to be implemented over a 10-year period to improve the resilience and sustainability of its major port[46]. In Lesotho, Malawi, and Zambia, GCF readiness support linked to the countries' programming process fostered an enabling policy and regulatory environment [through an agreed Minimum Energy Performance Standards (MEPS) and labelling scheme for Refrigerators and Distribution Transformers] to lessen strain on the electricity grid and reduce GHG emissions[47].

36) The TNA process promoted was described by stakeholders as "actually a fairly cost-effective sharing of experience in a lot of countries", with "a certain community that has developed around what is TNA, which is beyond just the assessment". TNA is not an end in itself; it is being actively promoted as a tool to support national and sectoral planning (in which TNA results can be mainstreamed). According to TEC's 2015 PSP Review, p14, ¶40: some developing countries have used TNA outcomes to support preparation of intended nationally determined contributions (INDCs), national communications, nationally appropriate mitigation and adaptation plans, and national development project proposals. The TEC's 2019 review of TNA implementation showed that TNAs have a strong potential to provide an effective and solid basis for countries to both scale-up and implement action on environmentally sound technologies for mitigation and adaptation. The following are illustrative examples:

- Ecuador used TNA results to prepare its national climate change strategy;
- Georgia implemented a project based on its TNA results to promote adoption of energy-efficient lighting technologies;
- Paraguay and Kyrgyzstan are leveraging GCF-funded support and technical guidance to conduct a TNA and prepare a TAP;

[42] p3, TEC Draft Paper (Oct 2019) Experiences, Lessons Learned, Good Practices in Conducting TNAs and Implementing their Results was based on the experiences with TNAs conducted in 36 developing countries in Phase I (2009-2013) and 26 developing countries in Phase II (2014-2018), with a specific focus on TAPs and TNA results in the 'post-TNA process' https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/9c6eeaa690534874bbcbb85bada9882c/b566fb9540cd4932b5503a0518d2af94.pdf

[43] GCF in Brief (2018): Support for Technology https://www.greenclimate.fund/sites/default/files/document/gcf-brief-support-technology_0.pdf

[44] Slide 13, Presentation by Emerson Resende (9 Sept 2021) GCF Support to Climate Technologies, TEC23 https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/d1500c56909f438c84888fc709715c4c/ae04d9c9e736457fab3e7e8aded1b4a7.pdf

[45] p4, Readiness and Preparatory Support Proposal (Dec 2019): "Technology Needs Assessment and Action Plans to Support Climate-Friendly Technology Implementation for Cambodia's Special Economic Zones in the Sihanoukville Province" https://open.unido.org/api/documents/17845954/download/GCF%20Readiness%20Proposal%20-%20Cambodia%20UNIDO.pdf

[46] p3, Concept Note (Dec 2020): "Adaptive Measures to Increase Port Louis' Harbour Resilience to Climate Change" https://www.ctc-n.org/technical-assistance/projects/climate-change-vulnerability-and-adaptation-study-port-port-louis

[47] p5, Readiness and Preparatory Support Proposal (Aug 2019): "National framework for leapfrogging to Energy Efficient Appliances and Equipment in Lesotho (Refrigerators, Distribution Transformers) through regulatory and financing mechanism" https://www.ctc-n.org/technical-assistance/projects/leapfrogging-lesotho-s-market-energy-efficient-refrigerators-and Similar proposals for Malawi and Zambia.

- Cambodia has used TNA and related action plans to promote adoption of climate-friendly technology in its special economic zones;
- Lebanon used the TNA process to focus the climate change discussion on 4 sectors and to see "the real challenges confronting the country". Having a fully-dedicated Technical Focal Point coordinating the TNA process was key to delivering good quality outputs, which are extensively used by policy-makers and technical experts to guide proposals, identify capacity-building needs, and request technical assistance. A stakeholder attested, "every single national report references the TNA, they actually use and complement the data. It's not just words. They are carrying the data forward and make something better out of it"[48].

37) Beyond TNA's role in supporting the formulation and implementation of NDCs, UNEP's Phase II implementation identified a need to develop bankable projects, ready for financing[49]. An interviewed stakeholder explained this in terms of "a need to go the extra mile" to make sure that support is provided to a country, together with a process to ensure that a project reaches the point of actual transfer of a climate relevant technology, under concessional or commercial support[50]. This challenge was taken up under TNA Phase III with quite some success, together with updated guidance for Technology Action Plan (TAP) preparation, with the result that TAPs are seen by stakeholders as useful documents to push TNA results toward implementation. TNA III and IV have included a new component on financing and development of concept notes. These improvements have enhanced the potential to realize funding for prioritised technologies[51]. Under TNA Phase IV, participating countries are supported to prepare new or updated and improved TNAs, including TAPs, for prioritized technologies that reduce GHG emissions, support adaptation to climate change, and are consistent with NDCs and national sustainable development objectives[52]. In this light, TNA and TAPs aligned with the NDC is a simple step that could enhance their adoption and oblige their uptake.

38) The GEF, GCF, and CTCN have an important role to play post-TNA. To enhance likelihood of bringing TNA results to implementation, the national focal points for these funding mechanisms, including Direct Access Entities, and donors could consider TNA/TAPs -- and countries could communicate their TNA/TAP priorities to donors and donor coordination groups present in the countries.

39) Some of those interviewed for this Technical Paper asserted that the level of support for TNA activities would likely need to be enlarged. More money per country[53] and a longer duration were mentioned by stakeholders interviewed for this Technical Paper (with the current short project cycles largely seen as detrimental to development: "good donors and good projects are in there for the long haul"). This contrasts with feedback from some recipient countries that have actually requested shorter durations. Some stakeholders for this Technical Paper contended that doing TNA as a serious exercise, beyond just capacity building, likely necessitates narrowing of scope, to fewer focal sectors. One stakeholder recommended to "play a longer strategy, step by step". This risk management strategy translates into scaling down initial pilots, doing seed projects, then going back a few years later to assess the results and plan further from that basis.

[48] In Lebanon's case, TNA is explicitly referenced in its National Renewable Energy Action Plan of Ministry of Energy and Water; Ministry of Environment/Ministry of Finance's Feasibility Study on Fossil Fuel Subsidies Removal; Ministry of Environment's Policy for Optimal Renewable Energy Mix, Pilot Projects for Rainwater Harvesting from Greenhouse Tops implemented by Ministry of Environment and UNDP, linked to National Guidelines for the Agricultural Sector, amongst many other policy and project references

[49] Identified in TEC's 2015 PSP review, this gap remains: (p14, ¶41). It was reported that stakeholders from implementing agencies, national coordination teams, and financial institutions alike noted that further steps were still needed to develop bankable projects emerging from the TNA results in order to materialize more widespread implementation of the envisaged technologies

[50] The UNFCCC Secretariat tracks TAP implementation by number of projects (but not financial flows). This information is available from: https://unfccc.int/ttclear/projects

[51] TEC Draft Paper (Oct 2019) Experiences, Lessons Learned and Good Practices in Conducting TNAs and Implementing their Results https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/9c6eeaa690534874bbcbb85bada9882c/b566fb9540cd4932b5503a0518d2af94.pdf

[52] The GEF-funded project (GEF ID 10171), engaging Kiribati, Comoros, Ethiopia, Guinea-Bissau, Maldives, Niue, Papua New Guinea, Solomon Islands, Somalia, South Sudan, St. Kitts and Nevis, Timor-Leste, Tonga Tuvalu, and Yemen, is illustrative of this approach https://www.thegef.org/sites/default/files/web-documents/10171_EA_Global_TNA_ReviewSheet.pdf

[53] The GEF clarified that all non-LCD/SIDS countries can use their STAR allocation to fund TNAs. In all of GEF-6 and GEF-7, only one LDC/SIDS chose to do so. Nevertheless, all LDC/SIDS countries that wanted to be included in the UNEP global project were included

40) Formal decisions have been made on the need to scale up TNA[54] as well as the recommendations coming out of the TNA process. To date, the 'how' has been left open. Experience from UNEP's TNA Phase II[55] points to the primordial importance of the national governance structure, highlighting essential features that work to facilitate financial support, as follows:

- Define a strong national project governance structure at the start[56];
- Align with existing structures that have proven to be effective;
- Use existing national climate changes committees, or other already-formed relevant committees to implement/supervise a project to avoid institutional duplication and immediately seek for alliance with other relevant national developments. This is applied by most countries and appeared to be successful;
- Avoid setting up a new structure that generates parallel networks and risks for overlaps and confusion during interconnected decisions;
- Incorporate the national UNFCCC - National Designated Entity (NDE) in a leading position within the governance structure; e.g. as (co)chair;
- Involve focal points for CTCN and appropriate representation (e.g. Designated National Authority, GEF Operational Focal Points) from funding partners (e.g. GCF, GEF, Adaptation Fund) in the structure, thereby creating first entry points for engaging with such financial mechanisms.

3.2 Initial Review of Impact using a Sectoral Technology Benchmarks Perspective

41) This section reviews the progress made through transformational climate technologies to achieve the ambition of the 2015 Paris Agreement. This progress has been assessed by the World Resource Institute (WRI), amongst others. In its State of Climate Action Report[57], the WRI explores global and country-level progress indicators describing the pathways for transformational climate technologies in 6 key sectors: Power, Buildings, Industry, Transport, Forests, Agriculture (see **Annex** which also outlines their 21 associated indicators and targets). These indicators inform on the required implementation levels of these critical climate technologies towards pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels[58], i.e., the required level to transition to clean electricity generation and accelerate electric vehicle uptake, decarbonized industrial production, and achieve sustainable agriculture and forests.

42) This section includes an initial review of the impact of the GEF and GCF projects reviewed for this Technical Paper towards achieving the critical transformative indicators through the support provided on climate technologies. The reviewed GCF projects were started after the signature of the Paris Agreement, whereas all reviewed GEF projects were started prior to the Paris Agreement. In this light, the notion of implementing transformational technologies meeting the ambition of the Paris Agreement does not exist for the GEF-funded projects. However, the notion of sectoral benchmarks and key indicators is not new (e.g. carbon intensity of electricity generation, share of renewables, crop yields). Of the 44 projects reviewed in total, only one (a

[54] Decision 13/CP.25 - https://unfccc.int/sites/default/files/resource/cp2019_13a02_adv.pdf#page=15
Decision 10/CP.23 - https://unfccc.int/sites/default/files/resource/docs/2017/cop23/eng/11a01.pdf

[55] TE (2020) of UNEP/GEF Project "Technology Needs Assessment Phase II" (F. Verspeek), from Lessons Learned, p13

[56] While not in place at the time of the projects included in the review for this Technical Paper, in GEF-8, there is a large focus on enhancing the GEF Country Support Programme. This could provide opportunities for more integration and dialogue with the CTCN

[57] This notion is linked to Parties' actions in developing INDCs and TNAs using a sectoral approach that involves identifying key priority sectors for mitigation and adaptation, aligned with national sustainable development priorities. Current TNA methodology includes detailed identification, prioritization, and assessment of sectors; technologies; and measures to overcome barriers for technology development and transfer. This could serve as a logical starting point for Parties preparing their NDCs. Linking sectors, technologies, and implementation measures across TNAs and NDCs would ensure that coherent climate targets and actions are mainstreamed and embedded in national policies/frameworks. See TEC/2018/16/7: Updated Paper on Linkages between the TNA and NDC Process https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/40067a60235c4b1c9737e9abf532003a/e8a0bd09bec44237934ee7ed569b2d9d.pdf

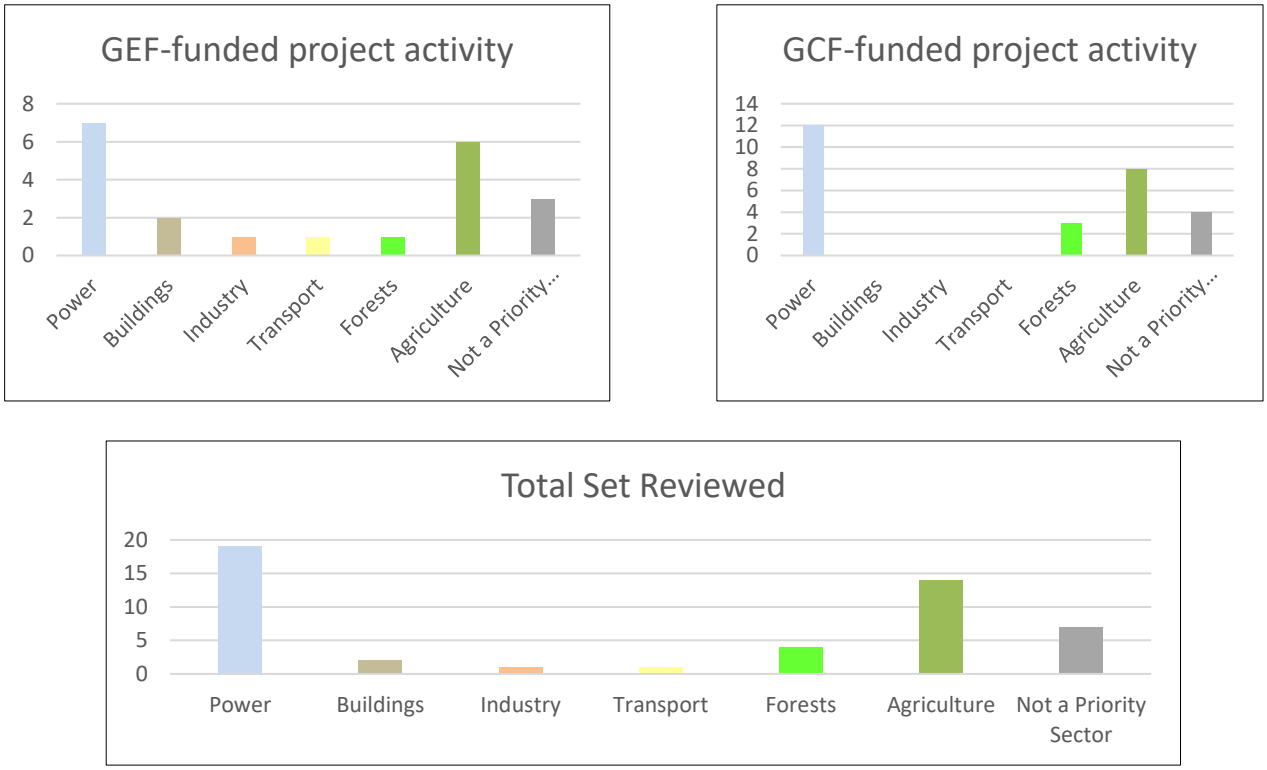
[58] Developed by World Resources Institute (WRI) and ClimateWorks Foundation, which assessed progress toward 2030 and 2050 emissions-reduction targets in the power, buildings, industry , and transport sectors (based on indicators/targets designed by the Climate Action Tracker consortium) and in forests and agriculture (based on indicators/targets designed by WRI. Of the 21 indicators assessed, 2 show a historical rate of change that is sufficient to meet both 2030 and 2050 targets, while 13 indicators show change is headed in the right direction but too slow, and 2 show change headed in the wrong direction altogether, as cited on p6, https://files.wri.org/d8/s3fs-public/2021-09/state_climate_action.pdf?VersionId=Rw2ZmL1HWNSg4z4iZGYz.SdTmn59xvlS

UNIDO-implemented project in Cambodia) had an outcome formulated in a way that referred directly to a priority sector identified by the WRI study (i.e. Power and transformational sectoral elements). In this case, beneficiaries were to learn how to utilize a transferred technology, adapt it to local conditions, integrate it with indigenous technologies, and replicate its use – with an aim to replace fossil-fuel powered generators and boilers for power generation and thermal energy applications with agro-waste biomass-fuelled energy systems.

