



# **Making Climate Finance Work for Early-Stage Innovation in Low-Income Country Settings**

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This report has been prepared by UrbanEmerge in consultation with the Frontier Technologies Hub. UrbanEmerge advises public, private and civil society sector clients in areas related to low-carbon, inclusive and resilient economic growth, sustainable cities, circular economy and responsible investment. These areas are supported by cross-cutting expertise in enabling technologies, including digital solutions. For more information, please visit the UrbanEmerge website at [www.urbanemerge.com](http://www.urbanemerge.com)

The views expressed in this report are those of the authors. This material has been funded by UK aid from the UK government as a part of the The Frontier Tech Programme; however, the views expressed do not necessarily reflect the UK government's official policies, nor those of any of the individuals and organisations referred to in the report.



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## Acronyms and Abbreviations

ABM	Adaptation Benefits Mechanism
AECF	Africa Enterprise Challenge Fund
AfDB	The African Development Bank
AFOLU	Agriculture, Forestry, Other Land Uses
ARAF	Acumen Resilient Agriculture Fund
AVPN	Asian Venture Philanthropy Network
BII	British International Investing
BMWK	German Federal Ministry for Economic Affairs and Climate Action
CDM	Clean Development Mechanism
CFA	Climate Finance Accelerator
CFP	Climate Finance Partnership
CIF	Climate Investment Funds
CIO	Climate Investor One
CPI	Climate Policy Initiative
DFI	Development Finance Institutions
EIB	European Investment Bank
EU	European Union
EV	Electric Vehicles
FCDO	Foreign, Commonwealth & Development Office
FT	Frontier Technologies
GCF	Global Climate Fund
GEF	Global Environmental Facility
GHG	Greenhouse Gases
GIF	Global Innovation Fund
IET	International Emissions Trading
IFC	International Finance Corporation
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
KPI	Key Performance Indicator
KSV	KawiSafi Ventures
LMIC	Low- and Middle-Income Country
MNC	Multinational Company/Corporation
MRV	Measuring, Reporting and Verification



NbS	Nature-Based Solutions
NDC	Nationally Determined Contributions
NZAOA	Net Zero Asset Owner Alliance
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
PPP	Public-Private Partnership
SAFE	Simple Agreement for Future Equity
SCAF	Seed Climate Action Facility
SEACEF	Southeast Asia Clean Energy Facility
SIDA	Swedish International Development Cooperation
SCF	Strategic Climate Fund
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VC	Venture Capital
VCM	Voluntary Carbon Market
VER	Voluntary Emissions Reductions
WWF	World Wildlife Fund
WRI	World Resources Institute



## Glossary

**Adaptation:** The process of taking appropriate climate action or 'adapting' to current and future adverse climate trends to minimise the effects of climate change and reduce vulnerability.

**Blended finance:** Blended finance refers to the strategic use of development finance in order to 'leverage' additional funds and expertise from the public and private sector. It is generally used to support projects with potentially high social and environmental benefits that would not be able to mobilise funding on strictly commercial terms because of their high risks.

**Climate finance:** Local, national or transnational financing - drawn from public, private and alternative sources of financing - that seeks to support mitigation and adaptation actions that will address climate change.<sup>1</sup>

**Concessional Loan/Debt:** Refers to loans granted at below normal market rates or on more favourable timeframes and other terms for the borrower as compared to the marketplace. This may include lower interest rate, income-contingent repayments or deferred repayments.

**Deep Tech:** A startup with the specific objective of providing technology solutions based on substantial scientific or engineering challenges.

**In-kind support:** Technical assistance (TA) or mentorship provided as an alternative to financial support.

**Mitigation:** This is the process or actions taken to prevent or reduce the emission of greenhouse gases (GHG) into the atmosphere by either reducing the sources of these gases or by enhancing GHG sinks.

**Outcome-linked debt structures:** This is a form of private funding from investors who are repaid upon the achievement of specific outcomes, decided before investments are made. An example of this is impact bonds, which can be a flexible source of upfront capital required by early-stage innovators.

**Ticket size:** In the context of startups or a climate action project, ticket size refers to the amount of money required for investment.

**Private Equity:** This is the financing provided in exchange for a share of ownership in a business. This is usually provided by private equity firms, and recently hedge funds, to more established startups that have passed the growth stage and are generating revenue but are not listed on a public stock exchange.

**Repayable and non-repayable grants:** Repayable grants are similar to loans provided on preferential terms and, as opposed to non-repayable grants, are intended to be paid back or can be later converted into shares or equity for the investors. Non-repayable grants are not intended to be paid back.

**Series A, B and C funding rounds:** These are initial investment rounds, occurring after pre-seed and seed funding rounds, which startups usually go through before they are able to reach an initial public offering (IPO). These funding rounds allow investors to invest money into a growing company in exchange for equity/ownership, and can sometimes reach up to series D and E rounds of funding.

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<sup>1</sup> UNFCCC Website: Introduction to Climate Finance. ([Link](#))



**Valley of death:** This is used to refer to the funding gap between seed funding and longer-term investments. During this stage, startups have typically begun operations but are not generating significant profits yet, making them too big for angel investors, and too high-risk for commercial lending.<sup>2</sup>

**Venture capital:** This is the financing provided by venture capital firms or funds for startups in exchange for shares or equity and occurs typically after an initial seed funding round. It is a form of private equity but in contrast, venture capital is invested into new and very early-stage startups.

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<sup>2</sup> PwC (2021) The State of Climate Tech 2021. [\(Link\)](#)



## Executive Summary

According to the Intergovernmental Panel on Climate Change (IPCC's) Sixth Assessment Report (AR6)<sup>3</sup> released in March 2023, climate finance and technological innovation are critical enablers for accelerated climate action and can contribute significantly to catalyse much needed solutions for mitigation of greenhouse gas (GHG) emissions and adaptation to the impacts of climate change impacts. **Early-stage mitigation and adaptation solutions in low- and middle-income countries (LMICs) are often held back from attracting finance for scale by a number of barriers**, such as high upfront costs, unproven business models, longer timeframes to achieve impact and return on investment and a lack of climate-impact data.<sup>4</sup> **Climate finance can play an important role in supporting early-stage climate innovation to overcome these barriers** and achieve scale.

Climate finance is a nebulous concept with many definitions. However, **one of the most widely held definitions** is that of the United Nations Framework Convention on Climate Change (UNFCCC), which states that:

**“Climate finance refers to local, national or transnational financing - drawn from public, private and alternative sources of financing - that seeks to support mitigation and adaptation actions that will address climate change.”<sup>5</sup>**

While access to climate finance for early-stage innovators has been increasing, from both public and private sector, the global climate finance gap remains very high. It is especially important to highlight the significant shortage of climate finance for adaptation, compared to mitigation, innovations which are often more likely to generate revenue through sales or user fees of a particular service or hardware. A drastic increase in private sector investment is required for early-stage innovation for both mitigation and adaptation.<sup>6</sup> This can be enabled by public sector climate finance incentivising and de-risking private sector investment to increase confidence and viability.

This **landscape review** is designed to help clarify the relevant aspects of the climate finance landscape and the options available to early-stage innovations that are supported by the [Frontier Technologies \(FT\) Hub](#), funded by the Foreign, Commonwealth & Development Office (FCDO). It should be noted that whilst this study seeks to better understand how public sector grant funding can act as a tool to scale up private sector investment in early-stage innovation, the FT Hub is itself a mechanism through which such funding is disbursed to early-stage innovators.

The study has found that the following broad categories of climate finance are relevant for early-stage innovation:

- **Pure grant funding:** Grant funding is effective in supporting early-stage innovation to prove a concept or method relating to mitigation or adaptation, prior to attracting private sector

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<sup>3</sup> IPCC (2023) AR6 Synthesis Report Climate Change 2023. [\(Link\)](#)

<sup>4</sup> Ibid.

<sup>5</sup> UNFCCC Website: Introduction to Climate Finance [\(Link\)](#)

<sup>6</sup> IMF (2022) Public Sector Must Play Major Role in Catalyzing Private Climate Finance. [\(Link\)](#)





investment. It is also necessary for innovations that have no potential for revenue generation and thus no prospect of private sector investment.

- **Catalytic capital from public sector and philanthropic sources:** Public sector and philanthropic sources of catalytic capital can be applied as climate finance, helping to leverage much more substantial volumes of private sector investment. This could include technical assistance for business support, training and mentorships for startup teams, grants or concessional debt finance to help cover initial costs, building networks, partnerships and a support community for innovators, and de-risking private sector investment into early-stage entities via blended finance instruments such as first loss guarantees.
- **Catalytic capital from private sector risk capital:** Private sector entities can play a crucial role to provide catalytic capital, helping to open up a pipeline of greater investment opportunities.
- **Carbon markets:** For innovations that enable significant emissions reductions or carbon sequestration, there are often opportunities to gain revenue from carbon credits, via the voluntary carbon market.

It is important to note that early-stage pilots and start-ups require different types and volumes of finance at different stages of their journey to scale. To conceptualise this, the UK government-funded Climate Finance Accelerator's (CFA)<sup>7</sup> **'climate finance investment chain' offers a useful framework**. During this cycle, the inherent risks in projects and businesses typically decline over time, while their capital needs typically increase. Observations are made on how **the climate finance approaches outlined above play a role in the different stages** of the investment chain.

While the insights from this study are applicable to early-stage innovation in all sectors, **sector-specific insights have also been presented for agriculture, forestry and energy**, given their relevance to the majority of the pilots within the Frontier Technologies programme portfolio. The role of geographic differences in accessing climate finance is also explored. The availability of **climate finance from the public sector and philanthropic sources varies only slightly, based on geographic differences**, as many development finance institutions (DFI's) and donor organisations, including FCDO, have the mandate to provide additionality and catalyse climate action in lagging markets. On the other hand, access to **private climate finance varies considerably** based on the enabling environment, such as internet access, maturity of the technology landscape, ease of doing business, and political instability, which all pose higher risks for investors.

This study also explores the role partnerships can play to improve access to climate finance, including by raising credibility to investors, strengthening supply chains, and improving access to markets and networks for early-stage innovators.

The study concludes **with learnings and recommendations** to funding agencies, such as the FCDO, as well as programme implementers, on supporting early-stage innovation to better access climate finance, considering their position in the investment chain, as follows:

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<sup>7</sup> The CFA is a £10 million capacity building programme funded by International Climate Finance through the UK Government's Department for Business, Energy, and Industrial Strategy (BEIS) to support emerging economies in achieving national climate plans.



For startups and pilots at the **project initiation stage, project development and primary project funding stage** (Stages 1, 2 & 3) of the investment chain:

- Provide support to early-stage innovation with a more long-term and integrated approach.
- Build a community of private sector investors that early-stage innovators could tap into.
- Improve coordination with other donors as well as national and sub-national governments.
- Support early-stage pilots to measure and demonstrate evidence of mitigation and adaptation impact.

For startups and pilots at the **secondary markets and refinancing stage** (4) of the investment chain

- Promote and support the role of blended finance.
- Support startups and pilots to access the voluntary carbon market.



# 1. Introduction

## 1.1 The Context: Financing early-stage climate innovation

The mobilisation of finance for climate action requires an immediate increase in global investments to achieve the adaptation and mitigation goals of the Paris Agreement. It is estimated that a minimum of US\$ 4.5 to 5 trillion investment in clean energy, energy efficiency and other low-carbon technologies is needed annually to transition to a sustainable, net zero emissions, resilient and green future.<sup>8</sup> Mobilising the necessary finance to support this transition is a major challenge. While global public sector climate finance increased in 2019/20, by 7% from 2017/18<sup>9</sup> delivered largely by multilateral and bilateral development financial institutions (DFIs), both public and private climate finance flows are still not close to the estimated needs.

A drastic increase in investment by the private sector is required to close the financing gap globally, particularly in low- and middle-income countries (LMICs) where this gap remains the largest. However, despite the critical role that private sector investment can potentially play in financing early-stage climate solutions, there are still significant barriers that deter investments. The main barriers include: longer timeframes before positive return on investment, weak policy and regulatory frameworks, lack of climate-related risk data, foreign exchange risks, poor creditworthiness, and high transaction costs for small-scale initiatives, particularly in low-income countries. On the other hand, early-stage climate innovators face challenges in accessing private sector capital, such as volatile market conditions, lack of track record and proof of concept, and a mismatch in investment timelines between the needs of investors and time required by startups or pilots to generate revenue and return on investment, particularly for adaptation projects in which the impacts may be realised over a decade or more.

To help address these barriers and challenges, climate finance can play an important role. There are a range of ways in which climate finance can be deployed or accessed in the context of supporting early-stage innovation to achieve scale. These include: catalytic capital from the public sector or philanthropic funds which can be used to provide concessional finance, the provision of technical assistance to innovators, and support to de-risk private sector investment, among other approaches. This can help to bridge the gap between high-risk early-stage climate innovation and private sector investment. Overall, the climate finance landscape for early-stage innovation is rapidly evolving and is challenging to navigate for pilots and startups, which tend to be stretched in terms of capacity to explore new financing options.

## 1.2 Early-stage climate innovation: Testing valuable climate solutions

Many of the technologies and solutions that are required to enable the transition to a low-carbon and resilient future are available today and need to be scaled up. At the same time, there is a hugely important role for new innovations and solutions in climate mitigation and adaptation. Supporting early-stage innovation in these sectors to access finance and scale can help identify new methods and business models that have the potential to greatly reduce GHG emissions or improve the ability of economic sectors and individuals to adapt to the impacts of climate change.

The FT Hub works with the FCDO at the intersection of technology, innovation, and international development. They have supported 60 early-stage innovation ideas since 2016, across more than 30

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<sup>8</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance 2021 ([Link](#))

<sup>9</sup> OECD (2022). Aggregate Trends of Climate Finance Provided and Mobilised by Developed Countries in 2013-2020. ([Link](#))



countries and a wide range of sectors, of which 14 are considered particularly relevant to this study, as presented in Table 1. Some of the pilots have been showcased as examples throughout the report to demonstrate links with climate finance related dynamics.

