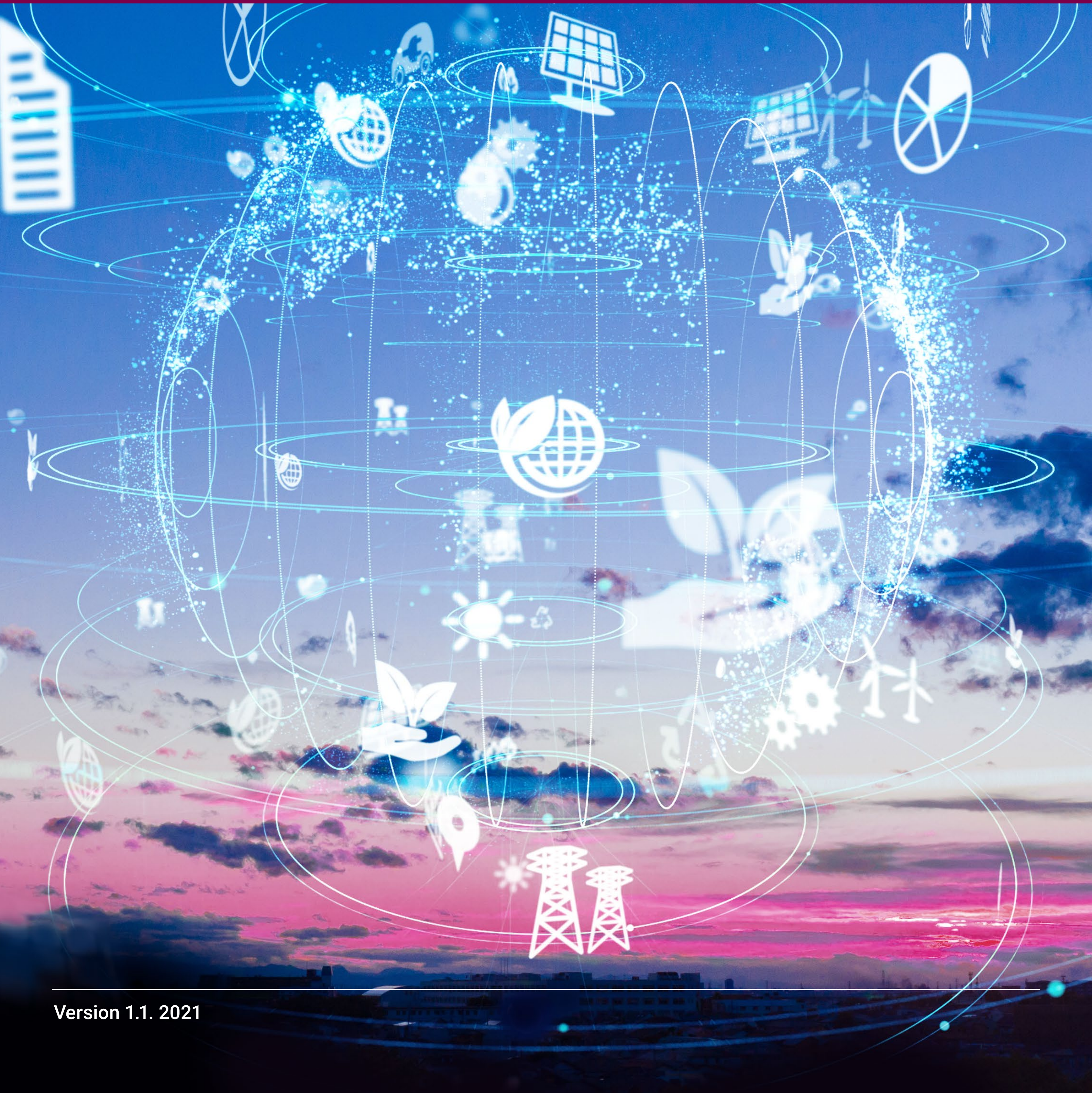
EMERGING CLIMATE TECHNOLOGY FRAMEWORK



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ACRONYMS

ACT – Assessing Low Carbon Transition
AEF – Avoided Emissions Framework
AM – Asset Manager
BE – Breakthrough Energy
CapEx – Capital Expenditure
CAPM – Capital Asset Pricing Model
CatER – Catalyzed Emissions Reductions
CDM – Clean Development Mechanism
CDP – Carbon Disclosure Project
CDSB – Climate Disclosure Standards Board
DAC – Direct Air Capture
ECT – Emerging Climate Technology
ERP – Emissions Reductions Potential
ESG – Environmental Social and Governance
EU – European Union
GH – Green Hydrogen
GHG – Greenhouse Gas
Gui – Guidance
IEA – International Energy Agency
IIRC – International Integrated Reporting Council
LCA – Life Cycle Assessment
LDES – Long Duration Energy Storage
MLE – Maximum Likelihood Estimator
NZE – IEA's Net-Zero Emissions by 2050 Scenario
ODA – Official Development Assistance
OECD – Organization for Economic Co-operation and Development
OPIM – Operating Principles for Impact Management
PCAF – Partnership for Carbon Accounting Financials
Rec – Recommendation
Req – Requirement
R&D – Research and Development
SAF – Sustainable Aviation Fuel
SBT – Science Based Target
SES – Social and Environmental Standards
TRL – Technology Readiness Level
UN – United Nations
UNDP – United Nations Development Program
UNFCCC – United Nations Framework Convention on Climate Change

DEFINITIONS

Additionality: a proposed activity is additional if the recognized interventions are deemed to be causing the activity to take place. The occurrence of additionality is determined by assessing whether a proposed activity is distinct from its reference scenario (see below), and unlikely to have occurred within that scenario had an intervention not occurred. (Gillenwater 2012).

Asset Manager: refers to the management and monitoring of investments on behalf of others.

Asset Owner: institutional investors or individuals who own the underlying assets. Asset Owners may manage their assets directly, while others entrust the management and monitoring of all or a portion of their assets to external Asset Managers.

Avoided Emissions and Emissions Reductions: a backward-looking (ex-post) quantification of GHG emission savings that occur because of an intervention, compared to a baseline scenario, during a specified period. The emission reductions are generically calculated as the difference between the emissions that would have happened in the absence of the intervention (baseline scenario) and the emissions from the proposed intervention, project, product or activity. In the context of this framework, these metrics are equally applicable to interventions, projects, products or activities that remove carbon from the atmosphere and the term "carbon removals" may be more appropriate in such cases.

Baseline scenario: scenario used for purposes for assessing Avoided Emissions and Emission Reductions Potential of new products, where low-carbon products do not exist, and markets are dominated still by the incumbent high-carbon products.