43) GCF-funded projects provide Annual Performance Reports that summarize progress on their implementation. As these are organised along the GCF Investment Framework (consisting of 6 criteria: impact potential, paradigm shift potential, sustainable development potential, needs of the recipient country, country ownership, efficiency, effectiveness), the projects include sectoral and transformational elements, which could be mapped, for at least some of the projects, towards the transformational impact of key sectors[59].

44) As shown in **Figure 2**, the reviewed projects primarily relate to the Power Sector (43%, i.e. 19 of 44 projects, with most oriented to increasing the share of renewables in electricity generation; specifically, 11 of the GEF-funded projects; 6 GCF-funded projects; 2 projects in this sector could not be mapped to the key sectors listed above. The Agriculture Sector attracted the second highest level of activity (27%, i.e. 12 of the 44 projects. Of these, 6 GCF-funded projects mapped exclusively to enhancing crop yields, mostly through improved water management while the GEF-funded projects focussed primarily on reducing carbon emissions from agricultural production. Four of the 44 projects (less than 10%) relate to Forests (3 funded by GCF; 1 by GEF), all oriented towards preventing deforestation. In the 3 remaining sectors, no GCF-funded projects were identified. On the GEF side, there were 2 projects in Buildings (reducing energy intensity), 1 for Transport (increasing share of electric vehicles), and 1 for Industry (not mapped to any indictor). Within the overall dataset, 16% (i.e. 7 projects) did not map to any of the identified priority sectors (3 GEF-funded projects; 4 GCF-funded projects). Those projects that could not be mapped to one of the 6 priority sectors were focussed on Adaptation, typically related to development of meteorological and/or hydrological information for development planning.

Figure 2: Mapping of Reviewed Projects to Priority Sectors to Limit Global Warming



[59] A total of 44 projects funded by GCF and GEF were counted in the dataset (including 10 nationally-implemented projects within the GEF-funded project *Promoting Accelerated Transfer and Scaled-Up Deployment of Mitigation Technologies through the CTCN*; excluding projects deemed to be not applicable for this mapping, given their aims were related to Network Building or Institutional Strengthening – as elaborated in Annex).

45) A recent UNFCCC report[60] analyzed the extent to which NDCs are contributing to global climate ambitions (examining, amongst other aspects, share of renewable energy in the overall mix; performance-based building codes to reach certain GHG emission standards; extent of shift to e-mobility solutions). Based on the information provided in this UNFCCC report, for most of the key sectors, only a portion of the 20-50% of countries are declaring their adoption of transformative climate technologies. Only for the energy sector, 84% of the countries are indicating the use of renewable energies. There is no systematic information on the achieved level for the adoption of climate technologies for the countries or across companies.

46) In this light, there is scope for further improving project reporting[61] with respect to (I) informing and reporting on the state and level of adoption of critical transformative climate technology; (II) the required level of adoption of transformative climate technologies towards achieving the ambition of the Paris Agreement, possibly on a sectoral level, for key sectors and key technologies; and (III) impact of support provided by GEF, GCF as well as other national and international climate funds towards achieving indicators, i.e. the level of adoption of critical climate technologies and their progression towards achieving the Paris Agreement targets. This would imply action at design level as well as refinements in monitoring, reporting, and evaluation to highlight achievements, shortfalls, and lessons to improve future project architecture and implementation. Possibly, NDEs could take a role in informing about the level of adoption of climate technologies in their countries as well as the historic and planned pathways towards achieving the targeted climate ambition.

Instruments[62]

47) In bringing forward experience on linking financial support for climate technologies with achievable sectoral indicators, stakeholders mentioned the importance of adopting a broad view, spanning financial instruments as well as innovating business models. The project review identified several examples; a few are profiled here.

48) GCF investment in Energy Savings Insurance (ESI), supported by IDB in El Salvador, Mexico, Colombia, Brazil, Peru has been recognized by international think tanks, bilateral donors, and specialized publications[63]. Having identified the problem as SMEs' reluctance to adopt relevant technology and invest in energy efficiency measures, the ESI solution is used to enhance their confidence that energy efficiency projects will generate sufficient energy savings to pay for loans that need to be assumed to make the investments. In conjunction, capacity building activities targeting local financial institutions have increased their understanding of the associated performance risk and returns thereby, in turn, increasing their willingness to finance such initiatives.

49) GCF investment in renewable energy through KawiSafi Ventures, which describes itself as investing growth capital in proven business models that address key market gaps, with an aim to deliver ambitious impact objectives and market-competitive returns[64], investing in companies that are scalable and focused on serving 'base of the pyramid populations' in Kenya and Rwanda[65]. With a GCF-provided grant of USD 10 million and USD 67.5 million in equity implemented by GCF's Accredited Entity Acumen Fund, Inc., during 2016-2025, through the creation of a new investment fund to drive off-grid solar power in East Africa (investing in 10-15 clean energy companies), KawiSafi has taken credit for driving a low-carbon paradigm shift and leapfrogging fossil fuel grids to clean energy – specifically mentioning that Kenya and Rwanda are now including cleaner off-grid solutions within their National Electrification Strategies – demonstrating that nations can accelerate their clean energy transition through decentralized solutions[66].

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[60] NDC Synthesis Report (17 September 2021) https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs/ndc-synthesis-report

[61] In 2018, it was noted that the GEF revamped its results and monitoring reporting. The effects of these changes are not reflected in the project reviewed for this Technical Paper.

[62] This represents a selection of implementation instruments extracted from the review; it is by no means complete

[63] https://www.iadb.org/en/sector/financial-markets/financial-innovation-lab/energy-savings-insurance-esi%2C19717.html

[64] https://www.kawisafi.com/fund

[65] p4, GCF's 2019 Annual Performance Report. With GCF's funding support, KawiSafi's portfolio companies directly impacted 4.8M lives in Kenya and Rwanda and offset 3.9M tons of climate-warming emissions, directly brought access to clean energy to an estimated 10.2M individuals - and averted 6.2M tons of climate-warming emissions. In terms of lives impacted, it was estimated that 41% have incomes at or below USD 3.20 per day (the poverty line as defined by the World Bank) and that 45% are women.

[66] As documented in the GEF's (2019) Annual Performance Report https://www.greenclimate.fund/project/fp005

50) Climate Investment Funds (CIF)[67] were identified by stakeholders as an attractive channel to mobilize funding towards achieving sectoral targets. Some pointed to the benefit of working with a Bank: "to help make projects implementable from a finance point of view". According to an interviewee, IDB and CTCN have begun to collaborate in designing studies that increase the bankability of proposed projects with technology elements. Others pointed to the potential for MDBs to collaborate with the CTCN. It was mentioned that IDB works with clients in Latin America and the Caribbean that include Councils of Science and Technology, which have an institutional role to actively push for the inclusion of climate considerations in national policy. An interviewed stakeholder explained, "you can see efforts made with good faith by a country's Climate Change Office to promote a technology. They do nice feasibility studies, but if they don't consider finance from the outset, there's little chance that a project will be bankable[68]. It will stay in a drawer".

Approach[69]

51) Since its 2011 creation, GCF has been channeling funding to recipient countries through accredited national and sub-national implementing entities (e.g. NGOs, government ministries, national development banks, and other national/regional bodies) that have piloted instruments too numerous to profile here, which provide evidence of success cases as well as mechanisms that have proven more challenging. While an instrument may succeed in some settings, an aspect seen to generate universal value lies in embedding ways to mitigate subsequent funding barriers as part of exit strategy. Evidence from TNA Phase II implementation indicates while alignment with country focal points of the CTCN and/or GCF typically takes place, this is "very rarely" the case with other donors and/or investors[70]. The strength (or weakness) of such a post-TAP step was attributed to the knowledge of the TNA coordinator, asserting that in situations where the TAP Coordinator or host agency also incorporates the NDE/NDA for the CTCN/GCF, "it is going more smoothly".

52) UNEP's TNA Phase II implementation points to the importance of giving specific attention to engaging with financial entities and mechanisms. While their role is pivotal post-project, experience shows that the earlier they are incorporated, the better – thereby aligning data collection, analysis, and descriptions of plans that later need finance to their requirements. This project's TE pointed to evidence that those countries that had clear knowledge about financial mechanisms (due to early stage engagement) were more successful in defining project proposals. Reportedly, this aspect has already been strengthened in the ongoing TNA Phase III.

53) The African Development Bank Group (AfDB) provides another example to linking financial support to the promotion of climate technology. AfDB has worked on action agendas, prepared investment prospectuses (related to energy access), and presented various investments that could or should take place as the result of a study (e.g. carried out in Botswana and Malawi). These initiatives were described as a direct result of the African Climate Technology and Finance Center and Network (ACTFCN), supported by AfDB. These were even validated by the government and key stakeholders with the purpose of identifying entry points with the potential for bigger investments to come in. Traditionally, the Bank would stop there. Now, AfDB is including a requirement in adaptation proposals to identify potential financing sources that could come in afterwards so that funding for climate technologies is actually included within the larger investment that is procured.

54) COP21/CMA1 put the TEC's attention on endogenous capacities and technologies[71]. While PSP-related projects under the GEF4/5 [described as 'technology-centric' and "technology push", ¶68), ¶83)] did not emphasize these notions, the more recently funded GCF projects have incorporated the idea that support will be used to

[67] Established in 2008, the USD 8.5 billion CIF aims to accelerate climate action by empowering transformations in clean technology, energy access, climate resilience, and sustainable forests. CIF's large-scale, low-cost, long-term financing lowers the risk and cost of climate financing. CIF tests new business models, builds track records in unproven markets, and boosts investor confidence to unlock additional funds. Currently, CIF manages a collection of programs that enable climate-smart development planning and action through 325 projects in 72 developing and middle-income countries worldwide https://www.climateinvestmentfunds.org/about-cif

[68] Refers to procedural aspects i.e. acceptable for processing by a bank, inferring provision of a traditional financing package

[69] This represents a selection of the approaches extracted from the review; it is by no means complete

[70] TE (2020) of UNEP/GEF's Project "Technology Needs Assessment Phase II" indicates that (p12) despite ambitions to put more emphasis on engaging with the donor community at the right moment of the trajectory of TNA/TAP development (and thereby secure potential funding for project ideas and align data gathering and information description towards requirements of donors), this was covered in a limited way in the bulk of UNEP's TNA Phase II implementation https://wedocs.unep.org/handle/20.500.11822/32207

[71] See https://unfccc.int/ttclear/endogenous/index.html and https://unfccc.int/sites/default/files/resource/sb2019_04E.pdf#page=10

"enhance" and "promote" endogenous capacities" (as specifically mentioned in readiness requests/project descriptions for Lesotho, Malawi, Zambia, Timor-Leste, Tonga, and Myanmar). Furthermore, the GCF-funded project in Bangladesh describes its aim to "leverage indigenous knowledge management capacities and approaches". Informants pointed out that irrespective of whether technology is transferred or endogenously developed, an ongoing challenge relates to having the right people in place with the right set of skills to operate and maintain the technology, and for those technologies to yield updated continuous information to inform decision-making. This highlights the need for the TEC/CTCN to focus on the soft aspects of climate technologies (i.e. the techniques, practical knowledge, and skills), not just the equipment.

3.3 Gender Mainstreaming

55) At COP22 (Marrakesh, 2016), the Parties reiterated their commitment to mainstreaming gender in climate change and the UNFCCC process, providing substantial instructions in a standalone decision on gender[72]. The Operating Entities have adopted gender policies and encourage the mainstreaming of gender in all projects. GEF's Implementing Agencies have their own policies related to gender responsiveness, and they also comply with GEF social/environmental safeguards and fiduciary standards. The GCF describes itself as the first climate finance mechanism to "mainstream gender perspectives from the outset of its operations as an essential decision-making element for the deployment of its resources"[73]. Through its Updated Gender Policy[74], the GCF mainstreams gender issues in all of its interventions and has gender considerations built into its Governing Instrument. Gender assessments and project-level gender action plans are required for each project/programme. Promoting gender-responsive climate action initiatives that benefit women and men, GCF has included sections in its Annual Performance Report template that oblige implementers to report on Environmental and Social Safeguards & Gender, Gender Action Plan, and progress on their implementation. To support NDAs, focal points, accredited entities and delivery partners, GCF has developed a toolkit with guidance to holistically mainstream gender into projects and programs[75]. The GEF has also produced guidance to advance gender equality in its projects and programs[76].

56) There was evidence of some sensitivity to gender mainstreaming in the GEF-funded projects under review for this Technical Paper (i.e. in the early PSP era) [77]:

- Sri Lanka Project to develop a bamboo supply chain (implemented by UNIDO)[78]; its 2016 MTR said: "The Consultant noticed that about 95% of the workers at the tea box factory visited were women working on benches for the assembly, polishing and finishing of the tea boxes. Four or five men only worked in the furnace areas where bamboo or wooden boxes were treated. Moreover, it was also noticed during the visit to one of the plantations that women were working alongside men in cutting weeds and cleaning up the land in preparation for a new harvest. It is also known that women in the rural areas work alongside their men in the fields and farms, plantations or in handicrafts. These observations and facts indicate that the project will certainly realize and improve gender mainstreaming in Sri Lanka when new industries using bamboo are established";

[72] https://unfccc.int/files/gender_and_climate_change/application/pdf/auv_cop22_i15_gender_and_climate_change_rev.pdf
[73] https://www.greenclimate.fund/projects/gender
[74] This policy outlines clear requirements across the project life cycle and with respect to the roles and responsibilities for GCF and Accredited Entities/NDAs, including in relation to the budgetary and capacity requirements that are needed on gender. The policy is guided by, amongst others, the UNFCCC and Paris Agreement, and aligns with the SDGs, which make explicit commitments to gender equality both as a standalone goal on gender equality and women's empowerment in SDG5 and as a cross-cutting theme across all the SDGs.
[75] GCF and UN Women (August 2017), ***Practical Manual for Mainstreaming Gender in Green Climate Fund Projects*** https://www.greenclimate.fund/sites/default/files/document/guidelines-gcf-toolkit-mainstreaming-gender_0.pdf
[76] GEF (October 2020), ***Guidance to Advance Gender Equality in GEF Projects and Programs*** https://www.thegef.org/sites/default/files/publications/GEF%20Guidance%20on%20Gender.pdf
[77] In the sense that there is insufficient power or support of authority to compel obedience or penalize inaction
[78] Launched in 2012, completed in March 2021, this project had an objective to develop a bamboo supply chain and product industry in Sri Lanka that would lead to reduced global environmental impact from GHG emissions and a sustainable industry base. Its design indicated Gender Marker 1: limited expected contribution to gender equality https://open.unido.org/projects/LK/projects/100043

- Cambodia Project to develop a bamboo supply chain (implemented by UNIDO)[79], its 2019 TE said "Because this project is under GEF-4 replenishment, the gender issue was not contemplated in the project design. However, project management encouraged participants in project activities to bridge the gender gap";

- China Project to promote 'green freight' (implemented by World Bank)[80]; its 2016 TE addressed gender as an overarching theme, together with poverty impacts and social development, suggesting the notion of a link between gender and vulnerability (see ¶61).

57) Since the implementation of GEF's Gender Equality Policy was approved on 1 July 2018[81] and its new ESS standards were adopted in 2018/2019, there has been more focus on gender aspects and more guidance has been provided. For example, GEF-7 PIFs[82] incorporate plans to carry out gender analyses and develop gender action plans and sex-disaggregated and gender-sensitive indicators during project development, to "ensure that gender-responsive approaches are applied throughout project development and implementation". Under UNEP's TNA III, a gender responsive approach was adopted, drawing on new guidance[83] on gender aspects, finance, as well as support on content in specific sectors[84]. The inclusion of gendered sectors (e.g. children, health, employment) in TNA would arguably ensure that the focus of resulting projects intentionally includes the needs of a large portion of the population that might otherwise be unintentionally excluded.