**Table 1. Overview of the selected FT Hub pilots**

Pilot title	Sector	Country	Mitigation vs. Adaptation	Implementing partner organisation
<a href="#">Testing the production of hydroponic fodder for cattle</a>	Agriculture	Nigeria	Mitigation	ME Solutions
<a href="#">Low-cost sensors for optimal insect protein production</a>	Agriculture	Kenya	Mitigation	Sanergy, ICIPE
<a href="#">Harnessing sensor technologies to improve beekeeping productivity in South Africa</a>	Agriculture	South Africa	Mitigation	Crop Health & Protection (CHAP), Agrisound, Cropimpi
<a href="#">Enabling smallholder farmers to access the global carbon markets</a>	Agriculture / Forestry	Uganda	Mitigation	Taking Root, ECOTRUST
<a href="#">Project Sapling: drone-based remote sensing for reforestation investment</a>	Forestry	Sierra Leone	Mitigation	UAVAd, Crown Agents, Tacugama Chimpanzee Sanctuary
<a href="#">Using AI to scale access to forest carbon markets</a>	Forestry	Tanzania	Mitigation	Omdena
<a href="#">Early Warning Forest Fire Detection System</a>	Forestry	Pakistan	Adaptation	WWF-Pakistan, Lahore University of Management Sciences
<a href="#">Safeguarding land-based climate investments in Ghana with blockchain</a>	Forestry / Environment	Ghana	Mitigation	Oko Forests, BenBen
<a href="#">Using climate change scenarios to inform community-based adaptation and planning in Nepal</a>	Environment	Nepal	Adaptation	Youth Innovation Lab
<a href="#">“FLEK TEY”, Electrifying Water Transport for Better Livelihoods</a>	Environment / Energy	Senegal	Mitigation	Joko Sun Energies
<a href="#">Solar Home electrolyser proof of concept</a>	Energy	N/A	Mitigation	University of Strathclyde
<a href="#">IoT enabled smart household battery distribution through micro-small retailer networks</a>	Energy	Senegal	Mitigation	4RDigital
<a href="#">Smart Solar Battery for Healthcare</a>	Health / Energy	Zimbabwe	Mitigation	Distributed Power Africa (DPA)
<a href="#">Solar Health Covid Response (FTx)</a>	Health / Energy	Zambia	Mitigation	SolarAid

Source: FT Hub



While early-stage mitigation and adaptation solutions in LMICs play an important role in developing climate action solutions, they are often held back from attracting conventional finance for scale by a number of barriers. These include high upfront costs, unproven business models, longer timeframes to achieve impact and return on investment and a lack of climate-impact data.<sup>10</sup> There is also a significant shortage of finance for adaptation, compared to mitigation, innovations which are often more likely to generate revenue through sales or user fees of a particular service or hardware. Climate finance can therefore play an important role in supporting early-stage climate innovation to overcome these barriers and achieve scale.

### 1.3 Research objectives

The purpose of the study is to provide a landscape review of climate financing as a route from innovation to scale, including the role of public sector grant funding as a tool to scale up private sector climate finance investment in early-stage innovation. A landscaping study has been conducted, including comprehensive desk-based research and 15 semi-structured interviews with key stakeholders (**Annex 1**), to identify the associated enablers and barriers to accessing funding, and the viable options for early-stage climate innovators to access climate finance in order to scale, illustrated by examples and learning points. The research was also informed and validated by three workshops; one with the FCDO applicants of the pre-selected 14 pilots relevant to this study held at the start of the research phase, a Peer Learning Workshop, and a Validation Workshop.

While this landscape review on climate finance is designed to provide insights to early-stage innovation in all sectors, it is particularly focused on the context of pilots in the **agriculture, forestry and energy sectors** to align with the pilots identified in table 1. Furthermore, this study will be a starting point for the FCDO to better anticipate and meet innovator needs in these sectors.

The study aims to respond to five key research questions:

- RQ1: What do we mean by climate finance and how can it support early-stage innovation?
- RQ2: What routes to scale are available through climate financing for early-stage innovation, including public sector financing, blended finance and alternative models?
- RQ3: What are the associated enablers and barriers to early-stage innovators accessing climate finance in order to scale?
- RQ4: What are the emerging best practices in how donor agencies have responded to early-stage innovation seeking investment, including facilitating access to additional alternative climate finance investments?
- RQ5: To what extent do geographical differences affect the options for climate finance availability for early-stage innovations?

This report summarises the findings of the landscape review of climate financing as a route from innovation to scale and is structured into five sections:

- **Section 2:** summarises some of the **definitions of climate finance and the benefits of access to climate finance in enabling early-stage innovation** to improve their value proposition and

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<sup>10</sup> Ibid.



business model and eventually to scale. It introduces a range of climate finance approaches, and how these are available to early-stage innovation at different stages of the investment chain.

- **Section 3:** provides a **deep dive into climate finance for early-stage innovation**. This section provides more detail on the climate finance categories that are available to early-stage finance (grant funding, catalytic capital provided by both public sector and private sector entities, and voluntary carbon markets), introducing each topic and the nuances related to the sectors covered by this study. Several best-practice examples are included as well as the typical challenges that early-stage innovators may experience in accessing this type of climate finance.
- **Section 4:** summarises a number of **additional dynamics related to climate finance for early-stage innovation**, including key points on sector related opportunities and challenges, geographic differences in access to climate finance, and the role of partnerships in overcoming barriers to accessing climate finance for scale.
- **Section 5:** sets out the **conclusions of the study and provides recommendations** for the FCDO and other donors supporting early-stage innovators to access climate finance, as well as programme implementation agencies.



## 2. Introduction to Climate Finance

Climate finance refers to the financing of projects and initiatives aimed at mitigation and adaptation to the impacts of climate change. It encompasses a wide range of financial instruments and mechanisms, including public and private funding, grants, loans and equity investments. As outlined in the previous section, access to finance is a significant barrier to developing and commercialising early-stage innovations in the climate sector. In this section we explore how climate financing can play a crucial role to help address typical barriers and provide more opportunity for early-stage climate innovations to access finance and scale.

### 2.1 Climate finance definitions and landscape

Climate finance is a nebulous concept with many definitions. However, one of the most widely held definitions is that of the United Nations Framework Convention on Climate Change (UNFCCC), which states that:

**“Climate finance refers to local, national or transnational financing - drawn from public, private and alternative sources of financing - that seeks to support mitigation and adaptation actions that will address climate change.”<sup>11</sup>**

This definition covers the widest range of sources of finance related to climate action and is illustrated in Figure 1. Based on this definition, climate finance flows have increased steadily over the past decade, reaching US\$ 632 billion in 2019/2020.<sup>12</sup> However, despite this increase, the volume of climate finance still falls short of what is required to limit global warming to 1.5 degrees Celsius, or just above this threshold. To achieve this goal, it is estimated that at least US\$ 4.3 trillion of climate finance is required every year.<sup>13</sup>

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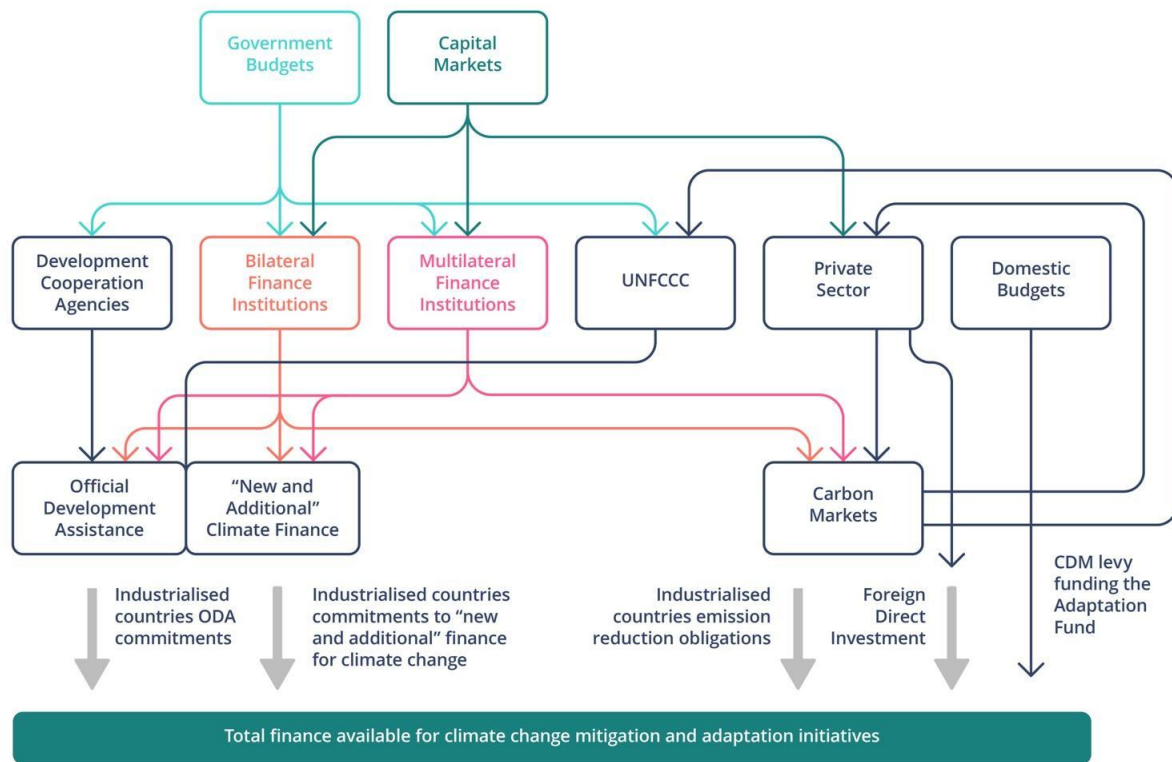
<sup>11</sup> UNFCCC Website: Introduction to Climate Finance ([Link](#))

<sup>12</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance 2021 ([Link](#))

<sup>13</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance. A Decade of Data: 2011-2020. ([Link](#))



**Figure 1. Sources of climate finance**



Source: UNEP<sup>14</sup>

The main sources of climate finance are introduced below, structured around the broad categories of public sector, philanthropic organisations and the private sector.

**Public climate finance**

As shown in Figure 1, climate finance originating from government budgets is provided through a wide range of public sector organisations, including development cooperation agencies such as UNICEF, bilateral development institutions such as the FCDO, multilateral finance institutions such as the World Bank and Asian Development Bank (ADB), and Development Finance Institutions (DFIs) such as the International Finance Corporation (IFC), European Investment Bank (EIB) and British International Investing (BII). Such international donor organisations are significant contributors to public climate finance, accounting for 68% of the total.<sup>15</sup>

The UK Government’s International Climate Finance (ICF) is the primary instrument through which the FCDO provides climate finance to support developing countries in their efforts to mitigate and adapt to climate change. This is part of the pledge made by OECD countries to mobilise US\$ 100 billion a year in climate finance for developing countries by 2020, at the COP15 of the UNFCCC in 2009.<sup>16</sup> However, due to the gaps in international climate finance architecture, this goal has been extended to 2025.

<sup>14</sup> UNEP (2021) Climate Risks and TCFD Workshop. [\(Link\)](#)

<sup>15</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance 2021. [\(Link\)](#)

<sup>16</sup> OECD, Climate Finance and the USD 100 Billion Goal. [\(Link\)](#)





A modest proportion of total public sector climate finance, approximately US\$ 2.5 billion on average, is disbursed annually through international climate funds such as the [Green Climate Fund \(GCF\)](#), the [Adaptation Fund](#), [Climate Investment Funds \(CIF\)](#) and the [Global Environmental Facility \(GEF\)](#).<sup>17</sup>

For early-stage innovation, public sector climate finance is typically made available via a range of technical assistance programmes, contribution to innovation funds, and contribution to vehicles that are intended to de-risk private sector investment such as blended finance instruments. For example, a multi-donor trust fund, the [Seed Capital Assistance Facility \(SCAF\)](#), has been set up by the United Nations Environment Programme (UNEP), which is supported by the German Federal Ministry for Economic Affairs and Climate Action (BMWK) and FCDO, to provide funding to early-stage innovators in renewable energies and energy efficiency.<sup>18</sup>

## Foundations / Philanthropic Organisations

As climate change continues to exacerbate existing inequalities, philanthropic organisations, such as foundations, charitable corporations, and individual donors are increasingly recognising the importance of addressing climate change and are integrating climate mitigation and adaptation initiatives into their portfolios. Philanthropic organisations can provide agile, flexible, patient and risk-tolerant capital to high-risk pilots or ventures, as needed for early-stage innovations. They can provide increased access to investor networks, support ecosystem building and promote collaboration. They are well positioned to address market failures to support emerging technologies in decarbonisation and mitigation efforts in low-income country settings. In addition, they can use a range of funding instruments including grants, competitions and challenges, mission-related investments, and venture philanthropy.<sup>19</sup>

In 2020, global philanthropic funding for climate mitigation more than doubled since 2015, reaching between US\$ 6-10 billion.<sup>20</sup> Some of these funds had climate action within their mandate, while for others this was a relatively newer and smaller proportion of their overall portfolio. While this amount constitutes just 2% of total annual global philanthropic funds, there is an emerging business case to use philanthropic funds as 'catalytic capital' to minimise the early-stage risk in climate investments to stimulate early-stage innovation. Supporting climate innovation is likely to create much-needed solutions for low-carbon and resilient economic development, which philanthropic organisations, including corporations, can replicate or scale up.

According to the [Asian Venture Philanthropy Network \(AVPN\)](#), younger leaders of philanthropic funds are increasingly becoming aware of the urgency of climate change and the interrelated risks to their businesses that generated the wealth in the first place. Therefore, investments in climate solutions are gaining much traction across South and Southeast Asia.<sup>21</sup> One example of this is the Southeast Asia Clean Energy Facility (SEACEF) initiative which focuses on providing catalytic funding for high-risk clean energy projects in the region. Philanthropic funds in Asia often align with government action plans and priorities and aim to address the gaps in public funding.

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<sup>17</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance. A Decade of Data: 2011-2020. [\(Link\)](#)

<sup>18</sup> UNEP, Seed Capital Assistance Facility. [\(Link\)](#)

<sup>19</sup> McKinsey & Company (2021) It's Time for Philanthropy to Step Up the Fight Against Climate Change. [\(Link\)](#)

<sup>20</sup> AVPN (2022) Climate Philanthropy in Asia. [\(Link\)](#)

<sup>21</sup> AVPN (2022) Climate Philanthropy in Asia. [\(Link\)](#)



## Private sector investment

While private sector investment in climate action has been increasing in recent years, it still falls short of the needs to achieve the Paris Agreement goals and a net-zero future. In 2019/2020, private sector climate finance reached nearly US\$ 310 billion, with corporations being the largest contributors. However, the growth rate of private sector climate finance at 4.8% is much slower than that of the public sector at 9.6%.<sup>22</sup> It is also noteworthy that private investments for adaptation initiatives have remained negligible, with the public sector providing the majority of global adaptation finance.<sup>23</sup>

The actors in private climate finance include commercial banks, institutional investors (pension funds, insurance companies, sovereign wealth funds, and other asset managers), impact investors (seeking impacts and return, as well as those not seeking market returns), private companies, and household spending (for example, on energy efficiency measures and solar water heaters). In particular, private financial institutions, with trillions of assets under management such as through pension funds, are increasing their appetite to commit to net zero and provide sustainable finance practices. In 2019/2020, climate finance contributions from these types of institutional investors increased significantly from 18% (2017/2018) to 39% (US\$ 122 billion).<sup>24</sup>

In general, the total funding for climate tech businesses, average funding size, as well as rate of startup formation have all continued to increase over the past seven years. Even during the COVID-19 pandemic, climate investments increased steadily including Amazon's US\$ 2 billion 'Climate Pledge' venture fund for clean energy initiatives; Unilever's €1 billion climate funds; and Microsoft's US\$ 1 billion Climate Innovation Fund.<sup>25</sup> For private investors, there are a myriad of investment opportunities across adaptation, mitigation and resilience-building initiatives, each with different upfront capital requirements, costs and revenue profiles, and potential returns and timeframes.

Despite these positive trends, there is still a significant lack of funding for early-stage climate innovation. According to recent research by PwC on Climate Tech Investment, many early-stage investors into climate action are still risk averse and largely focus on safer areas with demonstrated success and a pipeline of late-stage funding. Secondly, there is a limited talent pool of founders with deep understanding of climate tech challenges and required solutions, in contrast to defined investment areas such as Financial Technology (FinTech).<sup>26</sup> In addition, early-stage innovators in LMICs face additional challenges in accessing funding and support for their climate tech innovations. This is due to a variety of factors, including weak science and innovation policies, limited regulatory frameworks, and a lack of subsidies and tax incentives for private sector investments. As a result, many are more dependent on personal funds, donor grants and foreign venture capital, rather than domestic commercial finance.<sup>27</sup>

To address this gap, public finance actors such as development banks and development finance institutions can play a crucial role in catalysing more private sector climate investments in LMICs. These actors can support policy and regulatory frameworks that are conducive to green finance, provide seed funding and technical assistance to support startups and pilots to develop and prove concepts and business models, and cover the initial risks to encourage private sector investment, as introduced in Section 2.3.