58) In GCF-funded projects where gender dimensions were expected to drive transformative impact, the treatment of this topic came through more convincingly in adaptation projects than those aimed at mitigation:

- Malawi Adaptation Project is scaling up the use of climate information and early warning systems (GCF-funded, UNDP-implemented, 2017-2023): focuses on co-benefits pertaining to gender aspects. Its Annual Performance Report (2019) has 52 mentions of 'gender' embedded throughout, which report on the fruit of gender analysis and gender-responsive action plans formulated at the project's early stage;

- Zambia Adaptation Project is strengthening climate resilience of agricultural livelihoods (GCF-funded, UNDP-implemented, 2018-2025): highlights its 'gender-sensitive achievement' in reaching a 50:50 beneficiary ratio with exactly 132,246 women and 132,246 men involved, with collection and reporting of sex-aggregated data for participation and impact. Notably, a ToR for a Gender Specialist was developed. However, "due to a shortage of funds after the purchase of vehicles under co-financing from UNDP in

[79] Launched in 2012, completed 2018, this project's objective was to promote sustained transfer to Cambodia of small to medium sized 1-3 MW biomass-fueled power and steam generation technologies from one or more countries like India, China, Thailand, Malaysia, Indonesia, Vietnam where these technologies were already proven. Its design was assigned Gender Marker 1. While designed to use technology transfer to establish commercial pilot plants and being fully in line with national priorities for energy development, the project's performance was deemed unsatisfactory (due to inappropriate regulatory framework for supporting independent power producers, weak financial system, limited capacities of local technical resources, together with serious project design deficits (pX) https://www.unido.org/sites/default/files/files/2019-10/GEF%20ID-4042_GFCMB12002-100223_TE%20Report_2018.pdf

[80] Running 2011-2015, Guangdong Green Freight Demonstration Project aimed to test 6 technologies verified by the US EPA. In the face of slow uptake from the 145 involved trucking companies, public outreach was strengthened to build awareness of energy efficient truck technologies and cost savings. Responding to the Evaluator's moderately satisfactory project rating, the Borrower/Implementing Agency attested that green freight requires not only the joint effort of government, associations and transport sector enterprises, but also the active participation of the whole society.

[81] Consequently, all GEF-7 projects at or prior to CEO Endorsement/Approval provide: A) Gender Analysis or equivalent socio-economic assessment that identifies gender differences, gender-differentiated impacts/risks, and opportunities to address Gender Gaps and promote Women's Empowerment; B) Corresponding gender-responsive measures to address differences, identified impacts/risks, and opportunities through a gender action plan or equivalent; and C) if gender-responsive measures have been identified, the results or logical framework shall include actions, Gender-Sensitive Indicators and sex disaggregated targets. See https://www.thegef.org/sites/default/files/documents/Gender_Equality_Policy.pdf

[82] Project Identification Form is the first formal document submitted to the GEF Secretariat for review and approval. GEF requires its Implementing Agencies to provide the following in Program Framework Documents (PDFs) and PIFs: i) Indicative information on gender considerations relevant to the proposed activity, and any measures to address these, including the process to collect sex-disaggregated data and information on gender; ii) Description of any consultations conducted during project development, as well as information on how stakeholders will be engaged in the proposed activity, and means of engagement throughout the project/ program cycle.

[83] See https://tech-action.unepdtu.org/wp-content/uploads/sites/2/2019/07/web-tna-gender-guidebook-01.pdf

[84] Cited on p6, ¶25 of TEC Draft Paper (11 October 2019) Experiences, Lessons Learned and Good Practices in Conducting TNAs and Implementing their Results
https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/9c6eeaa690534874bbcbb85bada9882c/b566fb9540cd4932b5503a0518d2af94.pdf

2019, the recruitment process became delayed"[85];

- Benin Adaptation Project is building climate resilience using an Ecosystem-based Adaptation (EbA) approach (GCF-funded, UNEP-implemented, 2019-2024): identified gender equality as 1 of 6 key social and environmental safeguards. Gender mainstreaming is addressed throughout project reporting;
- Argentina Mitigation Project is scaling up investments by SMEs in RE-renewable energy and EE-energy efficiency (GCF-funded, UNEP-implemented, 2019-2024): describes various things that should be done with respect to a Gender Action Plan and gender baseline study not yet conceived;
- Mauritius Mitigation Project enabling the energy grid to use RE-generated electricity (GCF-funded, UNDP-implemented, 2017-2025): mentioned consultations held to develop a solar PV training program for women entrepreneurs and an awareness campaign to engage, inform, and sensitize communities and women entrepreneurs – seen to be "grassroots agents of change in the shift to RE" so that they could be better informed about the project's impacts and outcomes and "contribute in any way they wish".

59) GEF's 2021 Report to the COP (p38, ¶59) noted a "positive trend in terms of projects actively reaching out to women's organizations and gender focal points of relevant national ministries, NGOs and civil society. Differences remained, however, regarding the quality/scope of gender considerations and in communicating their results" in project implementation reports (PIRs) and MTRs. GCF's 2021 Report to the COP (p5, ¶16) indicated that it requires its accredited entities to consider and submit a gender assessment, along with appropriate environmental and social assessments, and a program/project-level gender action plan for all mitigation and adaptation activities implemented through the public and private sectors.

60) The interviewing of stakeholders for this Technical Paper points to a gap in understanding that still needs to be bridged regarding the extent to which climate impacts are gendered (with women, children and girls facing the greatest impacts) and that the core issue of gender mainstreaming relates to power asymmetries. There was limited evidence in the projects reviewed about ways in which their interventions increased or decreased women's power to participate. While aware that the gender aspect must be mainstreamed according to UN policy, interviewed stakeholders expressed confusion about the level and ways in which this topic can make a difference. Some relayed a conviction that the mandate of GEF and GCF is to reduce GHG emissions and build resilience to climate change. In this light, gender was called "a secondary notion", explaining "mitigation means that we're not heating up the planet too much; adaptation means that not too many people suffer too much from climate change". Another stakeholder maintained that "gender is not climate dependent and climate change is not gender dependent. Another contended that "climate finance is there to save the climate, not develop the world into whatever direction, other than climate proofing", emphasizing, "this is not a relevant topic at strategic planning level where you are talking very generically about where to steer the course of sizeable amounts", advocating that gender, like other dimensions that could be applied (poverty, immigration, conflict, social structure of a society) affect project quality and are "more appropriate to consider on a project level for having a successful initiative". Some stakeholders highlighted the need to consider vulnerability and resilience in climate change projects/programming[86], as sustainable development, GHG mitigation, and a climate-resilient society are all part of the Paris Agreement goals.

61) Suggestions for channelling focus and resources into paths that may be even more effective in mainstreaming gender and bridging the gap in the perceived relevance and utility of this approach in accelerating the transformative impact of technology transfer imply a mix of strategies ('stick', 'carrot', and 'other'):

- **Increase Oversight** through exercising stronger interest in and supervision regarding relevant reporting requirements, thereby raising the motivation of Project Managers (and others) to prioritize gender mainstreaming;

[85] p24 Annual Performance Report (2019) https://www.greenclimate.fund/document/2019-annual-performance-report-fp072-strengthening-climate-resilience-agricultural

[86] In this respect, GCF has an overarching Environmental and Social Policy (https://www.greenclimate.fund/document/revised-environmental-and-social-policy) and an Indigenous Peoples Policy (https://www.greenclimate.fund/document/indigenous-peoples-policy) that cover aspects of vulnerability. In July 2019, the GEF updated its Environmental and Social Safeguards Policy (https://www.thegef.org/sites/default/files/documents/gef_environmental_social_safeguards_policy.pdf)and since 2012, has put in place Principles and Guidelines for Engagement with Indigenous Peoples https://www.thegef.org/sites/default/files/council-meeting-documents/C.42.Inf_.03.Rev_.1_Principles_and_Guideline_for_Engagement_with_Indigenous_Peoples.Sept_10%2C_2012_4.pdf

- **Encourage bilateral donors to sensitize national governments on gender issues** and make it more fruitful to integrate this dimension into their planning and decision-making;
- **Identify the levels and entry points where gender is relevant / useful**, recalling, for example, TNA, which shows that this dimension can "help prioritize technologies" as certain technologies impact women more;
- **Recognize that the issue is [also?] vulnerability, not [just] gender, per se**[87]. The sections of society that will suffer fastest and deepest from climate change are those who are most vulnerable ("society's most powerful groups have the most influence in deciding which groups are the most vulnerable, and therefore most impacted"); broadening the scope to focus on those most vulnerable – rather than gender, per se – could pragmatically foreground attention on those groups most severely impacted by climate change, although arguably would still leave the women in this sector as the most negatively impacted (¶57).

3.4 Stakeholder Engagement

62) The Parties have long encouraged the adoption of practices that promote the participation of stakeholders in consultations and decision-making processes related to the Convention and its Protocols. The Operating Entities have reflected its pivotal importance by establishing their own policies and guidance, as well as setting requirements for their implementation intermediaries' policies, procedures and capabilities related to stakeholder engagement. The GEF positions effective public involvement as "critical to the success of GEF-financed projects"[88] and a key strategic lever to mitigate operational risk and tap the financial and non-financial resources of the private sector. Working with multi-stakeholder platforms is seen as essential to transform markets and economic systems at the scale required to drive the uptake of low-carbon and climate-resilient solutions [89]. GCF has operationalised its priority for stakeholder engagement by embedding it within environmental and social safeguards, linking it with its sustainability guidance, and requiring its Accredited Entities to establish meaningful consultation and engagement processes[90].

63) While there are regular mentions of the need for and commitment to engaging stakeholders and notions that this approach will build needed local capacities and benefit these actors, the set of TEs and MTRs used as the basis for project review provides very limited visibility of measures and strategies that projects have actually adopted where stakeholder engagement has proven key to accelerating action on technology development and transfer. There was mention of "getting a mixed audience", "including youth as part of the consultations", and "giving women and men an equal chance to participate".

64) Stakeholder engagement and national ownership are fully embedded in the TNA process across all countries participating in the global TNA project, and all TNA processes are run by a National TNA coordinator (nominated by the government) and local/national expert consultants. UNEP's global TNA project provides tools, training on tools, technical backstopping and guidance/advice/reviews in addition to resources for national/local expert

[87] UNDP and the Global Gender and Climate Alliance. Their joint 2013 ***Policy Brief: Linkages between Gender and Climate Change*** positions climate change as hitting the poorest the most; as women in developing countries highly depend on local natural resources for their livelihood (as they are traditionally charged with securing water, food, and fuel for cooking and heating), they face the great vulnerability to climate change – while also experiencing unequal access to resources and decision-making processes, with limited mobility in rural areas. In this light, poverty and climate change are intricately related: the poorest and most disadvantaged groups tend to depend on climate sensitive livelihoods (e.g. agriculture), which makes them disproportionately vulnerable to climate change. https://www.undp.org/content/dam/undp/library/gender/Gender%20and%20Environment/PB1-AP-Overview-Gender-and-climate-change.pdf

[88] Through its potential to improve project performance/impact by: (a) enhancing country ownership and accountability; b) addressing social and economic needs of affected people; (c) building partnerships among Agencies and stakeholders; and (d) harnessing the skills, experiences and knowledge of a wide range of stakeholders, particularly CSOs, community and local groups, and the private sector, as noted in the GEF Policy on Stakeholder Engagement (November 2017) https://www.thegef.org/sites/default/files/council-meeting-documents/EN_GEF.C.53.05.Rev_.01_Stakeholder_Policy_4.pdf

[89] GEF's (2021) Report to the GEF: p XIV ¶35; p26, ¶19(b); p30 ¶35

[90] As per its Environmental and Social Policy, GCF requires its Accredited Entities, including intermediaries, to ensure the effective engagement of communities and individuals, including transboundary, vulnerable and marginalized groups and individuals that affected or are potentially affected by the activities proposed for GCF financing. Stakeholder engagement plans must be developed to describe disclosure of information, meaningful consultation and informed participation in a culturally-appropriate and gender-responsive manner, and, in certain circumstances, free, prior informed consent, as required pursuant to the ESS standards of GCF. The Indigenous Peoples Policy also requires GCF's Accredited Entities to undertake an engagement process with indigenous peoples, where appropriate, through meaningful consultation, which is defined in the policy." https://www.greenclimate.fund/document/sustainability-guidance-note-designing-and-ensuring-meaningful-stakeholder-engagement-gcf

consultants. The following insights provide useful food for thought:

- **Importance of considering possible funders for TAP activities as early as possible** – in cases where a specific funding organisation is foreseen, the TAP could be developed with the requirements of this funder in mind; when the funding source is not yet clear, the TAP could be developed as a 'concept document' with basic information on the proposed activities, so that an action plan can be offered to a range of potential funding sources in a later date[91] (this approach has been integrated into UNEP's TNA Phase IV implementation);
- **Challenges in accessing stakeholders reflects weaknesses in networks and capacities** – UNEP's implementation revealed that local people know they have to engage multiple stakeholders, including youth, women, indigenous peoples but reportedly didn't have the tools and typically only have access to one group: government; the TNA team in Lebanon bridged these gaps by recruiting technical experts who had reputation/expertise recognized by their peers and already had their networks (think tanks, academics). The government supplied the network from its side (institutions);
- **Imbalance in knowledge across stakeholders hampers effective discussion** – while recognizing the importance of engaging the 'right' stakeholders in key steps of project implementation to brainstorm ideas, achieve consensus, and avoid subsequent obstacles ("there's a risk of people putting sticks in your path so you invite them to the table to have peace of mind"), this assembles a diverse mix of understanding and capabilities; UNEP's TNA Phase II project partially covered the gaps via preparation of factsheets to provide all participants with similar baseline information; however, "there was still a need for further action";
- **Pursuing a fit-for-purpose phased approach** – experience from Lebanon's TNA showed that large consultations that allowed for brainstorming together were appropriate at the early stage to come up with "quick wins" and ideas that would not face a lot of institutional hurdles "in order to get something happening". In the subsequent phase, the style of stakeholder engagement shifted away from technical experts and the academic sector to focus on decision-makers, using a 1:1 approach, working on a specific technology, with the expectation that inputs will be developed and taken forward into the legal framework.
- **Insufficient meaningful engagement of private sector actors** – they have had limited involvement in TNA ("missing in the process of identifying needed technology and how it will be scaled up"); in other processes, it was reported that business community representatives are brought in observers and "they feel as observers" ("they participate in 20 sessions but they are not directly involved"); UNEP's Phase II TNA evaluation (covering 28 countries) confirms limited involvement and "hesitation" of private sector actors, linking this to "limited funding, long process, mainly government-driven process, rather weak private sector in many of the countries"; insufficient representation via organisations (like CSOs); and their "doubt about the value of the process" – and recommended improved engagement with the private sector.