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<sup>22</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance 2021. ([Link](#))

<sup>23</sup> Ibid.

<sup>24</sup> Ibid.

<sup>25</sup> PwC (2020) The State of Climate Tech 2020. ([Link](#))

<sup>26</sup> Ibid.

<sup>27</sup> UNEP (2022) The Climate Technology Progress Report. ([Link](#))



## 2.2 Mitigation and Adaptation: Understanding the funding divide

It is also crucial to highlight the significant shortage of climate finance for adaptation, which is an additional challenge for early-stage innovators. According to the Climate Policy Initiative (CPI), adaptation finance accounts for only 7% of total global climate finance.<sup>28</sup> In addition, there is a low level of tracked private adaptation finance due to concerns on confidentiality, context variation, causal uncertainty, and lack of agreed-upon impact metrics.<sup>29</sup> Funding for climate adaptation innovation, including innovations with digital components as well as nature-based solutions (NBS), is available in the form of early-stage grants, such as through designated incubators and accelerators. For innovators with a demonstrable business model, funding is possible via commercial investment routes including venture capital and blended finance models, as well as through carbon markets that trade carbon credits with adaptation co-benefits.

A big challenge for early-stage innovators when accessing adaptation-specific climate finance is the lack of common metrics for defining and measuring outcomes from adaptation. For mitigation projects, the quantifiable global benefit from mitigation actions (i.e. tonnes of emissions avoided in CO<sub>2</sub>e) was central to the creation of carbon markets, but there is no easy parallel for adaptation to climate impacts. However, there are some innovative approaches being developed, such as the Adaptation Benefits Mechanism (ABM) by the African Development Bank (AfDB), which will issue certificates to verify the social, economic and environmental benefits of adaptation initiatives to de-risk and incentivise public and private investments.<sup>30</sup>

## 2.3 The role of climate finance in enabling scale of early-stage innovation

A wide range of climate finance instruments and approaches are available to support climate action, including infrastructure development and incentivising GHG emission reductions across a range of sectors. However, for the early-stage innovation focus of this landscape review, the options of climate finance sources and instruments are greatly reduced. The study has found that the following broad categories of climate finance – based on their funding approaches – are relevant, to varying degrees, for early-stage innovation:

- **Pure grant funding:** Grant funding is effective in supporting early-stage innovation to prove a concept or method relating to mitigation or adaptation, prior to attracting private sector investment. It is also necessary for innovations that have no potential for revenue generation and thus no prospect of private sector investment, for example, the FT Hub pilot in Tanzania using AI to scale access to forest carbon markets, where the government will be the likely owner of the resulting service.
- **Catalytic capital from public sector and philanthropic sources:** Public sector and philanthropic sources of catalytic capital can be applied as climate finance, helping to leverage much more substantial volumes of private sector investment. This could include technical assistance for business support, training and mentorships for startup teams, grants or concessional debt finance to help cover initial costs, building networks, partnerships and a support community for innovators, and de-risking private sector investment into early-stage entities via blended finance instruments such as first loss guarantees.

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<sup>28</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance 2021. ([Link](#))

<sup>29</sup> Ibid.

<sup>30</sup> AfDB. Adaptation Benefit Mechanism (ABM). ([Link](#))



- **Catalytic capital from private sector risk capital:** Private sector entities can play a crucial role to provide catalytic capital, helping to open up a pipeline of greater investment opportunities.
- **Carbon markets:** For innovations that enable significant emissions reductions or carbon sequestration, there are often opportunities to gain revenue from carbon credits. Carbon credits are traded on carbon markets under two systems: the 'compliance' market and the 'voluntary' market. The voluntary carbon market is most relevant to early-stage innovations.

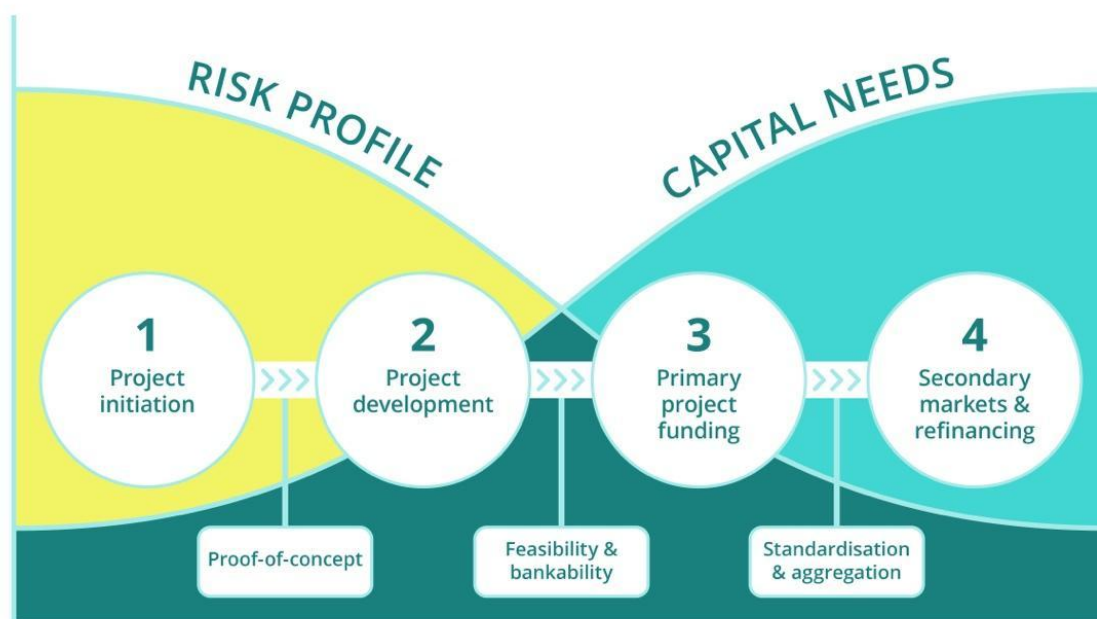
It is important to note that key informant interviews for this study revealed there are many different perspectives on what counts as climate finance and how it can best be applied to early-stage innovation. Indeed, the private sector climate landscape is rapidly evolving, and many funds interviewed are in the processes of restructuring and redefining how they engage with climate change and climate finance. The categories above have been designated based on the findings of this study, but do not represent the only way of categorising the climate finance landscape for early-stage innovation. These four categories are explored in detail in **Section 3**.



## 2.4 Climate finance approaches along the investment and scale cycle

It is important to note that early-stage pilots and start-ups require different types and volumes of finance at different stages of their journey to scale. To conceptualise this, the Climate Finance Accelerator's (CFA)<sup>31</sup> **'climate finance investment chain' offers a useful framework**. As shown in Figure 2, most projects, pilots or startups go through a four-stage process: i) project initiation, ii) project development, iii) primary project funding, and iv) secondary markets and refinancing. During this cycle, the inherent risks in projects and businesses typically decline over time, while their capital needs typically increase. Therefore, each stage requires access to particular types of finance, which must be readily available in any well-functioning climate finance ecosystem.

Figure 2. Climate finance investment chain



Source: CFA<sup>32</sup>

The four broad categories of climate finance, introduced in Section 2.3, are more effective or more available at different stages of the investment chain in Figure 2. For example:

- Pure grant finance is typically applied during the earlier initiation and development of a concept or initiative, as seed funding or to enable the development of a concept, feasibility and/or business model.
- Public sector, philanthropic and private sector capital can be applied as catalytic capital during the middle stages of the investment chain, to help leverage private sector investment, as part of the preparation for primary project funding.

<sup>31</sup> The CFA is a £10 million capacity building programme funded by International Climate Finance through the UK Government's Department for Business, Energy, and Industrial Strategy (BEIS) (now known as the Department for Business and Trade) to support emerging economies in achieving their national climate plans and Nationally Determined Contributions (NDCs).

<sup>32</sup> CFA (2022) Gaps in the Climate Finance Investment Chain. [\(Link\)](#)



- Blended finance, facilitated by public sector catalytic climate finance, would be applied as at the later stages in the investment chain, once the risk profile improves, and the significant resources required for a blended finance vehicle are more likely to generate a return on investment as a result of commercial success.
- Carbon markets can be accessed by startups or pilots later in the investment chain, once they have become more established and have generated sufficient evidence of their mitigation impact.

Generally, there is a greater need for public sector climate finance during the earlier stages of the investment chain, to establish concepts and go on to de-risk private sector investment. As the risk profile improves, there is greater potential for private sector investment as climate finance.

Understanding where there are gaps in the availability of climate finance makes it possible to improve the investment chain to enable greater flows of finance to innovators.<sup>33</sup> Based on findings from the CFA, Figure 3 below highlights the lack of all sources of climate finance, including venture capital, angel investors and public sector climate funds during the four stages of the investment chain, aggregated across Mexico, Columbia, Peru, South Africa, Nigeria and Turkey. This lack of early-stage climate finance is also observed in most other LMICs, as confirmed by the wider literature and interview findings from this study.<sup>34</sup>

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<sup>33</sup> *ibid*

<sup>34</sup> UNCTAD, *Improving Access to Finance*. [\(Link\)](#)



Figure 3. Availability of climate finance across the project cycle in CFA pilot countries

Source	Project Initiation	Project Development	Primary Project Funding	Secondary markets & refinancing
Commercial banks	Not relevant	Not relevant	Partially available	Available
Institutional investors	Not relevant	Not relevant	Available	Available
Private equity	Not relevant	Significant gap	Available	Available
Corporate funders	Available	Available	Available	Not relevant
Asset managers	Not relevant	Not relevant	Available	Significant gap
Venture capital	Significant gap	Significant gap	Available	Not relevant
Impact funds	Available	Available	Available	Not relevant
Angel investors	Significant gap	Significant gap	Significant gap	Not relevant
Microfinance and credit unions	Not relevant	Not relevant	Available	Not relevant
National development banks	Available	Available	Available	Not relevant
Climate funds	Significant gap	Available	Available	Not relevant
Bilateral development partners	Available	Available	Available	Not relevant
Multilateral development partners	Available	Available	Partially available	Not relevant
NGOs and philanthropic organisations	Available	Available	Available	Not relevant

Relevance/Availability of finance	
Not relevant	Significant gap
Partially available	Available

Source: CFA<sup>35</sup>

<sup>35</sup> CFA (2022) Gaps in the Climate Finance Investment Chain. [\(Link\)](#)



It is also important for donors and other actors supporting early-stage innovation to be aware of the connections and transitions between one stage and the next in the investment and scale cycle. The funding gap between seed funding and longer-term investments, typically referred to as the ‘valley of death’ can often occur due to providers of public sector finance withdrawing their support to innovators at the end of the proof of concept stage. Therefore, there is potential for donors to act as venture builders, taking a longer-term view of providing climate finance in the right form at the right time, along the investment and scale cycle.

Also notable is that there can be an important role for public climate finance to support the purchasing of products from ClimateTech innovators, to help scale impact, as explained in Spotlight 1.

#### Pilot Spotlight 1: Low-cost sensors for optimal insect protein production: The need to consider asset finance

Sanergy are working with the FT Hub and ICIPE in Kenya to develop [low-cost sensors for optimal insect protein production](#) through a circular economy process, collecting human waste via container-based sanitation and mixing this with organic food- and agricultural waste. They feed this mix to black soldier fly larvae (BSF) in controlled conditions to create nutritious insect feed for fish and livestock.<sup>36</sup> The BSF process is a type of composting, which relies on optimum atmospheric and temperature conditions. Sanergy have developed low-cost sensors which can be used in their own processes and also sold to farmers and other composting producers to allow them to optimise their production by measuring key parameters such as temperature and moisture levels. However, the cost of traditional sensors is prohibitively high for smallholder farmers in Kenya, requiring an upfront investment which could be supported with climate finance, if the GHG mitigation link can be demonstrated in the BSF composting process. Current investment from the FCDO is helping to show that it is possible to produce lower cost sensors (below, or significantly below US\$ 100) that can be accessible to such farmers and help them to increase their yields.

If high unit costs act as a barrier to uptake, development institutions can apply climate finance to support customers to meet these capital costs. This is particularly relevant for LMICs with little private sector involvement, whereas governments have significant market shaping power. All of these concepts and approaches are discussed in more detail in the following section.

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<sup>36</sup> Sanergy website. Accessed 13/04/2023. ([Link](#))





## 3. Deep-dive into Climate Finance for Early-stage Innovation

The main climate finance approaches and sources identified in the previous section are explored in detail here, with a focus on understanding their availability and relevance to early-stage innovation. Various routes to scale through climate financing are explored, including public sector financing, and blended finance, with the use of examples to demonstrate how donor agencies have responded to early-stage innovation seeking investment. The associated enablers and barriers to accessing climate finance in order to scale are discussed at the end of each sub-section.

### 3.1 Pure grant funding

#### Sources of finance:

- Donors
- Development Finance Institutions (DFIs)
- International climate funds
- Foundations / Philanthropic entities
- National and sub-national government
- National development banks
- Corporates (as part of Corporate Social Responsibility initiatives)

**Objectives:** Pure grant funding is effective in supporting early-stage innovation to prove a concept or method relating to mitigation or adaptation, prior to attracting private sector investment. It is also necessary for innovations that have no potential for revenue generation and thus no prospect of private sector investment.

**Investment Chain Stages:** 1. Project Initiation, 2. Project Development

#### Introduction

Grant funding remains the single most important source of climate finance during the initial stages of the investment chain (See Figure 2) for early-stage innovation, considering the significant deficit of private sector finance willing to support high-risk ventures. Many early-stage innovations are purely reliant on grants from governments and DFI's to support their early development. These early-stage innovations may face a bigger challenge in attracting private sector investment due to factors such as limited commercial viability, high risks, and lack of scalability at this stage of innovation.



In some cases, due to a lack of commercial aspects, some climate innovations may only be able to function over their entire lifecycle with grant finance. Grant funding can be particularly important for adaptation specific innovation, where revenue streams are less likely or require much a longer time-frame to test and introduce.

There is often a direct link from overseas development assistance (ODA) funding tagged as climate finance, such as the FCDO making the [UK's International Climate Finance](#) available for early-stage innovators through the FTL programme, as described in Box 1. However, there are many other sources of grant funding, as summarised above, including from international climate funds, national and sub-national governments. Another example is the Adaptation Fund Climate Innovation Accelerator, described in Box 2.

#### Box 1. Climate finance as overseas development assistance via the Frontier Technologies Hub

The Frontier Technologies Hub provides grants of up to GBP 75,000 to support early-stage innovations in the application of frontier technology to meet development challenges. It is funded through UK Aid via the FCDO, with a proportion of the funding supplied through overseas development assistance with several grants supporting climate adaptation and mitigation innovations. Pilots adopt an agile methodology, and are encouraged to work through sprints of activity, aimed at de-risking activity by testing critical assumptions to generate learning and evidence on the application of a tech innovation to a specified use case. Pilots take between 12-18 months to complete, and aim to generate evidence of what works, and what's needed to meet the needs of users in their context. Pilots also surface learning on what's needed to effectively support the innovation for scale, and may begin conducting preparation for scale activities. This is complimented by innovation method coaching, technical assistance, and matchmaking support to help teams to learn at pace. To date, 58 early-stage innovation ideas have been supported since 2016 across 32 countries.



## Box 2. Climate finance as grant funding via the Adaptation Fund Climate Innovation Accelerator

The Adaptation Fund Climate Innovation Accelerator (AFCIA) is a US\$ 10 million pilot small grants programme launched at COP25 by the Adaptation Fund. The AFCIA is implemented by the United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP) to foster innovation of adaptation practices in developing countries. The programme provides grants to a maximum of US\$ 250,000 to encourage new innovations; develop innovative adaptation practices, tools and technologies; as well as generate evidence of effective, efficient adaptation practices. The AFCIA targets a broad range of potential grant finance recipients, such as governments, entrepreneurs, young innovators and NGOs.<sup>37</sup>

### Considerations for early-stage innovation

The following are typical challenges and considerations for early-stage innovators when accessing pure grant climate finance.

- **Strong competition from other innovators:** Grant funding for early-stage climate innovation is in great demand as a result of intensive encouragement of entrepreneurs and innovators to solve challenges related to climate mitigation and adaptation.
- **Limited volumes of grant funding:** Despite the strong encouragement of the sector, there is a lack of significant volumes of grant capital available for climate innovation compared to other sectors such as health. Meaningful grant funding to enable scale is even more scarce.<sup>38</sup>
- **Fragmented and piecemeal financing:** It takes time and resources for innovators to seek and apply for new grants, which is not sustainable in the long run unless a longer-term grant can be secured to enable the operation and maintenance of a public good over time.
- **Complicated application procedures:** With grant funds for early-stage climate innovators the application process can be protracted and complex.
- **Navigating country-specific priorities:** Climate funds may have their own priorities for investments which are likely to be aligned with country specific priorities and action plans.
- **Low ability to evidence impact of the initiative:** Measuring and reporting on metrics is an issue for early-stage ventures for mitigation or adaptation impact. Adaptation projects don't have clear metrics like GHG emissions avoided such as in mitigation projects. Generally, with too many metrics, projects are unsure what is relevant for them.

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<sup>37</sup> Adaptation Fund Climate Innovation Accelerator (AFCIA) webpage. [\(Link\)](#)

<sup>38</sup> CFA (2022) Gaps in the Climate Finance Investment Chain. [\(Link\)](#)



Grant funding is important for supporting early-stage climate innovation, but it is not a scalable solution. For this reason, the use of public climate finance to leverage private sector finance is a much more effective strategy and this is discussed in the following section.

## 3.2 Catalytic capital from public sector and philanthropic sources

### Sources of finance:

- Donors
- Development finance institutions (DFIs)
- International climate funds
- Foundations / Philanthropic entities
- National development banks

**Objectives:** To unlock impact and additional investment that would not otherwise be possible, accelerating innovation fostering opportunity and economic growth, while paving the way for mainstream investors to get involved in transformative investments.<sup>39</sup>

**Investment Chain Stages:** 2. Project Development, 3. Primary Project Funding

Catalytic capital is investment capital that is “patient, risk-tolerant, concessionary, and flexible”.<sup>40</sup> It can play a crucial role in supporting impact-driven pilots and enterprises that are unable to access capital through conventional markets. As shown above, there are many types of organisations that can provide catalytic capital, including public sector finance, that may be more ‘officially’ tagged as climate finance, as well as philanthropic funding which is less definitive about being ‘climate finance’. Such sources of climate finance can be applied as catalytic capital, helping to leverage much more substantial volumes of private sector investment. Private sector entities can also play a catalytic capital role, helping to open up a pipeline of greater investment opportunities, as discussed in **Section 3.3**.<sup>41</sup>

**FCDO and other bilateral and multilateral donors can play an important role in directly funding climate finance instruments for early-stage innovation or directing funds to philanthropic organisations who provide catalytic capital.** Some examples of this are included in the boxes throughout this section. Public sector and philanthropic catalytic capital could take the form of repayable or non-repayable grants, concessional debt or equity. For catalytic capital, public sector and philanthropic grant funding can most effectively be deployed to attract private sector investments into climate related innovation through the following approaches:

<sup>39</sup> Catalytic Capital Consortium website. Accessed 15/02/2023 ([Link](#))

<sup>40</sup> *ibid*

<sup>41</sup> World Bank Group (2019) Early-Stage Financing in Green Sectors in Sub-Saharan Africa. ([Link](#))



**Support on improving the enabling environment:** This source of funding can help build national or sub-national government capacity to improve the enabling environment to be more conducive for private investments, including via improving policy and regulatory frameworks. This includes addressing data constraints for certain initiatives, improving the private sector investment climate and ease of doing business in a certain jurisdiction. An example of influential philanthropic actors supporting policy improvements as part of innovative capital mobilisation is the Asian Venture Philanthropy Network (AVPN)<sup>42</sup> and its country specific Policy Leadership Labs, such as in India.<sup>43</sup> The Shell Foundation is also active in this area, as described in Box 3.

### Box 3. Shell Foundation's support to the enabling environment for investment in climate innovation

The [Shell Foundation](#) is a UK-based independent charity that supports early-stage innovators through grant funding and non-grant instruments as appropriate, combined with extensive business support. They provide support to innovators to test new technology and enterprise models in the energy and transport sectors with a geographical focus on Africa and Asia. The Foundation was set up with a focus on renewable energy and was previously more focused on providing seed funding to early-stage innovators, helping them reach Series A and Series B rounds of funding. They work alongside strategic funding partners such as the FCDO, USAID, and Power Africa and **allocate a third of their budget to build a stronger enabling environment for social enterprises** in target countries.<sup>44</sup>

**Technical assistance to climate innovators:** As part of catalytic capital, technical assistance can be provided via grant funding and in-kind support from donor organisations to support early startups or pilots with project demonstration and proof of concept. Innovators often require support to improve their business processes, such as basic accounting and management, as well as more climate specific aspects such as methods to measure and prove the impact of their product or solution, in terms of GHG emissions reduction, carbon sequestration or resilience to climate change induced stresses.

These business- or initiative-level improvements can help to improve risk-return profiles of startups to attract investments at a later stage. International climate funds financed by the public sector, such as the Green Climate Fund (GCF), are potential sources of finance in this category who provide more upstream funding and focus on ecosystem building for early-stage innovation.<sup>45</sup> In the forestry and natural resource management sector, the WWF Nature-Based Solutions Accelerator (See Box 4) provides a strong example of technical assistance support to their portfolio of early-stage projects.

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<sup>42</sup> AVPN (2019) 4 Ways Policy Can Harness the Power of Networks to Drive Impactful Public-Private Collaborations. ([Link](#))

<sup>43</sup> AVPN India Policy Leadership Lab webpage. ([Link](#))

<sup>44</sup> Shell Foundation website. Accessed 07/02/2023. ([Link](#))

<sup>45</sup> GCF (2021) Accelerating and Scaling Up Climate Innovation: How the Green Climate Fund's Approach Can Deliver New Climate Solutions for Developing Countries. ([Link](#))



#### Box 4. WWF's Nature-Based Solutions (NbS) Accelerator

The Nature-Based Solutions Accelerator is a joint initiative of WWF, HSBC and the World Resources Institute (WRI) to overcome barriers to widespread and large-scale adoption of nature-based solutions through technical assistance and grant funding, helping to address mitigation and adaptation initiatives. The Accelerator is providing bankability support to a small portfolio of seven early-stage projects to make them investment-ready in two years through US\$ 150,000 grants.<sup>46</sup> The projects being supported are early-stage, not operating as yet, but with proof of concepts, focused on mangrove protection, forest protection and restoration, and regenerative agriculture. The Accelerator grants support the development of a solid business model and make those projects attractive for commercial investors. The Accelerator also **provides technical support on metrics**, guiding innovators on how to measure and to report on metrics relevant to them.<sup>47</sup>

**Matchmaking to scale up:** It is crucial to increase engagement and coordination between public and private climate investors to reach a consensus on why, and in what stage of the project cycle, can catalytic capital be most efficiently deployed, how to deploy it, and what outcomes it would yield. Early-stage innovators can be connected with the right investors through angel networks,<sup>48</sup> matchmaking events and platforms, as well as investor readiness programmes, which can help startups become more attractive to investors and reduce perceived investment risks. An example of climate finance being used for this purpose is Mercy Corps Ventures in Box 5.

#### Box 5. Mercy Corps Ventures

Mercy Corps Ventures invests in and catalyses venture-led solutions to increase the resilience of underserved individuals and communities. Founded in 2015 as the impact investing arm of the global development agency, Mercy Corps have supported 41 early-stage ventures to scale and raise over US\$ 333.9 million in follow-on capital. Their portfolio is 51% female-founded and centres around resilience-building solutions in adaptive agriculture and food systems, frontier fintech, and climate smart systems, so that those living in frontier markets can withstand disruption and plan for the future. Through seed capital and technical assistance support, piloting new approaches, action-oriented insights, and rigorously managing impact, they catalyse the ecosystem toward smarter, more impactful investments. This is supported by **matchmaking between the cohort and suitable investors** for specific innovations.

<sup>46</sup> Data from key informant interviews.

<sup>47</sup> Data from key informant interviews.

<sup>48</sup> CFA (2022) Gaps in the Climate Finance Investment Chain. [\(Link\)](#)



**Provision of working capital:** After startups have secured their first funding rounds, their next challenge is securing later stage funding, and finding the right market to scale up, which is also called the 'second valley of death'. This is where catalytic capital can be deployed as working capital for startups to refine their recruitment, operations, and finance processes as they are growing.<sup>49</sup> UNICEF's Venture Fund provides this type of support to early-stage climate innovators, as shown in Box 6.

#### Box 6. UNICEF's Venture Fund

UNICEF's Venture Fund was launched in 2016 and is a US\$ 17.9 million investment fund aligned with UNICEF's Global Innovation Strategy to provide technical and financial assistance to projects that can accelerate results for children. The Fund provides **equity-free funding for early-stage innovators ranging from US\$ 50,000–100,000** in technologies in UNICEF country offices, **helping to cover initial running costs and working capital.**<sup>50</sup> So far the Fund has invested in 130 frontier technology solutions, reaching 31 million beneficiaries with 7 successful exits where projects were acquired or merged into bigger firms.<sup>51</sup> UNICEF applies an innovative portfolio management approach which includes nine innovation portfolios, with each portfolio containing innovative solutions on climate change, gender equality, water and sanitation, amongst others.

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<sup>49</sup> Data from key informant interviews.

<sup>50</sup> Data from key informant interviews.

<sup>51</sup> UNICEF Venture Fund. [\(Link\)](#)



**Concessional debt / patient capital:** Concessional finance loans can be provided to startups or project developers at softer terms than prevailing market terms, improving terms for potential equity investors or giving confidence to other debt investors. Patient capital is a long-term investment, where investors are prepared to wait a considerable amount of time (10-15 years in some sectors such as agriculture) before seeing any financial returns. Examples of public and philanthropic climate finance being used as concessional finance and patient capital for early-stage climate innovators are provided by the Global Innovation Fund (GIF) in Box 7 and the Africa Enterprise Challenge Fund (AECF) in Box 8.

#### Box 7. The Global Innovation Fund (GIF) – Concessional finance for early-stage innovation

The Global Innovation Fund (GIF) is a non-profit, entirely public-funded, impact-first investment fund offering investments from US\$ 50,000 to US\$ 15 million. The GIF provides grants and risk capital such as equity and debt, future equity and convertible loans, with highest funding amounts for projects that can demonstrate evidence of success and ability to scale and replicate in multiple developing countries.<sup>52</sup> GIF recently supported Babban Gona in Nigeria with US\$ 2.5 million in **concessional debt investment** for scaling their innovative agriculture franchise model to improve the lives of smallholders. The Fund also provided equity investment to Kamatan, an agricultural technology startup in India that is working to connect farmer produce organisations with retailers.<sup>53</sup>

#### Box 8. Patient Capital from the Africa Enterprise Challenge Fund (AECF)

The Africa Enterprise Challenge Fund (AECF), started in 2008, is catalysing innovative private sector business models and technologies in Sub-Saharan Africa through **patient capital and growth support services**. Supported by partners such as the EU, FCDO, Bill & Melinda Gates Foundation and Swedish International Development Cooperation (SIDA), the AECF supports innovations in poverty alleviation, clean energy access and agriculture. The non-profit has raised US\$ 392 million to date, providing catalytic funding to enterprises by investing in businesses that are unable to meet traditional risk-return standards for commercial investors.<sup>54</sup>

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<sup>52</sup> Data from key informant interviews.

<sup>53</sup> Global Innovation Fund. [\(Link\)](#)

<sup>54</sup> AECF. [\(Link\)](#)





### **Support to financial intermediaries, such as Venture Capital (VC) Funds and commercial banks:**

Another important way in which climate finance can support early-stage climate innovation is by enabling financing intermediaries, such as commercial banks in a low-income country or a VC fund to be able to invest in higher-risk early-stage ventures. Public sector climate funding can play a crucial role for sectors such as renewable energy, where they can provide credit facilities to local banks and guarantee loans for startups.<sup>55</sup> This form of quick, low-cost and subordinated debt can play a catalytic role to unlock lower-risk 'on-lending' or investment by financial intermediaries such as VC funds and commercial banks. For example, the International Finance Corporation (IFC) supports VC funds to invest in more risk climate innovation (See Box 9) and the Climate Finance Partnership which provided a US\$ 100 million first-loss seed capital to mobilise US\$ 400 million of additional investments in sustainable infrastructure.<sup>56</sup> World Bank funding is also used to de-risk investment portfolios in developing countries through first-loss capital, partial credit guarantees, co-investment, and matching funding.<sup>57</sup>

#### Box 9. International Finance Corporation's (IFC) Startup Catalyst and Venture Capital Platform

IFC launched its Startup Catalyst platform in 2016 to support early-stage entrepreneurs in nascent venture ecosystems developing and scaling new technologies and tech-enabled business models to address challenges such as climate change, access to finance, healthcare, and education. **The Startup Catalyst platform invests in incubators, accelerators, and seed funds that are intermediaries** in supporting innovative early-stage startups in developing contexts through mentoring, networking, and funding. So far, the platform has supported 19 accelerators and seed funds that have invested in over 1,180 startups in 24 emerging markets. In addition, IFC is also supporting ecosystem building by investing directly in ventures and VC funds through its Venture Capital Platform. The platform will support early-stage innovators to scale up with US\$ 225 million in Pakistan, Middle East, Central Asia and Africa.<sup>58</sup>

<sup>55</sup> McKinsey & Company (2021) It's Time for Philanthropy to Step Up the Fight Against Climate Change. [\(Link\)](#)

<sup>56</sup> Hewlett Foundation (2020) Blending philanthropic, Public and Private Capital to Finance Climate Infrastructure in Emerging Economies. [\(Link\)](#)

<sup>57</sup> Data from key informant interviews.