Private Sector Engagement

65) Public private partnerships were included as a key PSP element, reflecting the conviction that the private sector is the most significant source of capital for climate-related financing (and due to the requirements for bankable projects, all too often, the only source). Acknowledging the Parties' longstanding interest to work effectively with the private sector to support technology development and transfer, both Operating Entities have undertaken efforts to deepen private sector engagement. GEF prioritizes partnership with the private sector: it approved a Private Sector Engagement Strategy in November 2019 and has had in place since 2012 a Non-Grant Instrument available to both public and private sector recipients[92]. GEF-7 programming promotes the transfer of low-carbon and climate-resilient technology, deployment, and innovation, especially for sustainable energy breakthroughs. GCF also puts a high emphasis on boosting private sector engagement, utilizing its Private Sector Facility as a key vehicle leading this effort. Furthermore the GCF Secretariat's ongoing

[91] Mentioned on p3 of TEC Draft Paper (11 October 2019) Experiences, Lessons Learned and Good Practices in Conducting TNAs and Implementing their Results https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/9c6eeaa690534874bbcbb85bada9882c/b566fb9540cd4932b5503a0518d2af94.pdf

[92] GEF's Private Sector Engagement Strategy is accessible from https://www.thegef.org/sites/default/files/council-meeting-documents/EN_GEF_C.57_06_GEF%E2%80%99s%20Private%20Sector%20Engagement%20Strategy_1.pdf; its Non-Grant Instrument is described here: https://www.thegef.org/topics/non-grant-instruments

promulgation of Request for Proposals (RFPs) for Climate Technology Incubators and Accelerators is seen as a direct response to guidance from the COP[93], building on the work of the TEC and the CTCN in this area[94].The following initiatives drawn from the reviewed dataset show the power of private sector engagement:

- GEF-funded, UNIDO-implemented project (2011-2015) in the Russian Federation[95] was anchored on strong cooperation between the private sector and government, specifically engaging private actors in the HCFC phase-out technology and equipment conversion. Private sector engagement was reported as strengthening ownership of the project's results on the part of target beneficiaries;
- GEF-funded, World Bank-implemented project (2011-2015) in China's Guangdong province[96], which promoted green freight technologies, attributed its success to partnership with public and private sector stakeholders; this engagement served to mobilize USD 8.02 million in private sector investment (which was eight times the estimated amount at appraisal) plus USD 11.47 million of government funds;
- GCF-funded readiness support rolled out by UNIDO (from 2019) in Cambodia[97], under its Programme for Country Partnership (PCP)[98], led to a full-project proposal that explicitly aims to engage private sector actors in climate action in special economic zones as well as build their capacity;
- GCF-funded readiness support implemented (since 2018) by the Caribbean Community Climate Change Centre (5Cs)[99] in The Bahamas[100] is unlocking private sector contributions to climate action using a phased approach: Phase 1: Diagnosis/ Barrier Analysis; Phase 2: The National Conversation i.e. convening a Public-Private Dialogue Forum; Phase 3: Elaboration of a clear plan to accelerate climate action through strengthened partnership and capacity building to design and implement transformative projects.

66) Considerations that emerged from a review of the project documentation and the exchange with interviewed stakeholders points to ways in which private sector engagement and leverage could be improved:

- **Seize the 'right' time and 'right' actor**: private sector (and government) actors need to be engaged at the 'right' moment: "too early contact can lead to disappointment and drop-out", "too late contact can lead to challenges during the implementation phase"[101]; however, certain private sector actors (especially climate technology developers) have a critical role to play in identifying opportunities, which suggests that the way in which they are brought into discussions needs to be reconsidered.

- **Manage expectations**: interest in possible investments arising from identified project proposals is seen as the trigger for private sector engagement; however such actors may doubt the value of the process and be unsure about time commitments. Challenges in garnering support from private investors were also mentioned in relation to concerns about the ability to subsequently turn a profit[102]. Looking to countries that were more successful in connecting with this group, as well as getting the timing 'right', successful engagement has stemmed from preparing/articulating a compelling value proposition (*What's in it for us*?

[93] By decision 13/CP.21, the GCF Board was invited to consider ways in which the GCF could facilitate access to environmentally-sound technologies in developing countries and support collaborative technology research, development, and demonstration to enable developing countries to enhance their mitigation and adaptation action. Source: ¶97, GCF Report to the COP (2021) https://www.greenclimate.fund/document/gcf-b29-03

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

[95] http://www.unido.ru/eng/project/current_projects/phase_out_of_hcfcs/

[96] https://projects.worldbank.org/en/projects-operations/project-detail/P119654

[97] https://www.greenclimate.fund/sites/default/files/document/readiness-proposal-cambodia-unido.pdf

[98] https://www.unido.org/sites/default/files/files/2021-06/PCP%20Cambodia%202019%20Annual%20Report.pdf

[99] In 2015, GCF accredited 5Cs as a Regional Implementing Entity (Direct Access Entity). Coordinating the Caribbean region's response to climate change, 5Cs is implementing GCF-funded readiness support in 11 of its 14 member states https://www.caribbeanclimate.bz/

[100] https://www.greenclimate.fund/countries/bahamas says these resources are actively supporting government in its role to create a favourable environment for attracting private investment towards national climate change programs/targets -- and advises the public sector to learn about private sector motivation to invest in climate-resilient/low carbon technologies and mitigation activities, and the associated risks and barriers. Through such dialogue, it is envisaged that appropriate policy/instruments could be developed to enhance private sector participation in adaptation and mitigation frameworks and investments.

[101] Lesson learned UNEP TE 2020, p79 https://wedocs.unep.org/handle/20.500.11822/32207

[102] Lesson learned UNEP-ADB TE 2020, as reported by GEF to COP26 (30 September 2020) on p125 https://www.thegef.org/sites/default/files/documents/GEF_Report_UNFCCC_COP26.pdf

- *Why should we be involved?*). It has also proved essential to be clear and open about the planning process and objectives and to pay attention to expectation management from the outset to avoid disappointments, frustrations, and exit[103].

- **Build trust**: generating confidence and trust were highlighted as "essential requirements" for the success of most projects. As illustration, the GEF-funded phase-out of HCFCs and promotion of HFC-free energy efficient refrigeration and air-conditioning systems implemented by UNIDO in the Russian Federation was secured through trust and strong cooperation of private sector and national government[104]. On the other hand, the GEF-funded project promoting production and use of bio-ethanol from cassava as a gasoline substitute made limited headway in Lao PDR because insufficient trust was built amongst consumers.

- **Build mutual understanding of opportunity and risk**: There is a strong desire for pilots to target innovative new approaches and technologies – and to leverage private sector contributions towards their realisation. However, investors have demonstrated limited appetite to commit to waiting 1-2 years for the project cycles of development actors to run their course. On the other hand, safeguards inserted into these processes, which may slow the pace of design and approval –exist to heighten quality and impact. Project experience in the Bahamas points to the need to promote dialogue so that the private sector "learns about policy frameworks and government priorities" while public actors "learn about the private sector's motivation to invest" in climate-resilient, low carbon technologies and mitigation activities as well as the associated risks and barriers.

3.5 Critical Enabling Conditions and Good Practices

Evidence from the project evaluations and exchange with stakeholders points to various lessons learned that help assure successful implementation of initiatives with technology components, particularly in light of the desire for sustained results and benefits, replication, and scaling up. These include:

67) **Prioritize the Development of Facilitating Policy/Legislation.** Leveraging understanding of the role of national policy in enabling and hindering technology transfer – and evolving changes in policy and legislation that will typically be required – is key to enabling the adoption of new technology and related business models developed by those intent on its exploitation. A stakeholder explained that replication happened if an activity in the policy space led to creating a conducive environment (e.g. GEF-funded, UNIDO-implemented projects saw scale-up when feed-in tariff schemes were established for energy generated from bio-energy; in St. Vincent and the Grenadines, the government acted to change legislation that allowed the electricity company to implement net-metering as well as tie and feed solar-generated electricity into the central grid – without this intervention, the new renewables concept would have failed; UNIDO's project to establish a bamboo supply chain in Sri Lanka stimulated changes to regulations that were introduced to facilitate bamboo harvesting and transportation – under the condition that the project plantation was part of a 5-year management plan[105]; the success of the SolarChill technology transfer to Colombia, Kenya, and Eswatini was put down to exemptions provided for warehousing and transportation; in Jordan, the "lack of a strategic decision to anticipate activities to create enabling conditions" undermined prospects for successfully transferring the intended irrigation technology [106] ; in Cambodia, while UNIDO was intent on transferring and upscaling biomass-fuelled technologies, there was insufficient appreciation of (and therefore inadequate resourcing to influence) the regulatory framework for supporting the envisaged independent power producers was inadequate"[107]);

68) **Focus on Evolving the Socio-Technological Context, not Technology Push.** In reviewing the GEF-4/GEF-5 technology transfer projects, this portfolio did not perform to expectations due to its underlying technology-centric approach. It reflects an idea to push early-stage commercialisation technologies (e.g. for gasification), which a stakeholder explained, "was done with a view that just by transferring technology into the local context, it can work, without understanding that the socio-technological context must evolve to absorb the

[103] Lesson learned UNEP TE 2020, p80 https://wedocs.unep.org/handle/20.500.11822/32207
[104] Lesson learned UNIDO TE 2018, p14 https://www.unido.org/sites/default/files/files/2019-01/GFRUS-105324_TE-2018_181218-F.pdf
[105] Lesson Learned. MTR 2016, p169 Bamboo for Sri Lanka
[106] Lesson Learned, MTR 2018, p30 SolarChill Development, Testing, and Technology Transfer Outreach
[107] Lesson Learned, TE 2019, p175 Using Agricultural Residue Biomass for Sustainable Energy Solutions

technology cycle". Leveraging the learning of these initial pilots, it is understood that subsequent projects under GEF-5, 6, 7 have been designed with a better understanding of the socio-technology context and how to influence the intermediate/coordinating environment in ways that will facilitate the adoption of technology and also create transformative change; put another way, "there's a process of embeddedness required to get successful adoption and replication of a technology solution";

69) **Build Momentum from Grassroots Demand and Technology Pull**. The review of the PSP-supported projects showed that pilots were more effective and ran more smoothly when they responded to a demand from the users of the technology. Their interest and endorsement exerted an important 'pull', whereas a technology 'push' approach resulted in weakened relevance for country stakeholders and difficulty finding partners willing to invest[108]. An interviewee explained, "for entities that go in and try to change the policy first, that process takes a long time. On the other hand, demand from stakeholders who could benefit from and own the technology typically accelerates policy change".

70) **Technology Integration Relies on Institutional Ownership**. Informants indicated that ownership of technology at an institutional level creates a permanent integration into the country's social and economic fabric. As an example, the success of IDB's GEF-funded project to implement a Regional Centre in Latin America and the Caribbean was attributed to generating ownership on the part of national and local governments. Another means of realising institutional integration was seen in reflecting a project's activities in the work plans of relevant institutions. The need to ensure sufficient resources are included at design was highlighted in order to "engage, convince, and gain political support from the permanent authorities of the most relevant governmental institutions"[109]). UNEP's experience with TNA indicates that: "institutionalisation needs to be the objective; if there is an objective for government to take ownership, then TNA can be driven in a different, much more useful, manner";

71) **Community Engagement Maintains and Sustains**. There also needs to be ownership where the technology will be installed, as well as a deep understanding of baseline conditions in the country, even in the location where the technology is to be adopted. Stakeholder consultation and community involvement are seen as critical in this regard (e.g. community involvement programmes established in various Caribbean nations have been utilized expressly for the purpose of protecting instruments installed in relation to Automatic Weather Stations, even acting to replace batteries when called on;

72) **Outreach to Education/Vocational Actors to Assure Continuation**. Projects that incorporate educational/vocational actors and notions related to capacity-building (i.e. soft aspects, ¶54), and succession build valuable capacity for sustaining benefits (e.g. the GEF-funded, IDB-implemented local solar project in Chile pointed to the achievement of its Photovoltaic Training Programme in developing capacities in technical schools outside the national capital, which reportedly stimulated graduates' interest to launch start-ups, based on their knowledge of the design, operation, and maintenance of small-scale PV systems). One interviewee asserted, "it's fine to install a technology in a country, but what happens when people leave or retire? It's important to have plans in place and a younger generation that can interact with the technology". Another stakeholder linked the notion of building the capacity of the next generation with taking ownership of the technology through establishing succession planning (e.g. the Caribbean Community Climate Change Centre kicked-off an internship programme to build the capacity of students on every aspect of one of its projects, from groundwater recharge to quality testing).

73) **Trust Underpins Adoption**. Technology use and replication are based on trust. UNIDO's transfer of bio-energy technologies (i.e. a simple gasifier or bio-ethanol production) has been more successful in contexts where there are established institutions, cooperative concepts, and trust relations. In LDCs, long-term contracts with suppliers of raw materials are uncommon; yet having trust in stable price and supply is key for building up the value chain. The end user's trust that the technology works is also an essential part of the equation. Pointing

[108] p25, ¶66, TEC (December 2015) by S. Nakhooda: Evaluation of the Poznan Strategic Programme on Technology Transfer: Final Report by the Technology Executive Committee https://unfccc.int/resource/docs/2015/sbi/eng/16.pdf

[109] Lesson Learned. MTR 2018, p66, Climate Technology Transfer Mechanisms and Networks in Latin America and the Caribbean https://www.thegef.org/project/climate-technology-transfer-mechanisms-and-networks-latin-america-and-caribbean

to the case of a solar-water heater promoted in the Middle East as a simple, low-cost, proven, easy-to-replace technology for electric- or gas-fired boilers for water in household and industrial applications, a stakeholder asserted that, "if trust is eroded from the first pilot, it's difficult to build it back". During the first wave of its introduction in Egypt, the system experienced many operational problems, which created a general perception that this technology was low quality. Potential users shunned the system. While neighbouring Jordan witnessed high adoption rates , reportedly linked with high trust in the device (due to having the quality assurance and testing infrastructure in place).

74) **Alignment Incentives Can Change Business as Usual**. Technology adoption and replication are more likely if there has been an influence in the policy space leading to a correction of market conditions. Going from the assumption that industry operates in an incentive environment, even if proven technology is available, a stakeholder indicated that "firms will continue with business as usual, unless there are alignment incentives". This suggests that appropriate incentives included into the enabling environment would logically nudge private sector actors in the direction of climate-resilient, low carbon technologies and mitigation activities. Other shifts in this domain were associated with training public agencies that some technologies need special treatment to overcome the 'green premium' barrier associated with technology development and transfer (e.g. as seen in the HCFC phase-out and promotion of HFC-free energy efficient refrigeration and air conditioning systems in the Russian Federation and in the SolarChill project implemented in 4 African nations).

75) **Clarify the role of intellectual property rights (IPR) in accelerating technology transfer**. A strong IPR regime is seen as a fundamental element that promotes technology development and commercialisation. Yet, IPR does not come up in most project reviews and it has reportedly not been raised by countries in their NDCs. While some stakeholders mentioned that IPR may have a bearing on the potential to engage private sector actors, this did not come through as a primordial challenge in the limited set of projects reviewed for this Technical Paper. The GEF-funded SolarChill project[110] implemented by UNEP in Colombia, Eswatini, and Kenya reflects confusion about ownership rights' effect on private sector participation. The project design for the GEF-funded, UNIDO-implemented pilot to produce ethanol from cassava in Thailand, Vietnam, and Lao PDR did not consider intellectual property rights; however, this was raised as a critical concern by the project's Evaluator, as the project was conceived to overcome policy, market and technological barriers to support technical innovation and south-south technology transfer[111]. Amongst the 24 GCF-funded projects reviewed[112], only one addressed IPR in that it put ownership of project deliverables in the hands of the Implementing Agency and used protections available through procurement procedures to treat IPR[113]. A 2013 UNFCCC synthesis report mentioned that some Parties referred to IPR issues in their TNA reports, mainly in relation to economic and financial barriers (i.e. cost implications to obtain access to certain technologies; policy/legal/regulatory barriers, in particular, regarding lack of IPR protection. This same report indicated that the lack of experts in negotiating IPR contracts was a barrier to the transfer and diffusion of their prioritized technologies and pointed to a need for international cooperation to clarify the role that IPRs play in technology development and transfer.[114]

[110] Key finding of MTR 2018, p27: This project started before "having" a demonstrated, performing, reliable SolarChill technology, meaning that technology transfer happened after field testing. To have a legal right to 'transfer' a technology, one must own that technology. In this project, the only technology owners were the manufacturers themselves: "logically, they won't share their know-how with competitors". The Evaluator observed that what is taking place here is simply a technology development, not a transfer of the basic design ideas, which are or have been generated by the SolarChill consortium https://www.solarchill.org/app/download/7932301956/Final+Report_SolarChill+Project-Midterm+Review.pdf?t=1608650810

[111] Key finding, TE 2018, p12 https://www.unido.org/sites/default/files/files/2019-08/TE-100264_Thailand_Overcoming%20policy%20market%20_Ethanol%20production.pdf

[112] The GCF portfolio consists of 190 approved projects (as of B.30 meeting); only 24 were included in the review for this paper

[113] p18, Section 6.1 of Readiness Support Request, "Technology needs assessment and action plans for the support of climate-friendly technology implementation in Cambodia's special economic zones" indicated that all final IPR of project deliverables will have UNIDO ownership, all 3rd party IPR will comply with the terms of the GCF-UNIDO Readiness Framework Agreement, and that UNIDO would undertake to ensure, through procurement procedures, that contracted services do not violate or infringe any industrial property or intellectual property right or claim of any third party.