<sup>58</sup> IFC Disruptive Technologies and Venture Capital. [\(Link\)](#)



**Blended finance models that de-risk private sector investment:** To invest in higher risk, but potentially very high impact climate innovation, private sector investors need incentives and guarantees such as first loss guarantees, tax benefits, and risk-sharing mechanisms. This is where blended finance can play an important role to remediate a market failure and incentivise private investments. Public or philanthropic climate finance can be used to de-risk private sector investment, via blended finance vehicles, which can unlock significant sources of private sector capital that would otherwise be deterred by high risks. For example, institutional investors' (pension funds etc.) share of total private climate finance remains marginal, at 1%, due to several barriers such as low risk appetite, a need for larger ticket sizes, and a lack of policy incentives. Blended finance has a significant potential in overcoming these barriers and catalysing investment at scale, as shown in Box 10<sup>59</sup>

Box 10. Credit lines and blended finance to de-risk on-lending to climate innovators by financial intermediaries, via the Climate Finance Partnership

The Climate Finance Partnership (CFP) is a blended finance fund, featuring a unique blend of philanthropic, government, and private sector capital. The vehicle's focus is to provide investments in renewable energy sources, energy efficiency, energy storage, and clean and low-emission transportation systems in Africa, Southeast Asia, and Latin America that significantly protect and preserve the environment.<sup>60</sup> The partnership will provide US\$ 100 million in concessional capital to mobilise as well as accelerate private capital for the mitigation sector in emerging economies. This is a pioneering approach under which blended finance will be provided in partnership with private asset managers for the first time, as opposed to development banks. The CFP is structured as a unique investment fund managed by BlackRock, the world's largest asset manager, and has raised catalytic capital of US\$ 130 million from foundations and the national governments of France, Germany and Japan. This catalytic capital will be **used to insulate investment risks for more than 10 institutional investors**, who have invested US\$ 523 million in the fund.<sup>61</sup>

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<sup>59</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance 2021 ([Link](#))

<sup>60</sup> William and Flora Hewlett Foundation (2020) Blending philanthropic, public and private capital to finance climate infrastructure in emerging economies. ([Link](#))

<sup>61</sup> Businesswire (2021) Climate Finance Partnership Mobilizes US\$ 673 Million to Accelerate Net Zero Transition in Emerging Markets. ([Link](#))



Blended finance can support mitigation and adaptation initiatives. Another relevant example, with a focus on adaptation, is an instrument promoted by the Climate Innovation Lab: the Climate Resilience and Adaptation Finance and Technology Transfer Facility (CRAFT) fund.<sup>62</sup> This blends commercial and concessional capital into a private equity fund to invest growth capital for adaptation initiatives. On the mitigation side, one of the most influential actors in blended finance is FMO Ventures, described in Box 11.

#### Box 11. Blended finance for climate innovation in the FMO Ventures Program

The FMO Ventures Program supports early-stage, tech-enabled direct investments in Fintech, Energy Access and AgriTech. Supported by funds from the European Investment Bank (EIB), they also provide repayable grants which are converted to shares or equity upon return. The program **follows IFC's five principles of blended finance**, which are: providing additionality; crowding-in and offering minimum concessional capital; commercial sustainability and viability; addressing market failures and minimising risks of crowding out private finance; and promoting and practising high standards.<sup>63</sup> FMO is also supported with guarantees from the European Commission which are used to focus on ecosystem building, finding early innovators and nurturing them to build pipelines.

While some interviewees expressed the view that donors and Multilateral Development Banks should put more money into the first two stages in the investment chain (as shown in Figure 2) via blended finance models, the risk appetite of blended finance vehicles is often limited by high management costs. Managing blended finance requires experience and legal expertise, which is costly, so less risks are taken with early-stage innovation. Many sources providing blended finance are set up as 'Limited Partners' that become a member of the fund. Blended finance is, therefore, generally only available to climate innovation pilots or startups that have a proven track record of revenue generation.

Blended finance can be used at that later stage of the investment chain in all the sectors of interest to this landscape review. In the forestry sector, an example is the Mirova Natural Capital (previously Althelia Climate Fund), an innovative pilot fund for forest-based carbon and other environmentally certified credits, acquired by Mirova in 2020. The Fund received EUR 25 million in investment from the European Investment Bank to de-risk and mobilise EUR 150 million in total private equity investments across Africa, Asia and Latin America.<sup>64</sup>

<sup>62</sup> Climate Policy Initiative, CRAFT. [\(Link\)](#)

<sup>63</sup> IFC, Blended Concessional Finance Principles for Private Sector Projects. [\(Link\)](#)

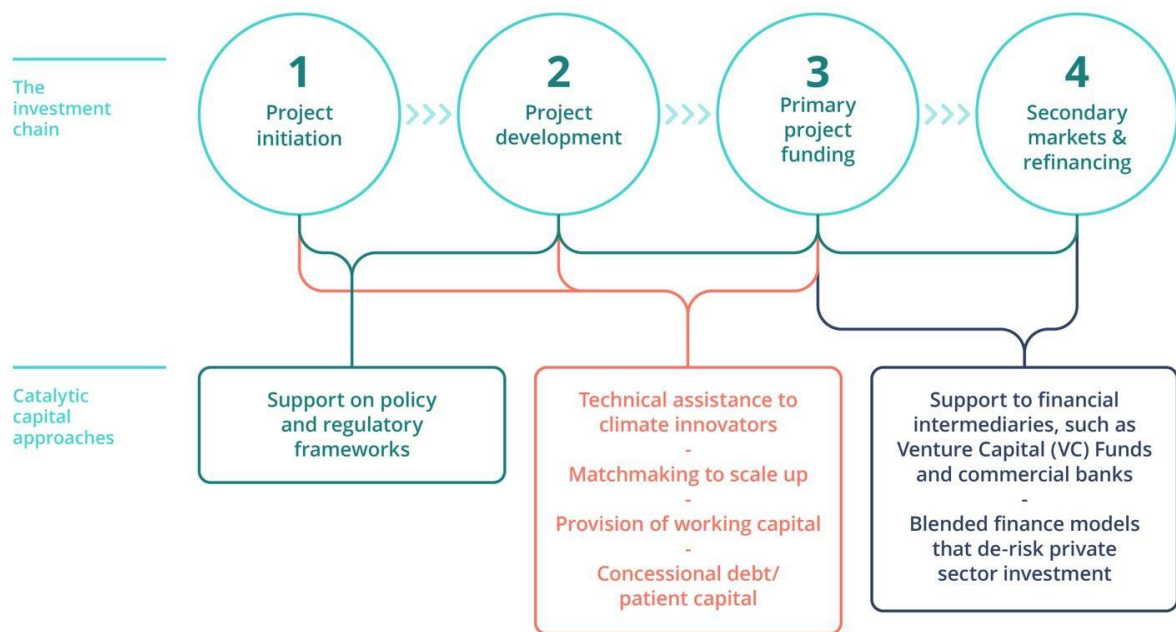
<sup>64</sup> European Investment Bank (2014). Innovative Climate Finance Products. [\(Link\)](#)



## Combined approach to catalytic capital

Importantly, many of the methods outlined above can be combined together within one climate finance supported fund or catalytic finance vehicle, or a sequence of funds, such as Climate Investor One (CIO).<sup>65</sup> Taking all of the above approaches to catalytic finance together, they have the ability to greatly improve the investment climate for private sector finance into climate mitigation and sometimes adaptation projects. The way in which some of these approaches are mutually reinforcing and can work together to mobilise greater volumes of private sector investment is illustrated in Figure 4.

**Figure 4. Potential effects of different catalytic finance approaches**



Source: Consultants' analysis

<sup>65</sup> Climate Investor One. [\(Link\)](#)



## Considerations for early-stage innovation

The following are typical challenges and considerations for early-stage innovators when accessing public sector and philanthropic catalytic climate finance.

- **Very little opportunity to access blended finance vehicles for early-stage innovation:** Blended finance vehicles require significant management resources and legal expertise. Therefore, this finance usually targets innovators that are at or past Series A and B.
- **Concentration of investments in certain geographies:** Some public financial institutions, such as the IFC, have specific mandates to work with the private sector, but there is a high chance that these actors may end up focusing on merely meeting private sector demands, concentrating their investments in only certain geographies where commercial success is likely to be higher.<sup>66</sup> This is why catalytic capital should be combined with support on policy and enabling frameworks in lagging countries.
- **Lack of a track record:** Early-stage pilots often lack proof of concepts and a track record which are crucial to gain investors' trust, even if supported by catalytic finance.
- **Due diligence requirements:** Pilots may also be required to go through stringent diligent processes (such as ethical supply chains, etc.) by philanthropists or public investors which can be difficult for them.
- **Culture gaps and timelines:** Early startups lack awareness about investor timelines and their financing rounds and tend to underestimate them. They are often used to quick turnarounds and find it challenging to align their processes to bureaucratic approvals, which may vary depending on the investor and geography.

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<sup>66</sup> World Resources Institute (2012) Public Financing Instruments To Leverage Private Capital For Climate-Relevant Investment: Focus On Multilateral Agencies. [\(Link\)](#)



### 3.3 Catalytic capital: Private sector risk capital

#### Sources of finance:

- Angel investors
- Commercial investors (including venture capital)
- Corporate investors
- Impact investors
- Accelerators with investment mechanisms

**Objectives:** To unlock impact and additional investment, where there is an incentive for private sector actors to do so.

**Investment Chain Stages:** 2. Project Development; 3. Primary Project Funding; 4. Secondary Markets and Refinancing.

There are many opportunities and benefits for the private sector that can be unlocked with climate finance, including catalytic capital by the private sector themselves. Benefits include development and distribution of new products and services; new, expanded markets for products and services; new revenue streams; reduced raw material and operational costs; competitive advantage gained through a more secure and resilient supply chain; and first-mover advantage.<sup>67</sup> Investors across the early-stage life cycle of climate tech innovation, therefore need to recognise the time-critical and strategic opportunity climate tech offers and to free up more capital to address the large financing and funding gap.

The number of VC firms and impact investment funds investing in early-stage innovation seems to be growing, including both traditional VCs and dedicated or specialist climate tech venture funds. There is an increasing focus on the role venture firms can play in the net zero transition, through efforts such as the UN-convened [Net Zero Asset Owner Alliance \(NZAOA\)](#),<sup>68</sup> a member-led initiative of institutional investors striving to transition their investment portfolios to net-zero GHG emissions by 2050. VCs can play a crucial role at the 'valley of death' stage and have recently moved into early-stage funding to address this gap.<sup>69</sup> As introduced in the investment chain in Figure 2, during the project initiation scale, the capital needs of a venture are relatively low while the risk of failure is high. As the project develops and moves into the 'primary project funding' stage of the cycle, the capital needs will increase, while risks of failure will decline.<sup>70</sup> However, the rate at which capital needs increase is much higher than the rate at which risks lower. This is where VC funding can provide the larger deals needed by startups to scale up their operations. However, it is important to note that there can be a clash between climate tech and the VC

<sup>67</sup> World Bank Group (2021) Enabling Private Investment in Climate Adaptation & Resilience. [\(Link\)](#)

<sup>68</sup> UNEP, UN-convened Net-Zero Asset Owner Alliance. [\(Link\)](#)

<sup>69</sup> Hermann, Jonas (2022) What is the "Startup Valley of Death"? [\(Link\)](#)

<sup>70</sup> Hermann, Jonas (2022) What is the "Startup Valley of Death"? [\(Link\)](#)



model, as the VC model is predicated on fairly rapid returns which causes an implicit bias in the types of companies invested in.<sup>71</sup> However, some VCs and impact investment funds are willing to fill this much needed role, such as the Barka Fund in Box 12.

#### Box 12. Barka Fund's support to climate tech

[The Barka Fund](#) is an impact fund supporting African entrepreneurs working on climate and environmental challenges in their communities. The Fund has a revenue-based investment model and helps small enterprises scale their environmental and climate solutions. They support ecosystem building by working alongside incubators and accelerators programs to identify, integrate and build a community of climate-focused startups. The Fund's Capital Investment Program provides early-stage impact investment solutions for climate startups across Africa working in sectors such as agriculture and food systems, environment, natural resources and energy. Their Investor Readiness Program is a 13-week program aimed at high potential climate-focused startups looking to raise seed investments, and helps them prepare to meet investors' requirements and raise capital faster.<sup>72</sup>

Corporate venture partners can also play a role to finance early-stage innovation to scale given their high resources, commercial expertise, and market knowledge. In particular, they have the capacity to develop new and more proactive models of engagement with pilots with heavy capital costs targeted at disrupting asset-heavy incumbent industries, in sectors such as energy and transport, with high barriers to entry. This includes funding early startups that are not yet mature or commercially deployable, to help them scale, while helping the corporate entity to meet their own climate targets.<sup>73</sup>

Private equity and investment firms can also play a crucial role as later stage investors to help fill the funding gap in order to accelerate the climate tech startup lifecycle by funding VC firms and related investment intermediaries that are targeting early-stage innovators. They can draw on their resources to also develop in-house technical and commercial capability to support direct investments for startups. By investing in the earlier life cycle of startups, they can gain a deeper understanding of the climate finance ecosystem to improve later round investments.

Another method of private sector supplied catalytic finance is purely private sector accelerators integrated with funds. Accelerators can play a strategic role to help climate startups scale up using their peer networks and drawing attention to their investment early needs. For early-stage innovators, accessing private investments through a de facto competitive process with one-size-fits-all standards and reporting systems is a crucial challenge and accelerators can help with this. One particularly relevant example is the Adaptation and Resilience (A&R) focus of the private sector BFA Catalyst Fund, which is described in Box 13.

<sup>71</sup> Data from key informant interviews.

<sup>72</sup> Barka Impact Fund: About Us. ([Link](#))

<sup>73</sup> PwC (2020) The State of Climate Tech 2020. ([Link](#))



### Box 13. BFA Catalyst Fund

The [BFA Catalyst Fund](#) is a pre-seed fund and accelerator that started off as a philanthropic grant in 2015, and later refined its model to meet market needs. The Fund provides a combination of catalytic grant capital, bespoke venture-building support from market and sector experts, and supports companies to access a global network of investors and corporate innovators.<sup>74</sup> With support from leading actors such as the Bill & Melinda Gates Foundation, JPMorgan Chase & Co., Rockefeller Philanthropy Advisors and the FCDO, the Fund supports entrepreneurs using technology, finance and data innovation, particularly those addressing climate challenges. The Fund relies on BFA Global for their consulting component, with Limited Partners as their main source of funds now. Focusing on Asia, Africa and Latin America, the Catalyst Fund has supported over 16 companies working in sectors such as health, agriculture, digital finance, informal retail, and digital commerce.<sup>75</sup>

The following approaches and terms are also worth understanding as part of the implementation of private sector catalytic capital:

**Sweat equity:** Some private sector entities such as VCs are able to support early-stage innovation in sweat equity, which is generally not monetary, and mostly comes in the form of technical assistance support. Through this, they gain equity in a startup in exchange for mentorship in business processes, and human resource management, providing connections and so on, which can then leverage greater amounts of private sector investment from another entity.

**Simple agreement for future equity (SAFE):** This gives startups a way to raise money without receiving a valuation or giving up equity in the early stages. It is a type of convertible security that early-stage startups can use to fund their business without valuing the company or giving up equity initially. An investor would give the startup cash in exchange for the right to buy equity in the company after a triggering liquidity event, which is typically the next funding round.

**Convertible note:** A convertible note is a loan that carries interest and eventually converts into preferred stock after a maturity date or triggering event. Since it's a loan, it means the startup company is taking on debt. However, instead of paying back the loan amount in cash, the company has the option to pay off the convertible debt with equity after a conversion event.