[114] p41, ¶133 Third Synthesis Report on Technology Needs Identified by Parties not included in Annex I to the Convention (21 October 2013) https://unfccc.int/resource/docs/2013/sbsta/eng/inf07.pdf

In considering the IPR issue, stakeholders noted that "many people working on the technology side are not trade or IPR experts"; consequently, "that side of government policy has not been addressed". Moreover, a large part of technology transfer work has been in terms of economic and technical feasibility and standards-setting, "not looking at why a technology owner is not willing to provide a technology to manufacture in a country" or hesitates to develop local industry to provide its components. In reflecting about the deepening of private sector involvement in conjunction with the privatization of government assets, another interviewee mentioned that understanding who has the rights to a technology becomes an issue "when countries feel they may lose national assets if aspects are divested to private individuals who might have only a profit motive".

3.6 Key Challenges

The review of projects and input from stakeholders revealed ongoing challenges to consider in efforts to make the support provided for climate technologies even more effective, ideally spurring transformational change:

76) **Dealing with COVID-19 Effects**. As a matter of first order, in their latest reports to the COP[115], both Operating Entities highlighted the magnitude of effects of the COVID-19 crisis, and their pandemic response. Recognition of the immensity of these challenges, and elaboration of mitigating measures, are echoed in communications of their Implementing Agencies. At project level, delays in virtually every aspect of operations have been attributed to the COVID crisis (in Mexico: "it's becoming more challenging to find suppliers that can meet technical requirements, delivery times, guarantees and bond conditions, resulting in longer procurement processes…limiting purchases to only one supplier"; no new capacity-building or awareness-raising activities were carried out in 2020 "due to the pandemic[116]; in Eswatini: "COVID-19 exacerbated existing project delays" (related to procurement, negotiation delays with governments in signing MoUs; shipping/customs clearance of SolarChill A units); since the pandemic's outbreak, work in the field with governmental or non-governmental partners has been "extremely challenging due to restrictions on movement", impacting project implementation[117]; in Sri Lanka: "delivery and instalment of imported equipment was stalled for months"[118].

77) **Realistic Understanding of Absorption Capacity**. While the bulk of projects under review include capacity-building elements, the extent to which the provided inputs, TA, and technologies can be absorbed within 3-4 year project timeframes differs dramatically across settings ("SIDS and LDCs are vulnerable, with few resources, and their development capacity is very low"). An illustrative example is drawn from the GEF-supported, IFAD-implemented irrigation project in Jordan where beneficiaries (poor farmers) were not able to adopt the agricultural practices nor make use of the new technologies being promoted during the project's implementation, despite its extension to a 7-year duration[119]. UNEP's experience with TNA echoes this message: reportedly, no countries have done another round of the TNA exercise on their own: TNA has made countries familiar with what they can do, but for the most part, it has "not been able to create a sustainable structure in the country so that TNA process could be reproduced and replicated". A stakeholder advised, "you really need to consider the demand of a country, province, or community based on capacity and capability to absorb the technology and market size". Where there is no market to commercialize the technology, this stakeholder contended "it is not appropriate to transfer technology to them to develop", asserting that "all these initiatives and support for small countries and provinces that have limited population are not very

[115] GCF/B.29/03 (7 June 2021) 10th Report of the Green Climate Fund to the Conference of the Parties of the United Nations Framework Convention on Climate Change https://www.greenclimate.fund/sites/default/files/document/gcf-b29-03.pdf and Report (30 September 2020) of the Global Environment Facility to the Twenty-sixth Session of the Conference of the Parties of the United Nations Framework Convention on Climate Change https://www.thegef.org/documents/report-gef-26th-session-cop-unfccc

[116] GEF 2021 Report to the COP (p144) regarding IDB-implemented project in **Mexico**: Entidad ejecutora del Proyecto de Promoción y Desarrollo de Tecnologías Eólicas Locales

[117] GEF 2021 Report to the COP (p146) regarding UNEP-implemented project in **Colombia, Kenya, Eswatini, Swaziland**: SolarChill Development, Testing, and Technology Transfer Outreach

[118] GEF 2021 Report to the COP (p151) regarding UNIDO-implemented project: Bamboo Processing for **Sri Lanka**

[119] p45, ¶125 and p51, ¶148/Recommendation #8, TE 2018, "Irrigation Technology Pilot Project to Face Climate Change Impact" documented considerable project delays that prevented the completion of most project activities and outputs. While the new equipment yielded promising results in terms of environmental and socio-economic benefits, most of the project's beneficiaries did not have time to use it in agricultural production during the project's operation – and there appeared to be no provisioning post-project to ensure beneficiaries and local service providers acquired the necessary understanding and capacity to apply climate-resilient agronomic systems and techniques, leading to the effective adoption and adequate use of the transferred technologies

meaningful". In technology transfer projects channelled into settings where there is insufficient capacity to absorb, the risk is that "it has to be run by outsiders" as there are few local people who can understand and carry on the work.

78) **Enabling Recipient Country 'Agency'**. Throughout the project documentation and exchange with stakeholders, country ownership [120] was linked with achieving legitimacy, sustainability, and transformational change ("engaging and generating ownership of national or local governments is critical to make the long-term objectives of a project - which are largely to be executed by the private sector - legitimate and sustainable"[121]). In exercising ownership, on the technology transfer front, recipient countries can benefit from (TNA) support in identifying their own needs and priorities and can actively set out to address these by tapping available tools, programmes, and projects (e.g. through Readiness Support, projects with technology elements, etc.).

79) On this landscape, the Financial Mechanism's Operating Entities are following the purposes for which they have been established, which are reflected in their missions, strategies, and programming directions. The GEF is a financial mechanism serving five Conventions, including the UNFCCC to administer part of international climate funds. The GCF was created to support developing countries' efforts to respond to climate change challenges. Its concept of establishing Direct Access Entities (DAEs) was described as "transferring implementing agency functions from third parties to accredited entities" – which is expected to enhance the level of country ownership and oversight, according to the GCF-funded readiness project in The Bahamas[122]. On the GEF side, it was reported that there is low understanding of the GEF by technology stakeholders, who do not understand the mandate of the GEF nor its operational modalities and the opportunities that exist and how they interface with entities, such as the CTCN. Furthermore, coordination between the different stakeholders is fragmented.

80) **Projects Versus System-Level Response**. The 2015 Paris Agreement has ambitious goals that call for radical emission reductions to limit global temperature rise to 1.5°C or well below 2C. In turn, the international community has generated a raft of initiatives, programmes, and projects to contribute to the world's Sustainable Development Goals (SDGs). While one stakeholder declared that "everything we do needs to be consistent with the pathway of keeping global temperature to a 1.5°C rise", others pointed to the contradiction inherent in the treatment of climate as "a limited part of everything, as a subset of nice things that we can and must do, so then we come up with projects: a mass transit project, an energy project, and so on" – implying that such a compartmentalized, project management-driven approach is increasingly veering away from what is needed to tackle the immensity of the challenge. Interviewed stakeholders rallied around notions that climate "is about changing mindsets", "working at a system level"; "must be embedded in development" and incorporate a long-term perspective, while highlighting a key challenge of doing "something that affects mitigation or adaptation in the short-term but aggravates the situation in the long-term". To address this challenge, the GCF's IRMF is actively used to assess how its investments deliver climate results and contribute towards shifting behaviour towards low-emission and climate-resilient development pathways. Recognizing that complex existing emerging challenges require the drivers of environmental degradation to be addressed in an integrated manner, the GEF has shifted its programming towards a more integrated approach[123]. Of note,

[120] While this notion was not elaborated in interviews conducted for this assignment, from evaluations carried out by the Consultant on relevant projects, the following features were typically mentioned: project execution in national hands, activities administered through a national legal entity with an associated governance structure; creation of an advisory structure with key representatives expected to coordinate activities with those institutions seen as benefitting from a project's support and therefore having an interest in sustaining its benefits. Country ownership is typically "indicated" by participation in terms of human resources and financing.

[121] p64, Section 7.1, MTR 2018: "Climate Technology Transfer Mechanisms and Networks in Latin America and the Caribbean Project"

[122] p12, Readiness Proposal with CCCCC for the Commonwealth of Bahamas (December 2018) assets that "direct access will enable proper reliance on and harmonization with national systems, plans, and priorities; help increase the speed of delivery of desired outcomes; eliminate transaction costs by 'domesticating' core activities; and potentially achieve better targeting of national priorities." https://www.greenclimate.fund/sites/default/files/document/readiness-proposals-bahamas-ccccc-strategic-frameworks.pdf

[123] Environment-related investments previously made in an isolated manner are now connected in combined portfolios seen as more appropriate for addressing complex, multi-faceted challenges. Key features of this integrated approach are: (i) Integrating actions across sectors; or Integration of resources across GEF focal areas; or Integration across supply chains;(ii) Delivering multiple global environmental benefits; (iii) Addressing drivers of environmental degradation at global or regional scales; (iv) Complementing country-level investments with transboundary action and impact at regional or global scales; (v) Mobilizing diverse coalition of stakeholders from relevant sectors for system transformation;(vi) Promote greater private sector engagement; (vii) Fostering knowledge sharing and learning. See https://www.thegef.org/sites/default/files/publications/GEF-2020Strategies-March2015_CRA_WEB_2.pdf

in June 2021, the GEF and GCF jointly defined a Long-term Vision on Complementarity, Coherence and Collaboration[124] to continue strengthening their response and to enhance the planning, implementation and outcomes of their investments.

81) Informants applauded the coherence of the GCF's adamant focus on the scale of reduction of CO_2 emissions (in keeping with its mission), while others asserted that "prosperity and climate objectives need to be linked and integrated in a smart way". Yet others noted that programming directions for GEF-7 and GEF-8 incorporate a complex, system-oriented vision, being translated into higher ambition levels, consistent with the urgency and scale of climate change. However, recipient countries, particularly LDCs, were described as having a high degree of political risk; this shapes the environment for technology adoption. Frequent changes in priorities, governments, civil servants, and broader societal conditions are seen to require adaptive responses built directly into project design (which is challenging to deploy in current protocols that "box inputs and outputs into results frameworks that are difficult to adjust"). The experience and achievements of the GEF-4/5 projects reviewed point to the need for more adaptability in time horizons and the overall project intervention model as well as a "higher risk tolerance in the whole value chain of support for technology transfer".

4 Key Messages

82) **Increasing complexity of project architecture may reduce adaptive, context-dependent approaches.**

Urgency to reverse accelerating climate change demands a higher ambition level. In turn, this seems to be bringing increased complexity and rigidity in projects designed to deal with the incumbent challenges. Such complex project architecture risks becoming misaligned with the dynamic nature of the recipient environment (which may hamper technology development and transfer) and may overlook opportunities for more effective context-dependent response strategies.

There is shared understanding of and conviction in the value of technology as a key instrument to address climate change (¶12). Operating Entities' initiatives to scale up the level of investment for technology transfer to assist developing countries in addressing their technology development and transfer needs are evident under the PSP funding windows created in 2008 (¶9) and follow-on GEF-funded mitigation and adaptation projects with technology-related objectives (¶13), strengthened by GCF support that came online through its RPSP and climate change portfolio (¶10).

In light of the IPCC's recent report[125], consensus and momentum are building around the urgent need to reduce global GHG emissions to net zero[126], bolstering the case to assist vulnerable nations in mitigating and adapting to the increasingly unavoidable effects of climate change. The technology-centric "push" strategy reflected in GEF 4-/5 funded projects did not reach the envisaged outcomes for transfer and replication [¶68), ¶69)]. Both Operating Entities have raised their ambition level – embodied in the GEF's system-oriented, integrated programming directions and the GCF's Updated Strategic Plan; both are aimed at accelerating transformative change (¶10). Their ability to adaptively respond to local contexts with a high degree of political risk, varying levels of absorption capacity (¶77), frequent changes in priorities, governments, civil servants, and broader socio-economic conditions that shape the environment for technology adoption and use (¶81) will be key to the effectiveness of future interventions. Frequent changes in priorities away from desired climate action would not be desired. Strong enabling environments, which include stable and high-level buy-in from partner countries, are equally critical to country-driven aspects.

[124] https://www.thegef.org/council-meeting-documents/long-term-vision-complementarity-coherence-and-collaboration-between-gef

[125] Launched 9 August 2021, this first instalment of IPCC's 6th Assessment Report (AR6, to be completed in 2022) indicated climate change is "widespread, rapid, and intensifying". Essential for "understanding where we are headed, what can be done, and how we can prepare", this report offered a clear picture of past, present, and future climate — and updated the likelihood of crossing the global warming level of 1.5°C in the next decades unless there are "immediate, rapid and large-scale reductions in GHG emissions" https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/

[126] Refer to Article 4 of the Paris Agreement available from https://unfccc.int/files/home/application/pdf/paris_agreement.pdf

Programmatic approaches[127] may well be a vital approach to achieve the needed global emissions cuts. Deploying approaches that require little adaptation for implementation in additional geographies/settings (¶22) can galvanize replication and scaling up, more systematically spreading critical climate technologies in key sectors. A programmatic approach can create momentum by setting stretch targets; for instance, to get from 50% renewable energy in 2022 to 80% in 2030, from 20% electric car sales in 2022 to 80% in 2030, from 1 million installed heat pumps to 5 million in 2030. Other strategic levers have also proven effective for successful technology transfer and localization [agility, adaptive response built directly into project design, space for experimentation, unorthodox piloting; ¶11)]. In heterogenous project contexts, development actors can select from a repertoire of strategies[128] (see **Table 2**) to allow for generally applicable approaches, where appropriate, and foster dexterity and localization in other settings, as reflected in project experiences with technology transfer considered in this review (¶11) and academic literature regarding technology diffusion. Reviewing the experience and results of more recent GEF/GCF-funded projects with technology elements would undoubtedly also help for pinpointing factors and criteria that could be applied in filtering strategies**.**

Table 2: Situational Strategies to Accelerate Climate Technology Action

All can be effectively and efficiently deployed, depending on the context

Type of Strategy	Context for Application
Cookie Cutter (industrialised)	No customization needed. Low Cost Proven modules that work irrespective of context
Templates (standardized)	Generally applicable, requiring minimal customization to be highly effective. Some costs will be involved for each new setting.
Niche Approaches	Fully tailored. High cost. Should only be used for tipping point contexts.
Leveraging	Opportunistic. Due to tailoring, likely to be high cost. Can be prepared through effective scenario planning

83) **Achieving ambitious climate goals needs inter-actor collaboration and alignment.**

This could be powered through even stronger linkage of transformational climate technologies to NDCs, which would ideally streamline diverse actions and channel efforts towards the common endeavour.

International- and national-level coordination have long been recognized as key to achieving ambitious climate change goals[129]. The gap in collaborative work amongst national focal points was previously put forward to the TEC as an area for improvement. This gap is driven by various factors, including the proliferation of focal points (¶23). Efforts have subsequently been made to enhance coordination; notably, the funds (GCF, GEF, AF, CIF) hold regular exchanges, including an annual dialogue of funds, annual roadmap of joint activities that support a range of issues (programming, capacity building, knowledge management, etc.) – to advance collaborative work on complementarity and coherence. While the different contact points add to complexity at national level, national sovereignty is paramount. The reviewed projects highlight important principles with respect to establishing a National Centre of Excellence for Technology (¶23), working through existing institutions (¶31), avoiding the establishment of new structures that generate parallel networks (¶40), using STAR allocations (¶79), and integrating TNA into political decision-making (¶34).

Interviewed stakeholders asserted that “whatever is identified to be sourced from the GCF and GEF should be anchored in meeting the targets of the NDC”. Given its “self-obligating” nature and legitimacy in reflecting national government priorities (¶34), bolstering linkages to a country’s NDC seems to be a logical trajectory

[127] Relevant successes in using a programmatic approach can be drawn Germany, WRI’s report, and IEA’s Net Zero by 2050 Report: A Roadmap for the Global Energy Sector (May 2021) https://www.iea.org/reports/net-zero-by-2050

[128] Developed by the Consultant, inspired by Situational Leadership Theory, which provides guidance for transitioning from a highly directive to fully delegative orientation, in conjunction with the development of maturity (knowledge, competence, commitment) and looking to cues, such as the type of task, nature of the group, etc. Operationalizing this framework involves offering varying degrees of support and direction according to the level of competence (level of skill, experience, knowledge, or behaviour related to a specific task) and commitment (motivation to learn a task and perceived confidence in ability to learn). See www.kenblanchard.com

[129] Amongst others researching climate governance, Hsu, A. and Rauber, R. (9 February 2021) point out the missed opportunities for deeper coordination that could result in more ambitious action in ***Diverse Climate Actors Show Limited Coordination in a Large-scale Text Analysis of Strategy Documents***, Communications Earth and Environment (2, 30 https://doi.org/10.1038/s43247-021-00098-7

for streamlining the diversity of actions and channelling sight towards its common goal, together with encouraging countries to align NDC/TNA prioritization with their requests for support to the Financial Mechanism, MDBs, and the private sector. This approach is consistent with procedures that have already been deployed by institutional actors to instil a direct link to national commitments (¶20).

84) **Inclusion of transformative climate technologies and financial actors, like impact investors, at an early stage could accelerate development of relevant bankable projects.**

Bridging the gap in developing bankable projects could be accelerated by early-stage inclusion of financial actors and impact investors (who typically have a longer-term horizon), together with negotiating mutual understanding of finance and development objectives, including the introduction of transformative climate technologies. Incorporating such an approach as standard practice within project exit strategies is key to reducing later funding barriers as well as embedding climate in development, with a long-term perspective.

While TAPs have made concrete progress in ensuring that the TNA exercise moves beyond an "unsubstantiated wish list" (¶36), there is still a gap in developing bankable projects, ready for financing (¶37). The key to bridging that chasm lays in incorporating financial actors early in the process, reflecting their pivotal role post-project (¶52) and creating space for negotiating a common understanding of finance and development objectives[130], as the basis for heightening prospects to align (i.e. data collection and the descriptions of plans that will eventually need financing) against mutually understood and embraced requirements. Ensuring that such an approach is included in project exit strategies as standard practice would mitigate subsequent funding barriers (¶51) as well as ensure that climate is "embedded in development" and incorporates "a long-term perspective" (¶80).

85) **More efforts are needed to fully tap the power of the private sector for climate-related financing.**

There is widespread conviction that the private sector is the most significant source of capital for climate-related financing. Clarifying the role of intellectual property rights (IPR) may help for channelling private sector resources, support, innovation, and creativity towards technology development and transfer. Leveraging the full potential of private sector participation also relates to drawing such actors in at the 'right time', through compelling value propositions, into contexts that enable agility and adaptive response consistent with the dynamism, absorption capacity, and complexity of recipient environments. The Parties' have a longstanding interest to unlock private sector support for technology development and transfer. While the Clean Development Mechanism (CDM) has been quite successful in facilitating technology transfer and tapping private sector support[131], the full potential of the private sector has not yet been fully realised. Getting the timing 'right' for engagement, building trust, successfully orchestrating involvement through compelling value propositions (¶66), establishing programme/project contexts that enable agile responses (¶82) consistent with the dynamism, complexity (¶81), and absorption capacity (¶77) of the recipient environment (e.g. through optimizing project design/approval timelines; adaptive response built directly into project design (¶81), and clarifying issues related to intellectual property rights have been identified as levers to effectively engaging private sector actors.

86) **More efforts are needed to deepen understanding of the ways in which gender mainstreaming (with its inherent focus on dealing with power asymmetries) can be a key lever to accelerate climate change action.**

While the projects under review offered little visibility of gender mainstreaming measures and strategies that have proven key to accelerating technology development and transfer, the approach to 'nudge' and slowly advance on this agenda reflects the diversity of perspectives regarding the relevance and utility of its link with accelerating climate change action. Strengthening the link with vulnerability and resilience was suggested, in light of perceived co-benefits stemming from community elements in many adaptation

[130] Thereby balancing 'bankability' (see Footnote 6850) with 'governance of common-pool resources' at the heart of addressing climate change challenge; refer to the life's work of Nobel Memorial Prize in Economic Sciences winner (2009) Elinor Ostrom; e.g. (1999), ***Coping with Tragedies of the Commons***, Annual Review Political Science (2:493-535) https://doi.org/10.1146/annurev.polisci.2.1.493

[131] UNFCCC (2010), The Contribution of the Clean Dvelopment Mechanisms under the Kyoto Protocol to Technology Transfer https://cdm.unfccc.int/Reference/Reports/TTreport/TTrep10.pdf

projects (which arguably reflect traditional gender roles in developing economies), seen as offering a further entry point for emphasizing gender sensitivity. However, the core issue of gender mainstreaming relates to addressing power asymmetries.

The Operating Entities and their Implementing Agencies have incorporated gender responsiveness and stakeholder engagement into their policies, communications, and procedures (e.g. templates to apply for Readiness Support, project information forms/project documents, reporting frameworks like the IRMF) to ensure that gender-responsive and inclusive approaches are applied in project design and implementation (¶55). This approach of enhancing awareness, encouraging consideration, and obliging reporting on gender mainstreaming and stakeholder engagement appears to be 'nudging'[132] action and slow advance, against the backdrop of diverse perspectives concerning the relevance of gender mainstreaming for accelerating transformative impact through technology transfer (¶60). While the operationalisation of gender policies and guidance took time to permeate project design and implementation – this topic has gained more traction following the institutional strengthening of guidance on this dimension. Adaptation projects were particularly able to leverage the notion of co-benefits pertaining to gender aspects; this assumes that (developing country) societies are embracing traditional gender roles (¶57)], suggestive of a stronger entry point potential than those aimed at mitigation.

5 Issues for Further Consideration

87) During the course of the analysis for this Technical Paper and through feedback for its finalisation, several areas emerged of interest to the TEC and could benefit from further analysis, which is beyond the scope of this current Technical Paper:

- Developing insights from policy and practice with a more specific focus on Gender Mainstreaming in climate technology-related programming – which would go beyond the insights and key messages from the review of a limited set of GEF- and GCF-implemented projects.
- Review of the work of the TEC, CTCN, and GCF on incubators and accelerators[133], including to what extent the collaboration with TEC and CTCN has influenced the GCF's programming on incubators and accelerators.
- Identification of elements that constitute a strong enabling environment and would function to drive stable, high-level buy-in from partner countries for technology development and transfer.
- Effects of changes made by the Operating Agencies in their project design cycles and reporting in terms of improving project reporting that informs about the state and level of adoption of critical transformative climate technology and progress vis-à-vis achieving the Paris Agreement, possibly on a sectoral level, for key sectors and key technologies.

[132] Nudge Theory (built on political theory and behavioural economics and sciences) was brought to prominence by Nobel Prize-winning economist R. Thaler (with C. Sunstein, in their 2008 book, **Nudge: Improving Decisions about Health, Wealth, and Happiness**) referring to influencing behaviour without coercion, offering insights into how to prompt people to take decisions that can be difficult but benefit them in the long term.

[133] https://www.greenclimate.fund/news/gcf-joins-un-bodies-to-help-entrepreneurs-embrace-climate-technology and https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/incubators_index/ee343309e8854ab783e0dcae3ec2cfa6/c172d2f388234bdbbe3dd9ae60e4d7e9.pdf

Annex 1: List of Interviews Conducted

#	Organisation	Informant	Current Function
1	Global Environment Facility (GEF), based in Washington, D.C., USA	(Ms) Chizuru Aoki	Leads engagement with 5 international conventions; oversees its climate change work, including through Least Developed Countries Fund (LDCF) and Special Climate Change Fund (SCCF)
2	Global Climate Fund (GCF), based in Incheon, South Korea	(Mr) Hansol Park	Multilateral Governance Officer
3	Climate Technology Centre and Network (CTCN), based in Copenhagen, Denmark	(Mr) Rajiv Garg	Regional Network, Climate Technology Centre and Network, Economy Division and Member of TEC Taskforce
4	(Pilot) Asia-Pacific Climate Technology Network and Finance Centre (ADB, UNEP), based in Philippines	(Mr) Xuedu Lu	Advisor, Regional and Sustainable Development Department, ADB Principal Climate Change Specialist, Climate Change Program Coordination Unit Regional and Sustainable Development Department
5	ACTFCN - African Climate Technology and Finance Centre and Network (implemented by AfDB), based in Cote d'Ivoire	(Mr) Ayanleh Daher Aden and (Mr) Guirane Samba Ndiaye	Senior Environment & Climate Finance Officer, Environment and Climate Finance Division, African Development Bank (AfDB)
6	Centre for Latin America and Caribbean (implemented by IDB, based in Washington, D.C., USA)	(Ms) Karla Espinoza and (Mr) Claudio Alatorre	Climate Change and Sustainable Development Sector, Inter-American Development Bank (IDB)
7	Project Coordinator for Lebanon's Technology Needs Assessment (TNA) and Member of Lebanese delegation to UNFCCC	(Ms) Léa Kai Aboujaoudé	Head of Climate Change Unit, Ministry of Environment
8	Works inside Ministry of Environment, which is GCF's Nationally Designated Authority (NDA) for Cambodia, UNFCCC Coordinating Officer in Cambodia and National Focal Point for the Inter-governmental Panel on Climate Change (IPCC)	(Mr) Sum Thy	Climate Change Department, Ministry of Environment and Climate Change Alliance (CCCA) Manager
9	GCF Accredited Entity Caribbean Community Climate Change Centre (5Cs), based in Belize	(Mr) Donneil Cain	Head of Project Development Unit
10	NDC Partnership In-Country Facilitator for Grenada	(Mr) Spencer Thomas	Ambassador and Special Envoy for Multilateral Environmental Agreements; lead negotiator for climate change and biodiversity; ex-member of CTCN Advisory Board
11	UNEP, based in Paris, France	(Mr) Mark Radka	Acting Director, Economy Division
12	UNEP, based in Bangkok, Thailand	(Mr) Sudhir Sharma	Focal Point, GEF CCM and Regional Liaison, CTCN, Asia Pacific Office
13	UNEP, based in Paris, France	(Ms) Ruth Zugman Do Coutto	GEF Focal Point for Climate Mitigation Projects, Economy Division
14	UNIDO, based in Vienna, Austria	(Mr) Stephan Sicars	Director, Environment Department
15	UNIDO, based in Vienna, Austria	(Mr) Tareq Emtairah	Director, Energy Department
16	Independent, based in The Hague, The Netherlands	(Mr) Frans Verspeek	Conducted Terminal Evaluation of UNEP's Phase 2 TNA project
17	Independent, based in Montreal, Canada	(Ms) Anne-Marie Verbeken	Conducted 2019 PSP Review for TEC

Annex 2: Interview Protocol

Background

The Secretariat of the United Nations Framework on Climate Change (UNFCCC) has mandated the development of a Technical Paper on experiences and lessons learned from support for climate technologies provided by the Financial Mechanism's Operating Entities (GEF, GCF) with a view to enhance operation of the Technology Mechanism and collaboration between the Technology Mechanism and the Financial Mechanism

This Technical Paper is an input to the upcoming September 2021 meeting of the Technology Executive Committee (TEC), and may subsequently contribute to developing a Policy Brief to submit to the COP

All input provided to the Consultant is held confidence, not attributed to any individual or their institutions and used only for the purpose of distilling learning, enriching the perspectives of the overall set of stakeholders, and contributing to the development of the Technical Paper, as a complement to information documented within Terminal Evaluations (TEs) and Mid-Term Reviews (MTRs) provided on the selected set of projects reviewed through this inquiry (see list in separate attachment)

Key Questions

1)	What is the relevance and impact of the support being provided ?
2)	What instances spring to your mind where implemented projects have been replicated (or have this potential) ?
3)	Are you aware of good examples where financial support been successfully linked with achieving sector technology development and transfer targets in recipient countries ?
4)	In which ways has gender mainstreaming proved useful in accelerating technology development and transfer action?
5)	What are the critical enabling conditions that underpin successful implementation of projects with technology elements (especially those with replication potential) ?
6)	What key challenges are being encountered in providing support for climate technologies ?
7)	Is there any further input or perspective that you would like to share ?