**Venture Studio:** An evolution of the VC model above is to the Venture Studio model, which offers an interesting possibility for early-stage innovation. A venture studio model combines the expertise and resources of a venture fund, an incubator, and an operating company – all in-house – which can be beneficial to make up for the limited capacity and experience of early-stage innovators in navigating the

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<sup>74</sup> Data from key informant interviews.

<sup>75</sup> BFA Catalyst Fund. [\(Link\)](#)





investment landscape.<sup>76</sup> Although the venture studio model requires significant equity from startups in order to make it attractive enough to spend resources on testing ideas and launching commercially, it can scale startups faster and avoid mistakes generally made by newcomers, greatly increasing the chances of success. An example of a university-led venture studio is described below.

#### Box 14. UConn's Future Climate Venture Studio

The University of Connecticut (UConn) has launched its Future Climate Venture Studio, a multi-year initiative to support climate startups with critical access to technology, research, networking with industry and corporate partners. In collaboration with R/GA Ventures (a leading venture studio operator and early-stage investor) and CTNex (a state agency dedicated to public-private partnership in Connecticut), the Studio will support mitigation projects using carbon technology, geoengineering, and blue technology, as well as adaptation initiatives on ecosystem management, agriculture, industry and manufacturing; along with startups working on and food, water, transportation and alternative energy sources.<sup>77</sup>

In general, it is important to recognise the current limitations of catalytic capital provided by the private sector to early-stage innovations. The private sector will design or produce climate resilience solutions in response to market demand or a government mandate for them, invest in climate resilience measures where there is a financial incentive to do so, or the risk of not doing so is deemed unacceptable.<sup>78</sup>

#### Considerations for early-stage innovation

The following are typical challenges and considerations for early-stage innovators when accessing private sector catalytic climate finance.

- **Lack of climate-related risk data:** The lack of country-level climate risk and vulnerability data and information services that can be used to guide investment decision-making is still lacking, which limits the ability of investors to make informed investment decisions.
- **Technical data:** Investors need climate data to be organised and presented in an understandable way. This enables them to identify and quantify climate risks and assess the opportunities to integrate into their investment decisions. Investors currently have limited analytical capacity to price climate risks and to integrate the “value” of adaptation outcomes and averted climate impacts into project assessments or return calculations.<sup>79</sup>

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<sup>76</sup> The Global VC (2022) The Secrets to Venture Studio Model Success. [\(Link\)](#)

<sup>77</sup> UConn Today (2022) Climate Venture Studio: A Comprehensive, Collaborative Approach to a Cleaner Planet. [\(Link\)](#)

<sup>78</sup> World Bank Group (2021) Enabling Private Investment in Climate Adaptation & Resilience. [\(Link\)](#)

<sup>79</sup> WBG. Enabling Private Investment In Climate Adaptation & Resilience. [\(Link\)](#)



- **Policy and frameworks:** The underlying country, regulatory environment, barriers and risks, and broader investment landscape are likely to be the most important determining factors for private sector involvement in climate-relevant investment.<sup>80</sup> In emerging markets, there are little to no existing regulations or formal standards and metrics in place to help ensure investments are meeting their climate needs.
- **Lack of quantifiable benefits for adaptation projects:** As discussed in **Section 2.2**, the lack of clarity on selecting and implementing metrics for adaptation initiatives is a persistent challenge to access catalytic climate finance.<sup>81</sup>
- **Initial equity leaves little room for later stage investors:** Typically, significant equity taken by the first investor leaves very little for later fund-raising stages. This is particularly acute where the initial risk is high at the start of the investment chain.<sup>82</sup>
- **Low alignment with strategic national climate goals:** climate finance that is purely implemented by private sector investors, without any guidance from public sector entities, can risk being disconnected from the areas of greatest focus such as a country's nationally determined contribution (NDC) objectives.
- **Lack of quantifiable benefits:** Investors need reliable data systems to engage more in nature- and climate-positive business outcomes. Private sector investors also typically have low ability to assess the full environmental and social benefits generated by investments.
- **Lack of private sector reporting:** Private sector finance is not reported or disclosed with the same level of sophistication, transparency, and consistency as public climate finance.<sup>83</sup> These data gaps make it harder to assess the impact and outcome of private climate finance.

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<sup>80</sup> World Resources Institute (2012) Public Financing Instruments To Leverage Private Capital For Climate-Relevant Investment: Focus On Multilateral Agencies. [\(Link\)](#)

<sup>81</sup> World Resources Institute (2012) Public Financing Instruments To Leverage Private Capital For Climate-Relevant Investment: Focus On Multilateral Agencies. [\(Link\)](#)

<sup>82</sup> Data from key informant interviews.

<sup>83</sup> Climate Policy Initiative (2022) Global Landscape of Climate Finance. [\(Link\)](#)



## 3.4 The compliance and voluntary carbon markets

### Sources of finance:

- Private sector businesses
- Individuals
- Other types of organisations wishing to offset GHG emissions via the carbon market

**Objectives:** Ability to generate revenue from selling carbon credits that recognise the GHG emissions reduction or carbon sequestration impact of an initiative.

**Investment Chain Stages:** 2. Project Development, 3. Primary Project Funding, 4. Secondary Markets and Refinancing.

For innovations that enable significant emission reductions or carbon sequestration, there are often opportunities to gain revenue from carbon credits. Carbon credits are traded on carbon markets, under two systems: the 'compliance' market and the 'voluntary' market.

- **The compliance market**, also known as the regulatory or mandatory market, has its roots in the Kyoto Protocol (1997) of the UN, where emission reduction targets were established for different countries. Three mechanisms were proposed through which this could be done: the Clean Development Mechanism (CDM), International Emissions Trading (IET), and Joint Implementation (JI). The CDM is the most relevant mechanism in the carbon credit context. Credits that are bought on the compliance market are called Certified Emissions Reductions (CERs).
- **The voluntary carbon market (VCM)**, whereby the participants in the voluntary market are not buying credits to comply with regulations/rules, but because they want to meet their Corporate Social Responsibility targets. Carbon credits bought on the voluntary market are called Voluntary Emissions Reductions (VERs) and they are supposed to offset the GHG emissions generated by the purchasing entity.

The CDM/CER market is highly regulated by government agencies and involves complex procedures and methodologies for project registration. The compliance carbon market size has been growing rapidly and reached US\$ 899 billion in 2021.<sup>84</sup> The scope of projects is narrower and omits forestry and agriculture for example. CER credits are aimed at the global compliance market and the price per tonne is broadly the same wherever it is bought.<sup>85</sup> Bearing in mind these factors, projects that can generate CER credits are generally large infrastructure projects, particularly in the energy and transport sectors, where GHG emission reductions can be significant. The compliance market route of financing is generally not applicable for early-stage innovators, while the voluntary carbon market is more accessible.

<sup>84</sup> Boe Report (2022) Making sense of Carbon Markets and Registries. [\(Link\)](#)

<sup>85</sup> Native Eco, 2021. "How carbon credits work". Native Eco. Accessed 25/08/2021. [\(Link\)](#)



Voluntary offset projects follow rules set by a voluntary standards body. These use different processes for verifying that emissions are genuinely reduced, based on methodologies and audited performance that is overseen by standards bodies such as Gold Standard and Verra. This flexibility in measurements allows for greater innovation and experimentation, so a wider range of large and small projects can be developed.<sup>86</sup> It is worth noting that the voluntary carbon market has come under significant criticism recently, following an investigation into the effectiveness and impact of a range of supposedly robust carbon offset initiatives.<sup>87</sup> However, the projects that are robust in terms of GHG emission reduction and carbon sequestration continue to play an important role. [The voluntary market for carbon credits](#) reached US\$ 2 billion in 2021,<sup>88</sup> nearly quadrupling from 2020, and is estimated to be nearly US\$ 8 billion currently,<sup>89</sup> with an increasing number of companies committing to net-zero and purchasing carbon credits to offset remaining emissions. It is estimated that by 2030, the VCM could grow between US\$ 30 billion at the low end and US\$ 50 billion at the high end.<sup>90</sup>

Voluntary carbon credits can help direct private sector finance into climate projects related to biodiversity, agriculture, clean cooking, forest protection and reforestation, that would not be able to generate funding to scale otherwise.<sup>91</sup> Carbon credits can also play an important role to lower the cost of emerging climate technologies by supporting investments in innovation. It is also crucial to scale up voluntary carbon markets, which can help address the challenge of capital mobilisation in developing countries, as well as provide cheaper investments into nature-based climate projects for the private sector.<sup>92</sup> An excellent example of carbon credits supporting early-stage clean cooking innovation is provided by ATEC, in Box 15.

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<sup>86</sup> *ibid*

<sup>87</sup> Greenfield, P. 18<sup>th</sup> January 2023, Revealed: more than 90% of rainforest carbon offsets by biggest certifier are worthless, analysis shows. The Guardian. ([Link](#))

<sup>88</sup> Ecosystem Marketplace (2022) VCM Reaches Towards \$2 Billion in 2021: New Market Analysis Published from Ecosystem Marketplace. ([Link](#))

<sup>89</sup> Data from key informant interviews.

<sup>90</sup> McKinsey & Company (2021) A blueprint for scaling voluntary carbon markets to meet the climate challenge. ([Link](#))

<sup>91</sup> McKinsey & Company (2021) A blueprint for scaling voluntary carbon markets to meet the climate challenge. ([Link](#))

<sup>92</sup> Data from key informant interviews.



### Box 15. Carbon credits enhance the scalability of ATEC clean cooking solutions in Cambodia and Bangladesh

Established in 2016 by an Australian founder, ATEC provides sustainable, affordable and accessible clean cooking products for bottom of the pyramid households, via Pay-as-You-Go (PAYG) financing. Through sales of their two flagship on-grid and off-grid products, ATEC Biodigester and eCook induction stoves, ATEC delivers data-driven scalable impact in Cambodia and Bangladesh and is aiming to expand into other markets as they develop their products and business model. ATEC were supported during the early stages by several grants, including from GSMA's Mobile for Development programme and they are now self-sustaining due to their income from user fees. In March 2023, ATEC signed a long-term agreement with ENGIE to purchase up to 11.5m tonnes of Gold Standard Digital measuring, reporting and verification (MRV) carbon credits from Bangladesh and Cambodia, utilising ATEC's patented IoT eCook devices. This helps to reduce the cost of clean cookstoves for households, helping to further accelerate uptake.<sup>93</sup>

Until recently, there was no internationally agreed standard or protocol on calculating how GHG reduction projects are able to quantify their emission reductions. **This has recently been resolved by the introduction of the GHG Protocol Project Quantification Standard.**<sup>94</sup> This is the recommended process to quantify the reductions associated with GHG mitigation projects for use as offsets or carbon credits.<sup>95</sup>

However, while the Project Quantification standard provides overall principles, it is down to each organisation seeking to sell carbon credits, to formulate their own detailed methodology for calculating the emission reduction and relevant co-benefits of their initiative, which translates into the value of each carbon credit. This will then need to be verified and approved by an independent body such as Gold Standard, Verra or the UN's Clean Development Mechanism (CDM) through independent auditors, which are often provided by the certifying agency. While robust, this can create a bottleneck in the scale of initiatives funded by carbon markets, which can potentially be resolved with digital ledger technologies and more specifically, blockchain.

Blockchain as a tool to help verify carbon credit related initiatives and transactions began to be widely discussed around 2015, including at COP 21 in Paris. In theory, distributed ledger technologies (DLT), including Blockchain solutions, can help in measuring, reporting and verification (MRV) processes, unlocking new ways to ensure that emission-reducing projects are having the impact they claim, in ways that are more accurate, transparent and cost-effective. For example, secure blockchain-based processes could cut down the lag-time of a company monitoring and reporting the carbon reduction and being awarded the credits from around 24 months to much closer to real-time. This makes it very attractive in terms of better cash flow for the business.<sup>96</sup>

<sup>93</sup> ATEC (2023) ENGIE & ATEC Sign Landmark Multi-Country Digital MRV Carbon Credit Agreement. ([Link](#))

<sup>94</sup> GHG Protocol Project Quantification Standard. ([Link](#))

<sup>95</sup> Some useful tools are available at: <https://ghgprotocol.org>

<sup>96</sup> Scott, M. (2021) From cookstoves to carbon markets: How blockchain is supercharging sustainability. Reuters. ([Link](#))



## Box 16. CarbonClear: Distributed Ledger as an alternative to voluntary carbon market accreditation

One interesting precedent of distributed ledger technology to bypass the ledgers / standard bodies like Gold Standard is the example of CarbonClear, who are providing off-grid solar energy and selling blockchain secured carbon credits directly on their website. This is compliant with a CDM methodology, but the carbon reduction is independently verified by Det Norske Veritas (DNV). The distributed ledger component is enabled by [Activeledger](#).<sup>97</sup>

There are also many examples of innovations trying to disrupt the voluntary carbon markets' dynamic through digital MRV solutions. One example of this is 4RDigital's CaVEX platform that is intended to provide access to carbon credits for households and individuals, by verifying emission reduction through remote technology. If there is a willing buyer, a different carbon credit set up is possible, but there are not yet many precedents of this in practice. However, it is likely to take a number of years before small projects can access carbon markets directly.

To access carbon markets, there are some important considerations for early-stage innovators. Startups or pilots should aim to integrate credits within their business model from the start if they want to generate revenue in this way.<sup>98</sup> Secondly, setting up carbon credits involves working with a project developer who would structure the project and sell the credits. The process of getting certified could take two or more years and involves prohibitive set-up costs not feasible for small scale projects. It is therefore often necessary to access grant funding to support this process. The WWF NBS Accelerator, for example, aims to support early-stage innovation to access carbon markets by linking the cohort members to carbon buyers and carbon intermediaries for technical expertise and investments.<sup>99</sup> It is also practical for most projects to 'stack' revenue, such that carbon-related revenue is additional to other sources of revenue related to sale of hardware or services, tourism, sale of sustainable local products and so on.

In the long run, solutions that address both adaptation and mitigation objectives, such as cold chain solutions and irrigation powered by renewable energy or innovative approaches to mangrove reforestation, could potentially access carbon markets through platforms that trade carbon credits with adaptation co-benefits. This would depend on sufficient scale, including achieving required scale through the aggregation of projects.

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<sup>97</sup> Carbon Clear website. ([Link](#))

<sup>98</sup> Data from key informant interviews.

<sup>99</sup> Data from key informant interviews.



## Considerations for early-stage innovation

There can be significant challenges for early-stage innovators in accessing the voluntary carbon market including:

- **High cost of the accreditation process:** The process of defining and proving a methodology and gaining accreditation from a body such as Gold Standard or Verra can be resource intensive and can cost around US\$ 200,000 on average.<sup>100</sup> However, alternative approaches are possible, as shown by CarbonClear above.
- **Significant time lag between achieving an accredited carbon credit and being able to generate revenue:** There is typically a time lag due to bureaucratic processes and a bottleneck caused by a limited number of standards bodies overseeing the global landscape.
- **Additionality criteria:** Projects need to fulfil the additionality criteria to be eligible for carbon credits, which means that without the added incentive created by the carbon credits, the project would not exist.
- **Fluctuating carbon market prices:** This can make it hard to forecast revenue from carbon credits and can invalidate business models if the price falls below a certain threshold.
- **The risk and uncertainty of receiving carbon credits:** This makes it a big barrier for private investors, who sometimes end up ignoring the possible revenue from carbon credits.<sup>101</sup>
- **Carbon buyers and intermediaries need to be involved from the initial stage:** Early-stage innovators should plan the involvement of appropriate intermediaries from an early stage, as they have the ability to purchase credits and provide expertise on achieving them.<sup>102</sup>

## 4. Additional Dynamics to Consider

In addition to the overview of climate finance options for early-stage innovation in the previous section, this section presents some high-level findings on sector and geographic dynamics in terms of access to climate finance, as well as an overview of how different partnership types can also help early-stage innovators to access climate finance.

### 4.1 Sector differences

This section will present insights on climate finance opportunities and challenges specific to the sectors of forestry, agriculture and energy as covered by the ongoing pilot innovations. For context, the energy sector receives the largest share of total climate finance and reached US\$ 334 billion in 2019/2020, accounting for

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<sup>100</sup> Data from key informant interviews.

<sup>101</sup> World Resources Institute (2012) Public Financing Instruments To Leverage Private Capital For Climate-Relevant Investment: Focus On Multilateral Agencies. [\(Link\)](#)

<sup>102</sup> Data from key informant interviews.



58% of total mitigation finance<sup>103</sup> and 53% of total climate finance.<sup>104</sup> For agriculture, forestry, and other land uses (AFOLU), finance for mitigation initiatives reached US\$ 8.1 billion on average in 2019/2020.<sup>105</sup> It should be noted that nearly all of this sector-wide tracked climate finance has been reported from public sources, and limited data reporting from the private sector makes it a challenge to calculate the overall financial flow.

For the clearly defined selected sectors of Agriculture, Forestry and Energy, in which the FTL programme supports a range of pilots that could benefit from climate finance, the following observations can be made across a set of themes.

### Availability of catalytic capital

**Agriculture:** Significant public sector catalytic capital for both climate mitigation and adaptation is available for innovators in the agricultural sector. Sources of mitigation finance are typically available for regenerative agriculture, renewable energy-powered assets and tools, such as cold storage and irrigation. An example of this is the solar water pump provider [SunCulture](#) receiving catalytic funding from [Shell Foundation](#) under their renewable energy portfolio. At the same time, [SunCulture](#) is also able to access climate adaptation-specific finance as their product reduces dependency on rain-fed agriculture and increases crop yield, which has recently been validated as an adaptation tool by an investment from ARAF.<sup>106</sup> While the agriculture sector has long been viewed as a risky sector for investments, resulting in a financing gap for smallholders estimated at US\$ 170 billion annually,<sup>107</sup> there are a number of commercial funders in climate adaptation finance including Omnivore, Katapult Africa and Acumen Fund, the latter of which is described in Box 17.

#### Box 17. Acumen Resilient Agriculture Fund (ARAF), managed by Acumen Capital Partners

[Acumen Resilient Agriculture Fund](#) (ARAF) is the world's first equity fund designed to build the climate resilience of smallholders. It is a US\$ 58 million impact fund investing in early and early-growth stage agribusinesses that enable them to anticipate, weather, and bounce-back from climate events, resulting in increased yields and incomes. ARAF is sponsored by Acumen, anchored by the Green Climate Fund, and supported by FMO, Soros Economic Development Fund and others.<sup>108</sup>

<sup>103</sup> Adaptation finance is not included as it accounts for only 7% of total climate finance and has a low level of tracked flows.

<sup>104</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance 2021. [\(Link\)](#)

<sup>105</sup> Ibid.

<sup>106</sup> Data from key informant interviews

<sup>107</sup> Dalberg (2022) Towards Market Transparency In Smallholder Finances. [\(Link\)](#)

<sup>108</sup> The Acumen Resilient Agriculture Fund. [\(Link\)](#)





Innovations in agriculture that involve new equipment (greenhouses, irrigation, etc.) or are trying to close a gap in infrastructure (e.g., post-harvesting solutions, storage facilities, etc.) also have to solve the asset financing problem as smallholder farmers are unlikely to be able to afford new equipment or access to a loan. To solve this, blended financing mechanisms have been developed, where a development partner takes a percentage of an innovator's losses if farmers default on the payments at a higher-than-average rate. An example of this has been implemented by FSD Kenya and Alphamundi Foundation, who together provide a second loss facility to [SunCulture](#).<sup>109</sup>

**Forestry:** Forests enable essential ecosystem services and contribute to global biodiversity conservation objectives. Monetisation of forestry projects is achieved mostly via the sale of timber from managed forests and the sale of agricultural commodities from agroforestry. Additional revenue streams allow for a 'revenue-stacking' approach that also includes revenues derived from tourism and payments for ecosystem services.

However, the forestry sector lags behind considered sectors for commercial investments at scale due to underdeveloped business models and fewer financial revenue streams available to digital providers. There are only a few funds, such as WWF's [Nature-Based Solutions Accelerator](#) (discussed in **Section 3.2**), and [Mirova's 'Nature+' fund](#), which support digital innovations in forestry, among other more traditional types of projects. Funding from individual donors and foundations for digital projects with high potential for replicability, and strategic partnerships with prospective clients for digital verification services could be one of the few available routes to access commercial capital for digital innovators.

**Energy:** The renewable energy sector is a highly viable and attractive avenue of investment for the private sector, which provided more than double the climate finance provided by the public sector for energy systems in 2019/2020.<sup>110</sup> In addition, renewable energy finance accounted for more than 91% of total mitigation finance in 2019/2020, with most investments for Solar PV and onshore wind initiatives.<sup>111</sup> Corporates, the largest source of private finance, contributed 75% of their climate finance into renewable energy projects, whereas banks provided 82% of their climate finance to the energy sector.<sup>112</sup> Direct climate finance from institutional investors and funds was also targeted mostly at renewable energy generation initiatives. There are many notable sources of funds such as [FMO Ventures](#), [Shell Foundation](#), [SIMA](#) and [Climate Investor One \(CIO\)](#) who have a long track record and sector-specific focus on providing funding for innovations in the energy sector in developing countries.

### Role of voluntary carbon market

**Agriculture:** There are many interesting and rapidly evolving opportunities for farmers and AgTech innovation to benefit from carbon credits. Carbon offset programmes could open additional sources of revenue for farmers implementing regenerative practices as well as innovators in the agricultural sector. Still, the barriers to early-stage innovators' access to carbon markets discussed in **Section 3.4** are just as relevant for farmers and innovators in the agricultural space.

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<sup>109</sup> SunCulture (2022) SunCulture Annual Letter 2021. ([Link](#))

<sup>110</sup> Ibid.

<sup>111</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance 2021. ([Link](#))

<sup>112</sup> Ibid.



**Forestry:** Carbon markets offer a great opportunity for revenue generation for mitigation and conservation projects in forestry, but have to be considered with a range of challenges in mind, similar to those discussed in **Section 3.4** of the report. Large scale is required for a forestry project to be commercially financed, e.g., projects with an average size of 2 thousand to 5 thousand hectares could be considered, while smaller projects would not be economically viable for an investor. Another challenge for forest restoration is the long waiting period after planting the trees and before the associated benefits can be monetised. To help address this, the FT Hub has been working with Taking Root and Ecotrust in Uganda to enable smallholder farmers to access global carbon markets (see Spotlight Box 2 below).

#### Pilot Spotlight 2: Enabling Smallholder farmers to access global carbon markets

The [FT Hub recently supported the partnership between Taking Root and the Environmental Conservation Trust of Uganda \(Ecotrust\)](#) to pilot the application of Taking Root's tech innovation that combines field data with remote sensing data to build a robust methodology for the quantification of carbon from live forest biomass to certify carbon credits to meet international standards.

Where Ecotrust, as the programme manager, typically used manual data gathering methods to map the land across a number of smallholder plots, this pilot looked to explore their experiences of applying digital techniques to the land mapping process. [The result was that 12 Ecotrust technicians were able to map 1,289 land parcels, totalling 809ha across 39 different communities, using Taking Root's approach.](#) The data collected was then integrated with Taking Root's web app to quantify carbon and measure land plot performance, making it easy to report traceable and transparent carbon removals.

Consequently, Ecotrust reported greater efficiencies and accuracy when mapping land plots, improving the quality and transparency of their reforestation outcomes whilst mitigating the cost associated with in person verification practices. By applying a tech innovation to a programme management intermediary, the pilot was able to capture the activities of smallholder farmers, ensuring the proceeds of their services are being passed down and rewarding the farmers for their practices, whilst minimising the burden of reporting.

As with other sectors, direct access to carbon markets is a lengthy and expensive process, due to accreditation with standards bodies. Seed investment for financially viable forestry projects is possible and players like [Mirova](#) can finance a project early-on at the pre-feasibility stage, covering the investment required for project development and certification.<sup>113</sup> Aggregation of smaller projects is currently considered as an opportunity area, but the mechanisms for financing such a portfolio as well as for managing a group of small-scale projects at required quality are still at experimentation stage with very few examples available (e.g., Indigo Carbon, or ECOTRUST's Trees for Global Benefit programme mentioned

<sup>113</sup> Based on data from key informant interviews.



above).<sup>114</sup> At the same time, large scale forestry projects can access investments from a range of commercial funds, some of those using blended finance models in collaboration with other ecosystem players. Examples of established funds for the forestry sector include [ECOTIERRA](#), [The Tropical Landscape Finance Facility](#) by ADM Capital, [Terra Global Capital](#) and others.

**Energy:** Carbon credits can play an important role to subsidise the cost of clean energy alternatives, such as solar mini-grids and clean cooking stoves.<sup>115</sup> Given the high rate of private sector investments in this space, VCs can play a strategic role to support early-stage innovators to get their carbon projects accredited and validated whilst providing the upfront capital required.<sup>116</sup>

#### Box 18. KawiSafi Ventures Fund

The [KawiSafi Ventures \(KSV\)](#) was created and developed by Acumen Capital Partners to unlock the potential of renewable off-grid energy in East Africa and make it faster, cheaper, and cleaner. Using equity capital from the Green Climate Fund (GCF), the KSV invests in companies that are developing decarbonised and distributed energy infrastructure. Two of the companies in their portfolio have succeeded in developing revenue streams through the carbon market, which has played a crucial role in lowering costs to consumers, and accelerating product sales.<sup>117</sup>

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<sup>114</sup> Indigo Carbon website. [\(Link\)](#)

<sup>115</sup> UN Climate Champions (2022) Carbon credits and the energy transition: An Investor Perspective. [\(Link\)](#)

<sup>116</sup> Ibid.

<sup>117</sup> KawiSafi Ventures, Community Report 2021. [\(Link\)](#)



## Role of digital innovation to support access to climate finance

**Agriculture:** In the agriculture sector there are some innovative financing use-cases, which are climate adaptation specific such as agricultural insurance, supporting productivity and access to markets. Climate finance funding options for these would generally be restricted to agriculture-themed philanthropic funds, accelerators and early-stage venture capital, or the few funds available for climate adaptation innovation or purely commercial investors. InsurTech<sup>118</sup> for agriculture is one of the sectors of digital innovation for climate adaptation that has gone a long way in the last decade from a proof of concept to a revenue generating business at scale. Established insurance players in the agricultural sector like OKO and Pula have been able to raise series A investments, while new entrants can receive technical support and investment through accelerators like the [BFA Catalyst Fund](#).

**Forestry:** Digital solutions could deliver a number of benefits and cost-savings to the forestry sector, which, in turn, can simplify access to climate finance via improving the business model and attractiveness to investors. Digital applications with geo-tagging, checklists and ability to upload photo and video files could support on the ground data collection. Drone inspections and satellite imagery could support verification and measurements of the forestry project at scale.<sup>119</sup> This approach is being piloted through the [FT Project Sapling drone-based remote sensing for reforestation investment pilot](#), as described in Pilot Spotlight 3. When combined with on-the-ground data collection tools, such as mobile devices, drones can also be a highly effective tool for mapping and documenting land rights as demonstrated by [CADASTA's project](#) in Odisha, India.<sup>120</sup>

### Pilot Spotlight 3: Project Sapling drone-based remote sensing for reforestation investment

Working closely with the Government, the UK-based not-for-profit organisation Crown Agents and UK-based drone specialist UAVaid are working with the Frontier Technologies programme to explore technology to increase investor confidence in the community-based forest carbon market, with support from Tacugama Chimpanzee Sanctuary in Sierra Leone. The pilot is developing drone-based remote sensing to verify the success of reforestation programmes in Sierra Leone. As part of this, the team is working with local communities to plant, tag and upload data of trees with the intention to support local custodianship of forests. Drones will be used to periodically map the planted land, verifying the growth and health of trees to reduce funder hesitancy and encourage investment in reforestation activity, connecting to the carbon market to support community income. Such initiatives can significantly reduce the time and financial resources required for the measurements and verifications necessary to meet international carbon standards.

<sup>118</sup> Insurtech is the innovative use of technology to improve the efficiency of the insurance industry.

<sup>119</sup> GSMA (2020). Digital Dividends in Natural Resource Management. [\(Link\)](#)

<sup>120</sup> GSMA, 2020. Digital Dividends in Natural Resource Management. [\(Link\)](#)



Localising climate finance through digital services could also support two-way communication with on-the ground workers, and local communities engaged in the conservation initiative. A relevant example of such innovation is the [ForestLink](#) platform developed by the Rainforest Foundation, and available for forest projects around the world. Interviews have shown that investors in conservation and forestry projects see digital technologies as ‘supporting’ components that could potentially reduce costs and improve overall business models of projects.

**Energy:** Asset finance is also very important to consider in the energy sector and related areas, such as home energy generation and energy storage, where hardware can be prohibitively expensive for households. This is being addressed by lease financing by one FT pilot in Senegal, as explained in Pilot Spotlight 4.

#### Pilot Spotlight 4: Asset finance considerations for home energy solutions in Senegal

The FT pilot [IoT enabled smart household battery distribution through micro-small retailer networks](#) tested whether an IoT enabled, digitally-financed clean energy charging station for micro-retailers could generate additional income. In rural areas of Senegal, customers could go to their local micro-retailer to lease household batteries that they could then use to charge their mobile phones and other home-energy products. It looked to make clean energy accessible and affordable for low-income households, who are not currently connected to the grid and cannot afford solar panels. A significant constraint was the typical household’s willingness to pay for the solution, which could be overcome with a lease finance solution.



## 4.2 Geographic differences

It is also important to note key findings from the study on geographic differences in terms of access to climate finance for early-stage innovation. In general, the regions with the majority of low- and middle-income countries receive less than 25% of total climate finance flows,<sup>121</sup> indicating the high investment gaps for these contexts. In some cases, catalytic capital from public sector and philanthropic sources has an attached additionality criteria which determines the geographic focus of funding. For example, the IFC has launched a new US\$ 225 million platform to improve venture capital ecosystems in Egypt, Kenya, Nigeria, Senegal, South Africa and Pakistan.<sup>122</sup>

### Correlation between enabling environment and private catalytic capital

Catalytic capital from the private sector, such as VC funding, is considerably affected by geographical differences. There is a correlation between the enabling environment, such as internet access, ease of doing business and access to climate finance for early-stage innovation. For example, Nigeria and India have a more evolved IT and tech landscape and accordingly, early-stage innovation receives more public and private sector funding and is easier to scale compared to a country such as Malawi.<sup>123</sup> In addition, impact investors as well as commercial investors are known to avoid making investments in some regions such as Central Africa due to political instability and higher risks.