Annex 3: Materials Consulted

Related to the Technology Mechanism

Decisions of the COP and CMA related to technology development and transfer (COP Decision 4/CP.17 for TEC modalities and procedures) https://unfccc.int/ttclear/negotiations/decisions.html

FCCC/CP/2014/6 Documented submitted: Linkages between the Technology Mechanism and the Financial Mechanism of the Convention: recommendations of the Technology Executive Committee https://unfccc.int/sites/default/files/resource/docs/2014/cop20/eng/06.pdf

TEC/2018/16/7: Updated Paper on Linkages between the TNA and NDC Process https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/40067a60235c4b1c9737e9abf532003a/e8a0bd09bec44237934ee7ed569b2d9d.pdf

UNFCCC Standing Committee on Finance (2017), Technical Paper on the 6th Review of the Financial Mechanisms https://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/tp_6th_review_31oct_1130.pdf

UNFCCC Technology Executive Committee, 22nd Meeting (20-23 April and 26 April 2021) Concept Note for Preparing a Technical Paper on Experiences and Lessons Learned from Support for Climate Technologies provided by the Operating Entities of the Financial Mechanism https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/954b204c918f45629fcac696f7c0341d/8973108d71eb4d20b3d570eff56026e3.pdf

UNFCCC (2019) Paris Agreement Reporting Requirements: Outcomes from COP24, Outlook to COP 25 https://unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.33/2019/mtg4/S1_2_UNFCCC_COP24_25.pdf

UNFCCC (17 September 2021) NDC Synthesis Report https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs/ndc-synthesis-report

Materials related to the TEC meeting (20-23 April 2021) https://unfccc.int/ttclear/tec/meetings.html

Presentation by the GEF into TEC 22 meeting: GEF Support for Technology Transfer https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/8fd01c60c1114246a64736b75af13701/870af041e1d845fba48da898d14aebe9.pdf

Presentation by the GCF into TEC 22 meeting: GCF Support for Technology Transfer https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/19cff07af05440fc95602c1fe4bd55c6/166f850ea2db4675a6e4499ce1fb0b46.pdf

Working Paper (2013) by Smita Nakhooda: Effectiveness of Climate Finance: A Review of the Global Environment Facility https://cdn.odi.org/media/documents/8632.pdf

Briefing (2015) by Sam Barnard and Smita Nakhooda: Financing Climate Technology: Lessons from Efforts under the UNFCCC https://cdn.odi.org/media/documents/10053.pdf

TEC Report (April 2019) by Anne-Marie Verbeken: Updated Evaluation of the Poznan Strategic Programme on Technology Transfer https://unfccc.int/sites/default/files/resource/7e.pdf

TEC Report (December 2015) by Smita Nakhooda: Evaluation of the Poznan Strategic Programme on Technology Transfer: Final Report by the Technology Executive Committee https://unfccc.int/resource/docs/2015/sbi/eng/16.pdf

TEC (10 February 20201) Rolling Workplan of the Technology Executive Committee for 2019-2022 https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TEC_Documents_doc/34ca4e8b224b4c1d9cebe374cb4d392b/349baae0106e47ae9e2b0d59c3c1d4e1.pdf

TEC Draft Paper (11 October 2019) Experiences, Lessons Learned and Good Practices in Conducting TNAs and Implementing their Results https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/9c6eeaa690534874bbcbb85bada9882c/b566fb9540cd4932b5503a0518d2af94.pdf

Active Technical Assistance Requests to the CTCN (2021) https://www.ctc-n.org/technical-assistance/data

Lee, Woo Jin Lee and Rose Mwebaza (25 September 2020), The Role of the Climate Technology Centre and Network as a Climate Technology and Innovation Matchmaker for Developing Countries, MDPI, https://www.mdpi.com/2071-1050/12/19/7956/htm

IADB (April 2021, Confidential) Poznan Strategic Programme Regional Report for Update on FY21 Technology Transfer Activities for the GEF Report to COP26

IADB (2021, Confidential), Good Practice Briefs Review of IADB-Implemented Projects for GEF-5 Replenishment Period related to Climate Change, Mitigation, and Adaptation

United Nations Climate Change Paris Committee on Capacity-Building (PCCB), July 2019 PCCB Strategic Plan for Stakeholder Engagement, Communications and Resource Mobilization https://unfccc.int/documents/198470 and Communication and Stakeholder Engagement Strategies for the PCCB for the period of the 2021-2024 Workplan https://unfccc.int/sites/default/files/resource/2021-4%20PCCB%20Communication%20and%20stakeholder%20engagement%20strategies.pdf

UNFCCC (20 August 2021) Report on the Second Independent Review of the Effective Implementation of the Climate Technology Centre and Network https://unfccc.int/sites/default/files/resource/cp2021_3_AV.pdf

Related to the Operating Entities of the Financial Mechanism

GEF's Report to COP26 (dated 30 September 2020) https://www.thegef.org/documents/report-gef-26th-session-cop-unfccc

GEF Annual Reports submitted to COP (2008 to 2020) https://unfccc.int/ttclear/support/poznan-strategic-programme.html

GEF (July 2020) Delivering Transformational Change: The Journey of the Global Environment Facility https://www.thegef.org/publications/delivering-transformational-change-journey-global-environment-facility

GEF Good Practice Brief (2021/2) Senegal: Strengthening Climate Resilience through People Centred Approaches (GEF-5) https://www.thegef.org/sites/default/files/publications/GEF_GoodPracticesBriefs_Senegal_r2%20%281%29%20%281%29.pdf

GEF Good Practice Brief (2021/2) Cambodia: Renewable Energy Technology for Smallholder Famers (GEF-6 replenishment) https://www.thegef.org/publications/good-practice-brief-renewable-energy-technology-smallholder-farmers

GEF-7 Programming Directions (April 2018) https://www.thegef.org/documents/gef-7-programming-directions and GEF-8 Programming Directions (April 2021) https://www.thegef.org/sites/default/files/council-meeting-documents/2021_04_22_First_Meeting_GEF-8_PDs_Presentation.pdf

Green Climate Fund description (2017) https://cdn.odi.org/media/documents/11851.pdf

GCF's 10th Report to the COP (2021) https://www.greenclimate.fund/document/gcf-b29-03

GCF Annual Reports submitted to the COP (2008 to 2020) https://unfccc.int/ttclear/support/poznan-strategic-programme.html

Updated Strategic Plan for the Green Climate Fund: 2020-2023 https://www.greenclimate.fund/document/updated-strategic-plan-green-climate-fund-2020-2023

GCF in Brief: Support for Technology https://www.greenclimate.fund/sites/default/files/document/gcf-brief-support-technology_0.pdf

Presentation by Emerson Resende (21 June 2019, Bonn, Germany): The GCF and its TNA Related Activities, file:///C:/Users/joyce/Desktop/UNFCCC%20Mandate/GCF%20Emerson%20presentation%20%20on%20TNA%20related%20Activiites%20June2019.pdf

Presentation by Emerson Resende (9 Sept 2021) GCF Support to Climate Technologies, TEC23 https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/d1500c56909f438c84888fc709715c4c/ae04d9c9e736457fab3e7e8aded1b4a7.pdf

GCF's Integrated Results Management Framework (23 February 2021) https://www.greenclimate.fund/sites/default/files/document/gcf-b28-09.pdf

GCF Project Preparation Facility Guidelines (16 October 2020) https://www.greenclimate.fund/sites/default/files/document/ppf-guidelines.pdf

GCF and UN Women, Practical Manual for Mainstreaming Gender in Green Climate Fund Projects, August 2017 https://www.greenclimate.fund/sites/default/files/document/guidelines-gcf-toolkit-mainstreaming-gender_0.pdf

GCF Annual Results Report (March 2020): Climate Action During the Pandemic https://www.greenclimate.fund/document/annual-results-report-2020

GCF Spotlight: Least Developed Countries (20 March 2021) Factsheet https://www.greenclimate.fund/sites/default/files/document/gcf-spotlight-ldc_1.pdf

GCF Spotlight: Small Island Development States (20 March 2020) Factsheet https://www.greenclimate.fund/sites/default/files/document/gcf-spotlight-sids_1.pdf

CIF-Climate Investment Funds c/o The World Bank Group (2019) 10th Anniversary Report of Mobilizing Finance for Climate Action https://www.climateinvestmentfunds.org/knowledge-documents/10-years-climate-action

CIF (May 2021) FY21 Progress Report on Implementation of the CIF Gender Action Plan Phase 3 related to support provided to multilateral development banks (MDBs) and countries on gender technical assistance https://www.climateinvestmentfunds.org/documents/fy21-progress-report-implementation-cif-gender-action-plan-%E2%80%93-phase-3

Related to Implementing Agencies of the Financial Mechanism's Operating Entities

UNIDO (October 2019) Impact Evaluation of UNIDO's Industrial Energy Efficiency programme Volume 1 https://www.unido.org/sites/default/files/files/2019-11/E-Book%20IEE%20Impact%20Evaluation.pdf

UNIDO, UN Habitat, and FAO-Food and Agriculture Organisation (June 2021) Theme Report on Innovation, Technology and Data: Towards the Achievement of SDG7 and Net-Zero Emissions for the High-level Dialogue on Energy 2021 https://www.un.org/sites/un2.un.org/files/2021-twg_4-062121.pdf

UNIDO (February 2021), Thematic Synthesis of Independent Evaluations of UNIDO Renewable Energy Projects from 2016-2020 https://www.unido.org/sites/default/files/files/2021-06/Thematic%20Synthesis_UNIDO%20Renewable%20Energy%20Evaluations%202016-2020_210406.pdf

UNIDO (July 2021) The Role of Bioenergy in the Clean Energy Transition and Sustainable Development: Lessons from Developing Countries https://www.unido.org/sites/default/files/files/2021-07/New-Publication-Bioenergy.pdf

UNEP DTU Partnership (June 2019) How to Transfer, Finance and Implement Climate Technology https://unepdtu.org/how-to-transfer-finance-and-implement-climate-technology/

KfW (June 2017) Gender Response Plan for FP041: Simiyu Climate Resilient Development Programme in Tanzania https://www.greenclimate.fund/sites/default/files/document/gender-assessment-fp041-kfw-tanzania.pdf

Global Gender and Climate Alliance (GGCA) and UNDP (2013) Policy Brief: Linkages between Gender and Climate Change https://www.undp.org/content/dam/undp/library/gender/Gender%20and%20Environment/PB1-AP-Overview-Gender-and-climate-change.pdf

Other Resources

World Resources Institute and ClimateWorks Foundation (2021), State of Climate Action: Assessing Progress Toward 2030 and 2050 https://files.wri.org/d8/s3fs-public/2021-09/state_climate_action.pdf?VersionId=Rw2ZmL1HWNSg4z4iZGYz.SdTmn59xvlS

Annex 4: List of GEF- and GCF-funded Projects Reviewed

A total of 42 projects were reviewed for this Technical Paper. This includes 18 GEF-funded projects and 24 GCF-funded projects. This review was conducted using the latest available evaluation report (Mid-Term Review or Terminal Evaluation) for the selected GEF projects. The 2019 Annual Performance Report was primarily used to review the GCF funded projects.

These projects have been mapped to priority sectors and associated indicators outlined in Annex . Evaluation reports available since preparation of 2019 PSP evaluation for the UNFCCC are highlighted in yellow.

18 Evaluation Reports for GEF-4 Cycle projects for implementation of Poznan Strategy Programme (PSP)

#	*Geography*	*Implementing Agency*	*Country Type*	*Project Type*		*Priority Sector*	*Contribution to Priority Sector Indicator*	*Project Identification*	*Report Type / Date*
1	Cambodia	UNIDO	LDC	Mitigation	Technology Transfer	Agriculture	**Indicator 1**: Emissions from agricultural production (excluding land use change) in $MtCO_2e$	Using Agricultural Residue Biomass for Sustainable Energy Solutions	TE 2019
2	Chile	IADB		Mitigation	Technology Transfer	Power	**Indicator 1**: Share of renewables in electricity generation (%)	Promotion and Development of Local Solar Technologies	MTR 2017
3	China	World Bank		Mitigation	Technology Transfer	Transport	**Indicator 1**: Share of electric vehicles (EVs) in the global light-duty vehicle fleet	Guangdong Green Freight Demonstration Project	Results Report 2016
4	Colombia, Kenya, Swaziland	UNEP		Mitigation	Technology Transfer	Power	**Indicator 1**: Share of renewables in electricity generation (%)	SolarChill Development, Testing, and Technology Transfer Outreach	MTR, 2018
5	Jordan	IFAD		Adaptation	Technology Transfer	Agriculture	**Indicator 2**: Crop yields (t/ha/yr)	Irrigation Technology Pilot Project to Face Climate Change Impact	TE 2018
6	Mexico	IDB		Mitigation	Technology Transfer	Power	**Indicator 1**: Share of renewables in electricity generation (%)	Entidad ejecutora del Proyecto de Promoción y Desarrollo de Tecnologías Eólicas Locales	MTR 2015
7	Russian Federation	UNIDO		Mitigation	Technology Transfer	Power	**Indicator 3**: Carbon intensity of electricity generation (gCO_2/kWh)	Phase out of HCFCs and Promotion of HFC-free Energy Efficient Refrigeration and Air Conditioning	TE 2018
8	Senegal	UNDP	LDC	Mitigation	Technology Transfer	Buildings	**Indicator 2**: Energy intensity of buildings (kWh/m^2)	Transfert de Technologie: Production de Matériaux d'Isolation thermique à base de Typha au Sénégal	MTR 2016 *(project was completed in Dec 2018)*

9	Sri Lanka	UNIDO		Mitigation	Technology Transfer	Agriculture	Not mapped to any indicator	Stimulate bamboo plantation to increase feedstock supply to manufacturing as a replacement for wood, reduce emissions	MTR 2016
10	Thailand, Vietnam, Lao	UNIDO	LDC (for Lao PDR)	Mitigation	Technology Transfer	Power	Not mapped to any indicator	Promote production and use of bio-ethanol (made from cassava) to substitute gasoline	TE 2019
11	Cote d'Ivoire	AfDB	LDC	Mitigation	Technology Transfer	Not related to a priority sector	Not mapped to any indicator	Construction of 1,000 Ton per Day Municipal Solid Waste Composting Unit in Akouedo, Abidjan	GEF Report to COP 2021, pp 168-169
12	Global	CTCN		Not applicable	Network Building	*Not applicable as related to Network Building*		2nd Independent Review conducted for the UNFCCC by EY & Associés	Independent Review, 2021
13	Asia-Pacific	UNEP and ADB		Not applicable	Network Building	*Not applicable as related to Network Building*		Pilot Asia-Pacific Climate Technology Network and Finance Centre	TE 2020 (*mainly UNEP's outcomes)*
								Establishing a Pilot Center to facilitate Climate Technology Investments in Asia and the Pacific	MTR 2016 *(covering only ADB outcomes)*
14	Africa	AfDB		Not applicable	Network Building	*Not applicable as related to Network Building*		African Climate Technology and Finance Center and Network (ACTFCN) *Extended implementation until July 2021*	MTR 2016
15	European Territorial Cooperation	EBRD		Not applicable	Network Building	*Not applicable as related to Network Building*		Finance and Technology Transfer Centre for Climate Change (FINTECC) *Extended implementation until Dec 2022*	MTR 2017
16	Latin America and Caribbean	IADB		Not applicable	Network Building	*Not applicable as related to Network Building*		Climate Technology Transfer Mechanisms and Networks in Latin America and Caribbean	MTR 2018 TE 2021
17	Global	UNEP		Not applicable	TNA	*Not applicable as related to Institutional Strengthening*		Technology Needs Assessment Phase I	TE 2015
								Technology Needs Assessment Phase II	TE 2020
								Technology Needs Assessment Phase III	MTR 2021
18	Global subsuming 9 nationally-implemented projects	UNIDO		Mitigation	Technology Transfer			Promoting Accelerated Transfer and Scaled-Up Deployment of Mitigation Technologies through the CTCN https://www.ctc-n.org/news/5-new-ctcnunido-calls-proposals-technology-transfer-gambia-guinea-panama-paraguay-and-zimbabwe	GEF's description of achievement in June 2021 report to UNFCCC

	Mali		LDC	Mitigation	Technology Transfer	Agriculture	**Indicator 1**: Emissions from agricultural production in $MtCO_2e$	Agricultural productive uses https://www.ctc-n.org/news/ctcn-collaboration-brings-new-agricultural-technology-and-investment-mali
	Uganda		LDC	Mitigation	Technology Transfer	Power	**Indicator 1**: Share of renewables in electricity generation (%)	Geothermal Energy https://www.ctc-n.org/technical-assistance/projects/development-geothermal-direct-use-project-uganda
	Dominican Republic		SIDS	Mitigation	Technology Transfer	Buildings	**Indicator 2**: Energy intensity of buildings (kWh/m^2)	Energy-efficient lighting
	Vietnam			Mitigation	Technology Transfer	Agriculture	**Indicator 1**: Emissions from agricultural production in $MtCO_2e$	Bio-waste minimization valorization for low carbon production in rice sector https://www.ctc-n.org/technical-assistance/projects/bio-waste-minimization-and-valorization-low-carbon-production-rice
	Chile			Mitigation	Technology Transfer	Agriculture	**Indicator 1**: Emissions from agricultural production (excluding land use change)	Replacement of F-refrigerants in food processing and exports https://www.ctc-n.org/technical-assistance/projects/support-replacement-f-refrigerants-used-refrigeration-system-food
	ECOWAS			Adaptation	Technology Transfer	Power	Not mapped to any indicator	Mainstreaming gender energy system
	Paraguay			Adaptation	Technology Transfer	Not related to a priority sector	Not mapped to any indicator	Application of environmental flows and river basin management framework for the Tebicuary River Priority Basin https://www.ctc-n.org/technical-assistance/projects/application-environmental-flows-and-river-basin-management-framework
	Gambia		LDC	Adaptation	Technology Transfer	Not related to a priority sector	Not mapped to any indicator	Recycling organic waste for energy and smallholder livelihood https://www.ctc-n.org/news/capacity-building-gambia-recycling-waste-and-organic-materials
	Guinea		LDC	Adaptation	Technology Transfer	Forests	**Indicator 1**: Deforestation (million hectares)	Support awareness-raising and training of local producers of metal-ceramic fireplaces https://www.ctc-n.org/technical-assistance/projects/support-awareness-raising-and-training-local-producers-metal-ceramic
	Zimbabwe			Mitigation	Technology Transfer	Industry (focused on textiles/ leather industry)	Not mapped to any indicator	Piloting rapid uptake of industrial energy efficiency and efficient water utilization in industrial sector https://www.ctc-n.org/technical-assistance/projects/piloting-rapid-uptake-industrial-energy-efficiency-and-efficient