### Overlaps between sector and geographic differences

For the agricultural sector, East Africa, West Africa and India are known hotspots of innovation, and consequently attract a higher number of investors drawn to the number of projects that are at an investable stage, as opposed to markets with fewer or smaller initiatives.<sup>124</sup> In the distributed renewable energy space, enabling environments have facilitated access to mobile money, driving recent digital innovation in sub-Saharan markets whilst such innovation remains nascent in Latin America. For the forestry sector, Latin America has the strongest track record in access to climate finance for innovation, as well as a number of dedicated funds for conservation, such as The Terra Bella Colombia Fund. This is due to the presence of the Amazon basin, which draws 34% of the global finance for nature protection and sustainable forest management.<sup>125</sup>

### There are a number of carbon market leaders in LMICs

As mentioned earlier, direct access to carbon markets is highly challenging for early-stage innovators in LMICs overall. However, in Africa, countries such as Ghana, Kenya and Namibia are spearheading the development of policy frameworks,<sup>126</sup> and digital infrastructure by the private sector<sup>127</sup> which is likely to improve the access to carbon markets for early-stage pilots and startups.

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<sup>121</sup> Climate Policy Initiative (2021) Global Landscape of Climate Finance 2021. ([Link](#))

<sup>122</sup> IFC Disruptive Technologies and Venture Capital. ([Link](#))

<sup>123</sup> Data from key informant interviews.

<sup>124</sup> Data from key informant interviews.

<sup>125</sup> OFAC (2019) International financial flows to support nature protection and sustainable forest management in Central Africa. ([Link](#))

<sup>126</sup> UNDP (2022) Carbon Justice for All: How Carbon Markets Can Advance Equitable Climate Action Globally. ([Link](#))

<sup>127</sup> KEPSA (2023) Change the Story: Developing a Local Carbon Market in Kenya. ([Link](#))



## 4.3 The role of partnerships

Strategic partnerships for early-stage innovators can play an important role in accessing climate finance. They can lower risks to unlock investments, as well as help bring more credibility, improve access to markets and networks, strengthen supply chains, and refine monitoring and evaluation, as well as governance processes. However, while partnerships offer a range of benefits, they are not essential for all early-stage innovators. Whether a partnership is necessary or not is determined by the sectors and geographies that a pilot is operating in, as well as the context specific to their business or impact model.

There are a variety of possible partnership models available which early-stage ventures and initiatives may wish to consider, as they seek to strengthen their ability to access climate finance for further fundings and scale. These are introduced below:

### Local NGOs

Partnering with NGOs can play an important role in extending the reach of an initiative to communities and individuals who may be a target market or beneficiaries of a service. For example, startups working on adaptation initiatives or those looking to unlock carbon credits will benefit greatly from partnerships with local NGOs who are familiar with policy landscapes and local markets, and have an understanding of macroeconomic factors.<sup>128</sup> The caveat here is the cultural gaps that startups may encounter as different types of partnerships will entail different work cultures, approaches to problem-solving, and varying timelines.

### Startup - government partnerships

There may be a scenario in which pilots seek to explore a public-private partnership (PPP) to enable the delivery of a service. As explored in a [Toolkit](#) prepared by GSMA's Mobile for Development programme, there are many forms of PPP, ranging from simple operation and maintenance contracts, through to full concessions for operating services.<sup>129</sup> A robust and effective partnership proposal can help provide the basis for catalytic capital support funded by climate finance, as well as private sector investment. However, for early-stage innovators, partnerships with sub-national governments or local public sector entities should be treated with caution, and only pursued if there is a clear value proposition due to the typical challenges of low capacity and resources on the government side, as well as risks related to corruption.

### Mentorship and access to networks

Mentorship can increase the chances of a startup's success by nearly three times,<sup>130</sup> and was recommended as part of personalised capacity building for startups by the Shell Foundation and Seedstars to make startups investment ready.<sup>131</sup> Partnering with organisations can provide technical and legal support to help startups navigate the investment space.<sup>132</sup> However, there are cost constraints associated with this as pilots are typically not able to pay for such services. Therefore, this type of support is typically provided or facilitated as part of an accelerator or fund. For example, almost all projects supported by WWF's NBS

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<sup>128</sup> Data from key informant interviews.

<sup>129</sup> GSMA (2021) Partnering with the Public Sector: A Toolkit for Start-ups in the Utilities Sectors. [\(Link\)](#)

<sup>130</sup> TechCrunch (2015) Mentors Are The Secret Weapons Of Successful Startups. [\(Link\)](#)

<sup>131</sup> This was a three-month investment readiness programme for 20 startups working in access-to-energy and sustainable mobility sectors in sub-Saharan Africa.

<sup>132</sup> Data from key informant interviews.



Accelerator are implemented through some sort of partnership, which strengthens the impact on the ground and enables greater access to further finance.<sup>133</sup> In addition, partnering with other startups can support knowledge sharing and peer learning on governance procedures, technical design, business and financial models. For example, the BFA Catalyst Fund actively promotes startups partnering with other startups in the cohort or alumni companies, which results in a better culture fit and speeds up governance processes and operations.<sup>134</sup> The role of technical and legal mentors may also be played by larger companies if the basis for partnership can be established, as explored below.

### Bigger corporate partners

Multiple key informant interviews highlighted the benefits of startups partnering with national SMEs or multi-national corporations (MNCs). This partnership can lead to corporate funding, resources, customer and market access – which is usually the biggest motivation for startups.<sup>135</sup> On the other hand, such partnerships can benefit corporations by giving them access to cutting-edge innovation and technologies, which can help them to stay ahead of the competition and become more agile. A recent McKinsey study found that investment in an early-stage startup may include high risks, but is ten times more cost effective than one Series B investment.<sup>136</sup>

#### Pilot Spotlight 5: ME Solutions in Nigeria working with a commercial dairy partner

ME Solutions, working with the FT programme in Nigeria, provides an example of how developing a partnership with a larger company can help reduce barriers to entry. Within a pilot looking to [test the production of hydroponic fodder for cattle](#), ME Solutions are partnering with a local dairy firm in order to jointly apply for additional funding from commercial banks, **aiming to use corporate partnerships to be able to leverage funds for poorer herders and farmers. The novel business model will partner herders, farmers and a dairy to work together with a hydroponic system to ultimately generate greater income and profit for all.** This type of partnership may also enable access to funding via a blended finance facility, where climate finance is used to de-risk private sector investment.

<sup>133</sup> Data from key informant interviews.

<sup>134</sup> Data from key informant interviews.

<sup>135</sup> McKinsey & Company (2021) Collaborations between corporates and start-ups. [\(Link\)](#)

<sup>136</sup> Ibid.





## Academic institutions

There are contrasting views around partnerships with academic institutions, as investment funds consider them high risk and often a distraction due to their longer timelines.<sup>137</sup> On the other hand, academic partnerships can offer technical expertise and mentorship to pilots in LMICs, as well as access to digital technology, information and data, as shown by the example in Spotlight 6.

### Pilot Spotlight 6: Academic partnership for Forest Fire Early Warning System in Pakistan

A recent FT pilot in Pakistan has partnered with the renowned Lahore University of Management Sciences (LUMS) and WWF to develop an '[Early Warning Forest Fire Detection System](#)'. Through leveraging LUMS' technical expertise in the application of AI, computer vision, IoT and remote sensing technologies, the academic partnership has enabled access to digital technology resources, resulting in the [development of a technology-driven solution for early detection and response to forest fires](#), and connections to a wider range of stakeholders, including relevant government bodies, to support its iteration and uptake. This all helps to improve credibility and potential for scale of the pilot, which in turn can help to secure climate finance for subsequent stages of growth.

Overall, the types of partnerships outlined above can add significant value to the value proposition of an early-stage startup, pilot or innovation, helping to secure climate finance. However, pilots should only engage in partnerships when there is a clear advantage for them to do so, as working in tandem with other organisations can also take up valuable time and resources in coordination.

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<sup>137</sup> Data from key informant interviews.



## 5. Conclusions and Recommendations

There is a severe financing gap for early-stage innovation that is seeking to address climate change. This landscape review has explored the role of climate finance in helping to address this financing gap. The key concluding points are set out below, followed by recommendations for FCDO and other donors in better supporting early-stage innovation to access or benefit from climate finance to enable scale.

### 5.1 Concluding points

This climate finance landscape review has resulted in the following key findings:

- **There is a severe lack of conventional finance options for early-stage climate innovation.** This is due to a range of barriers, including lack of track record and proof of concept, foreign exchange risks, the 'Valley of death' phenomenon, and a mismatch in investment timelines for projects that may need many years to start generating revenue.
- **Climate finance can play a role in meeting the scaling needs of early-stage innovation.** Defined as public sector funds from donors, development finance institutions, governments, as well as philanthropic sources and private sector sources, there are significant and growing volumes of climate finance available. However, accessing this remains a severe challenge for early-stage innovation, for a range of reasons, including high risk of failure early in the investment chain.
- **Climate finance is not always clearly demarcated.** Interviews for this study showed a wide range of perspectives on what counts as climate finance. Many institutions support adaptation and resilience related innovation, without considering themselves to be providers of climate finance. Similarly, private sector investors may be a source of finance to scale for climate innovation, but may not identify themselves as climate finance.
- **Climate finance in relation to early-stage innovation can be summarised in four main categories.** These are i) pure grant finance, which can be important for initiatives with no ability to generate revenue; ii) public sector catalytic finance, which can help to improve the enabling environment, build pilot capacity in business processes and ability to measure mitigation and/or adaptation impact, as well as de-risk private sector investment; iii) private sector catalytic finance, which is deployed by investors to help develop a pipeline of investable ventures; and iv) the voluntary carbon market, which offers private sector finance via carbon credits, for solutions that help to reduce GHG emissions or sequester carbon.
- **There are a number of challenges and considerations for early-stage innovators when trying to access climate finance.** These depend on the specific type of climate finance, but include limited volumes of pure grant funding available, the need to be able to prove mitigation and adaptation impact when applying for public sector catalytic finance, and high costs involved in accreditation of a solution for the voluntary carbon market.



- **Public sector climate finance is particularly effective when deployed to leverage greater volumes of private sector investment.** There are a large number of instruments and funds dedicated to supporting early-stage climate innovation to overcome the barriers to scale. Many of these make use of public and philanthropic climate finance to build the technical and business processes of a pilot or startup, showcase them to a range of investors, and de-risk private sector investment with instruments such as first loss guarantees.
- **There are a number of sector differences in terms of access to climate finance.** For example, the agriculture sector requires access to both adaptation and mitigation finance and is restrained by the low paying capacity of smallholder farmers and availability of asset financing to support innovators at growth stage. The forestry sector requires large scale projects to access financing, which makes entry points for innovators more challenging. Consequently, very few commercial finance funds are available for innovators in the forestry space.
- **There are a number of geographic differences in access to climate finance.** For startup pilots, these include a strong correlation between the enabling environment and tech landscape of LMICs, including the mobile money environment, and the likelihood of securing private or public sector climate finance to scale.
- **A range of partnerships can be considered to enable greater access to climate finance.** These include partnerships with NGOs, to extend local reach and access to markets, with larger companies that can provide corporate funding and resources, and with sub-national governments to encourage and facilitate uptake. However, partnerships are not critical for each pilot and can take up valuable time and resources for coordination.

## 5.2 Recommendations for FCDO and other donor organisations

The following recommendations are made to the FCDO and other donor organisations on supporting early-stage innovation to better access climate finance. These are structured in line with the investment chain.

For startups and pilots at the **project initiation stage, project development and primary project funding stage** (Stages 1, 2 & 3) of the investment chain:

- **Provide support to early-stage innovation with a more long-term and integrated approach.** Donors can play a more active role in supporting the connections between stages of the investment cycle and ensuring the innovators don't become stuck in the valley of death between early-stage seed funding and larger volumes of investment. This would also increase opportunities for donors to learn what works in the long run.
- **Build a community of private sector investors that early-stage innovators could tap into.** Dedicate resources to building relationships with investors, providing early-stage innovators with opportunities to pitch and attend matchmaking events, and so on. The UNICEF Venture Fund offers a strong example of how this has been applied.



- **Improve coordination with other donors as well as national and sub-national governments,** to provide complementary support and catalytic financing for early-stage climate innovation to certain countries, local areas or sectors.
- **Support early-stage pilots to measure and demonstrate evidence of mitigation and adaptation impact.** The lack of consistent and reliable data is a barrier when pilots seek to apply for climate finance or related funds or accelerators that benefit from public sector climate finance. FCDO and other donors can develop the capacity of pilots and startups, as well as private sector investors, in climate impact measurement and evidence requirements and best-practice.

For startups and pilots at the **secondary markets and refinancing stage** (4) of the investment chain:

- **Promote and support the role of blended finance:** Support innovators to access suitable blended finance vehicles that can leverage greater volumes of private sector investment, including from more risk averse institutional investors.
- **Support startups and pilots to access the voluntary carbon market:** With better defined revenue streams and resources available, innovators will be better positioned to seek accreditation for carbon credits, based on a robust methodology for mitigation.

And finally, **cross cutting** recommendations:

- **Encourage early-stage innovators to seek appropriate climate finance related approaches.** As set out above, the routes available to pilots differ by sector and whether a pilot has a commercial model or not. A wide range of public and private sector catalytic finance options are available. Some of the most notable are included in Annex 2.
- **Aim to catalyse greater volumes of private sector funding into adaptation finance.** There are not many players in this space and examples include the BFA Catalyst Fund and Acumen. Programme implementers could run specific cohorts on adaptation, with coordinated initiatives to encourage follow on financing. Donors and investors could benefit from peer support on metrics and criteria to streamline the selection process and how impact is measured.



## Annex 1. List of Interviewees

The following stakeholders and experts from across the climate finance for early-stage innovation sector were interviewed to inform the findings of this report.

Name	Role	Organisation
Ashish Kumar	Climate and Innovation Lead	Shell Foundation
Federica Chiappe	Team Leader	CFA and Head of Blended Finance, Neovela Transition Finance
Francesco Valenti	Investment Director	Global Innovation Fund
Gaetan Hinojosa	South Pole	Consultancy, structuring projects for climate finance
Hasnat Ashraf	Senior Manager, Innovation and MEL	Karandaaz Impact Investing Platform, Pakistan
Haysam Azhar	Analyst, Climate Policy Initiative	The Global Innovation Lab for Climate Finance
Ian Callaghan	Climate Finance Expert / Project Director	BEIS-funded Climate Finance Accelerator (CFA)
Jin Lee	Private Sector Specialist	World Bank Finance, Competitiveness, and Innovation Global Practice
Jon Ridley	Co-founder	4RDigital
Malika Anand	Head of Impact and ESG	BFA's Catalyst Fund
Michael Koppenol	Strategy Officer	FMO Ventures Programme
Sam Lampert	Head of Natural Capital	Mirova (The Athelia Climate Fund 1)
Sophie Van Eetvelt	Business Growth Manager	WWF, Nature Based Solutions Accelerator
Tatwin Edmunds	Head of Climate Change Team	British International Investing (BII)
Various	FCDO Pioneers from a range of FT Hub Pilots	FCDO



## Annex 2. List of Notable Funds and Instruments

Please refer to the separate Excel spreadsheet for a list of approx. 60 notable funds and vehicles which can support early-stage innovators, as part of the wider climate finance landscape.





[frontiertechhub.org](http://frontiertechhub.org)