Annual Project Reports (2019) for GCF-funded projects with technology elements included in the analysis relate to those projects implemented in SIDS and LDCs, as per the guidance from the UNFCCC Secretariat)

Projects with Technology Elements implemented in SIDS (4)

#	*Geography*	*Theme*	*Project Type*	*Priority Sector*	*Contribution to Priority Sector Indicator*	*Project Name*	*Description*
1	Maldives	Adaptation / Coastal community resilience	Mitigation	Power	**Indicator 1**: Share of renewables in electricity generation (%)	Supporting vulnerable communities to manage climate change-induced water shortages https://www.greenclimate.fund/project/fp007	Integrated water production and distribution technologies. Desalination water plants in 4 islands installed and made operational, using a grid-tied and / or off grid solar PV technology
			Adaptation	Agriculture	**Indicator 2**: Crop yields (t/ha/yr) – through improved water management		
2	Vanuatu	Adaptation / early warning	Adaptation	Not related to a priority sector	Not mapped to any indicator	Climate Information Services for Resilient Development Planning https://www.greenclimate.fund/project/fp035	Technology/modelling-based and low-tech community-based CLEWS for specific hazards depend on data availability and relevant community resources. LIDAR sensor to modify existing SPC drone technology
3	Barbados	Cross-cutting water & energy	Mitigation	Power	**Indicator 1**: Share of renewables in electricity generation (%)	Water Sector Resilience Nexus for Sustainability (WSRN S-Barbados) https://www.greenclimate.fund/project/fp060	Photovoltaic Renewable Energy Systems and Natural Gas Microturbines. Potable Water Storage Systems
			Adaptation	Agriculture	**Indicator 2**: Crop yields (t/ha/yr) – through improved water management		
4	Mauritius	Mitigation Financial instrument	Mitigation	Power	**Indicator 1**: Share of renewables in electricity generation (%)	Accelerating transformational shift to a low-carbon economy https://www.greenclimate.fund/project/fp033	Technology-oriented Grid Absorption Capacity solutions. A loan scheme for PV adopters

Projects with Technology Elements implemented in LDCs (11)

#	Geography	Theme	Project Type	Priority Sector	Contribution to Priority Sector Indicator	Project Name	Description
5	Zambia	Adaptation / water & energy	Mitigation	Power	**Indicator 1**: Share of renewables in electricity generation (%)	Strengthening climate resilience of agricultural livelihoods in Agro-Ecological Regions I and II https://www.greenclimate.fund/project/fp072	Innovative water management technologies. Introduction of 158 boreholes with solar PV or biomass pumping technologies
			Adaptation	Agriculture	**Indicator 2**: Crop yields (t/ha/yr) – through improved water management		
6	Bhutan	Adaptation / alternative energy	Adaptation	Forests	**Indicator 1**: Deforestation (million hectares)	Bhutan for Life https://www.greenclimate.fund/project/fp050	Rural alternative energy technologies (e.g. biogas, solar)
			Mitigation	Power	**Indicator 1**: Share of renewables in electricity generation (%)		
7	Bangladesh	Adaptation / water	Adaptation	Agriculture	**Indicator 2**: Crop yields (t/ha/yr) – through improved water management	Enhancing adaptive capacities of coastal communities, especially women, to cope with climate change induced salinity https://www.greenclimate.fund/project/fp069	Community level freshwater pond systems with filtration treatment technology. Water supply technologies. Pond Sand Filters (PSFs)
8	Malawi	Adaptation / early warning	Adaptation	Not related to a priority sector	Not mapped to any indicator	Scaling up the use of Modernized Climate information and Early Warning Systems https://www.greenclimate.fund/project/fp002	Removing barriers to adoption of new practices and technologies (e.g. ICT/mobile technologies for EWs, weather advisories. Initiatives focused on transferring knowledge and technology via South-South cooperation
9	Senegal	Adaptation / early warning	Adaptation	Not related to a priority sector	Not mapped to any indicator	Integrated Urban Flood Management Project https://www.greenclimate.fund/project/fp021	Installation in Greater Dakar of precise meteorological and hydrological monitoring tools
10	Benin	Adaptation	Adaptation	Agriculture	**Indicator 2**: Crop yields (t/ha/yr)	Enhanced climate resilience of rural communities in central & north Benin through implementation of ecosystem-based adaptation in forest and agricultural landscapes https://www.greenclimate.fund/project/sap005	Information and Communication Technologies will be explored to create mutual partnerships between complementary actors along the targeted value chains

11	Tanzania	Adaptation / early warning	Adaptation	Agriculture	**Indicator 2**: Crop yields (t/ha/yr)	Simiyu Climate Resilient Project https://www.greenclimate.fund/project/fp041	An ICT platform on climate change to increase generation and use of climate information
12	Ethiopia	Adaptation	Adaptation	Agriculture	**Indicator 2**: Crop yields (t/ha/yr)	Irrigation technologies https://www.greenclimate.fund/project/fp058	Building gender-responsive resilience to drought risk of vulnerable communities
13	Bangladesh	Mitigation / cooking	Mitigation	Forests	**Indicator 1**: Deforestation (million hectares)	Global Clean Cooking Program https://www.greenclimate.fund/project/fp070	Clean cooking
14	Rwanda	Mitigation / cooking	Mitigation	Forests	**Indicator 1**: Deforestation (million hectares)	Strengthening Climate Resilience Rural Communities https://www.greenclimate.fund/project/fp073	Investments in forestry, efficient technologies for cooking
15	Rwanda, Kenya	Cross-Cutting – Energy & Financial instrument	Mitigation	Power	**Indicator 1**: Share of renewables in electricity generation (%)	KawiSafi Ventures Fund https://www.greenclimate.fund/project/fp005	Mobile technology, cloud-based data management. Innovative clean energy technologies. refined solar panel technologies, innovative remote monitoring technologies, mobile payment, data and systems, emerging credit scoring models and algorithms

2019 Annual Project Reports for GCF-funded readiness support in SIDS (3) with CTCN as delivery partner

#	*Geography*	*Project Name*	*Project Type*	*Priority Sector*	*Contribution to Priority Sector Indicator*	*Delivery Partner*	*NDA / Focal Point*
16	Bahamas	CTCN - Strategic Framework https://www.greenclimate.fund/document/strategic-frameworks-support-bahamas-through-ccccc	*Not applicable as related to institutional strengthening*			UNIDO-CTCN	The Ministry of the Environment Housing
17	Mauritius	Climate Change Vulnerability/Adaptation Study for Port Louis https://www.ctc-n.org/technical-assistance/projects/climate-change-vulnerability-and-adaptation-study-port-port-louis	Adaptation	Not related to a priority sector	Not mapped to any indicator	UNEP-CTCN	Ministry of Finance and Economic Development
18	Tonga	Development of an Energy Efficiency Master Plan for Tonga https://www.greenclimate.fund/document/strategic-frameworks-support-tonga-through-unep-and-ctcn	Mitigation	Power	**Indicator 3**: Carbon intensity of electricity generation (gCO_2/kWh)	UNEP-CTCN	Ministry for Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications (MEIDECC)

2019 Annual Project Reports for GCF-funded readiness support in LDCs (6) with CTCN as delivery partner

#	Geography	Project Name	Project Type	Priority Sector	Contribution to Priority Sector Indicator	Delivery Partner	NDA / Focal Point
19	Cambodia	Technology needs assessment and action plans for the support of climate-friendly technology implementation in Cambodia's special economic zones https://open.unido.org/api/documents/17845954/download/GCF%20Readiness%20Proposal%20-%20Cambodia%20UNIDO.pdf	Mitigation	Power	**Indicator 3**: Carbon intensity of electricity generation (gCO_2/kWh)	UNIDO-CTCN	Ministry of Environment
20	Lesotho	National framework for leapfrogging to Energy Efficient Appliances and Equipment in Lesotho (Refrigerators, Distribution Transformers) through regulatory and financing mechanism https://www.ctc-n.org/technical-assistance/projects/leapfrogging-lesotho-s-market-energy-efficient-refrigerators-and	Mitigation	Power	**Indicator 3**: Carbon intensity of electricity generation (gCO_2/kWh)	UNEP-CTCN	Ministry of Energy, Meteorology and Water Affairs
21	Malawi	National framework for leapfrogging to Energy Efficient Appliances and Equipment in Malawi (Refrigerators, Distribution Transformers) through regulatory and financing mechanism https://www.ctc-n.org/content/national-framework-leapfrogging-energy-efficient-appliances-and-equipment-malawi	Mitigation	Power	**Indicator 3**: Carbon intensity of electricity generation (gCO_2/kWh)	UNEP-CTCN	Environmental Affairs Department
22	Zambia	National framework for leapfrogging to Energy Efficient Appliances and Equipment in Zambia (Refrigerators, Distribution Transformers) through regulatory and financing mechanism https://www.ctc-n.org/content/national-framework-leapfrogging-energy-efficient-appliances-and-equipment-zambia	Mitigation	Power	**Indicator 3**: Carbon intensity of electricity generation (gCO_2/kWh)	UNEP-CTCN	National Planning Department, Ministry of Finance
23	Myanmar	Strengthened drought and flood management through improved science-based information availability and management https://www.ctc-n.org/news/ctcn-myanmar-strengthened-drought-and-flood-management	Adaptation	Not related to a priority sector	**Indicator 2**: Crop yields (t/ha/yr)	UNEP-CTCN	Ministry of Environmental Conservation and Forestry
24	Timor-Leste	Enabling Readiness for Capacity Building on Installation and Maintenance of Solar PV in Timor-Leste https://www.ctc-n.org/technical-assistance/projects/capacity-building-timor-lestes-renewable-energy-sector	Mitigation	Power	**Indicator 1**: Share of renewables in electricity generation (%)	UNEP-CTCN	National Directorate for Climate Change (DNAC) Direcção Nacional para Alterações Climáticas (DNAC)

Annex 5: Sectoral Benchmarks

Through their State of Climate Action Report, the World Resources Institute and ClimateWorks Foundation assessed global and country level progress towards 2030 and 2050 emissions-reduction targets in the Power, Buildings, Industry , Transport sectors (based on indicators/targets designed by Climate Action Tracker consortium) and in Forests and Agriculture (based on WRI indicators/targets). The 21 indicators and their associated targets are fully described here: https://files.wri.org/d8/s3fs-public/2021-09/state_climate_action.pdf?VersionId=Rw2ZmL1HWNSg4z4iZGYz.SdTmn59xvlS

According to the Report's authors, these six sectors are expected to limit global warming to 1.5°C and therefore prevent its most dangerous impacts:

Sector 1: Power - rapidly transition to clean electricity generation

Indicator 1: Share of renewables in electricity generation (%)	**Target**: Share of renewables reaches 55-90% by 2030 and 98-100% by 2050
Indicator 2: Share of unabated coal in electricity generation (%)	**Target**: Share of coal falls to 0-2-5% in 2030 and 0% in 2050
Indicator 3: Carbon intensity of electricity generation (gCO_2/kWh)	**Target**: Carbon intensity falls to 50-125 gCO_2/kWh by 2030 and below zero in 2050

Sector 2: Buildings - rapidly reduce carbon intensity and energy efficiency

Indicator 1: Carbon intensity of buildings ($kgCO_2/m^2$)	**Targets**: carbon intensity of residential buildings is 45-65% lower than 2015 levels by 2030 for select regions. Carbon intensity of commercial buildings is 65-75% lower than 2015 levels by 2030 for select regions. All buildings reach near zero emissions intensity globally by 2050
Indicator 2: Energy intensity of buildings (kWh/m^2)	**Targets**: energy intensity of residential buildings is 20-30% lower than 2015 levels by 2030. Energy intensity of commercial buildings is 10-30% lower than 2015 levels by 2030 in key countries and regions. Energy intensity is 20-60% lower for commercial buildings than 2015 levels by 2050 in key countries and regions
Indicator 3: Renovation rate of buildings (%/yr)	**Target**: The share of the world's buildings that is renovated each year rises to 2.5-3.5% in 2030 and 3.5% in 2040. No more renovation is needed in 2050

Sector 3: Industry - reduce emissions from industrial production

Indicator 1: Carbon intensity of cement production $kgCO_2$/t)	**Target**: Emissions intensity is 40% lower than 2015 levels in 2030 and 85-91% lower than 2015 levels in 2050, with an aspirational target to achieve 100% reduction in 2050
Indicator 2: Carbon intensity of steel production $kgCO_2$/t)	**Target**: Carbon intensity is 25-30% lower than 2015 values in 2030 and falls to near net zero in 2050
Indicator 3: Share of electricity in final energy use in industry (%)	**Target**: The share of electricity in final energy use in industry reaches 35% in 2030, 45-55% in 2040, and 50-55% in 2050, compared to 27% in 2017

Sector 4: Transport - accelerate uptake of electric vehicles and reduce carbon intensity

Indicator 1: Share of electric vehicles (EVs) in the global light-duty vehicle fleet	**Target**: Share of EVs in global light-duty vehicles reaches 20-40% by 2030 and 85-100% in 2050
Indicator 2: Share of EVs in annual new car sales (%)	**Target**: Sale of EVs as a % of all new car sales reaches 45-100% in 2030 and 95-100% in 2050
Indicator 3: Carbon intensity of land-based passenger transport (gCO_2/pkm)	**Target**: Carbon intensity per passenger-kilometre travelled cut in half in 2030 compared to 2014 levels and reaches near zero in 2050

Sector 5: Forests - increase annual tree cover gain

Indicator 1: Deforestation (million hectares)	**Target**: Reduce deforestation by 70% relative to the 2019 level by 2030 and by 95% by 2050
Indicator 2: Gross tree cover gain (million hectares)	**Target**: Restore tree cover on 350 million hectares of land by 2030 and 678 million hectares by 2050
Indicator 3: Carbon removal from the atmosphere due to tree cover gain ($MtCO_2$)	**Target**: Cumulative carbon removal to reach 75 gigatons of carbon dioxide ($GtCO_2$) by 2030 and 75 $GtCO_2$ by 2050 above the 2018 level

Sector 6: Agriculture - boost agricultural productivity; shift to more sustainable food consumption patterns

Indicator 1: Emissions from agricultural production (excluding land use change) in $MtCO_2e$	**Targets**: 2030 – 22% reduction from the 2017 level; 2050 – 39% reduction from the 2017 level
Indicator 2: Crop yields (t/ha/yr)	**Targets**: 2030 – 13% increase from the 2017 level; 2050 – 38% increase from the 2017 level
Indicator 3: Productivity of ruminant meat production (kg/ha/yr)	**Targets**: 2030 – 27% increase above the 2017 level; 2050 – 58% increase above the 2017 level
Indicator 4: Food loss and waste (kg/capita/yr)	**Targets**: 25% reduction below the 2017 level; 2050 – 50% reduction from the 2017 level
Indicator 5: Ruminant meat consumption (kcal/person/day)	**Targets**: 2030 – limit increase to 5% above the 2017 level; 2050 – limit increase to 6% above the 2017 level