Blended finance: a structuring approach that allows organizations with different objectives to invest alongside each other while achieving their own objectives — whether financial return, social or environmental impact, or a blend of both.

Catalytic capital: investment capital that is patient and accepts disproportionate risk and/or concessional returns relative to a conventional investment in order to generate positive impact and enable third-party investment that otherwise would not be possible.

Catalyzed Emissions Reductions (CatER): a forward-looking (ex-ante) quantification of GHG emission savings that may occur as a result of the accelerated deployment of emerging climate technologies, compared to a reference scenario, during a specified period. This metric is equally applicable and is calculated in the same way for technologies that remove carbon from the atmosphere.

Catalyzed scenario: the alternative scenario for the reference deployment of an emerging climate technology that considers the effects of the investment of catalytic capital in a given emerging climate technology.

Emerging climate technology: a commercially promising technology that addresses climate mitigation challenges but needs to attract enough investment to deploy the technology and develop business models and markets for the product or services it produces. Eventually it may become a successful innovation deployed at scale, generating new markets or profoundly disrupting established (fossil-based) ones (Auerswald *et al.*, 2005). This corresponds to levels 5 to 10 in the Technology Readiness Level scale applied by the IEA, (see Annex 1).

Emission Reductions: see Avoided Emissions.

Emissions Reduction Potential or Potential Avoided Emissions: a forward-looking (ex-ante) quantification of the potential to reduce greenhouse gas emissions over a specified time horizon, compared to a baseline scenario. In the context of this framework, this metric is equally applicable and is calculated in the same way for technologies that remove carbon from the atmosphere.

Ex-ante: before the event or fact, usually used in reporting for forward-looking metrics and reporting.

Ex-post: after the event or fact, usually used in reporting as backward-looking reporting.

The Framework: Emerging Climate Technology Framework, developed by CDP, in partnership with Breakthrough Energy.

Green Premium: the difference in the final consumer price of a low-carbon solution and the final consumer price of the incumbent solution.

GHG accounting – attributional approach: provides information about the impacts along the value-chain of the processes used to produce (and consume and dispose of) (Brander, 2015) goods and services from a company. It does not consider system-wide effects arising from changes in the output of a product and the interactions in a marketplace or the whole economy. Examples of attributional GHG accounting standards include the GHG Protocol Corporate Accounting and Reporting Standard and Corporate Value Chain (Scope 3) Standard.

GHG accounting – consequential approach: provides information about the system-wide consequences of changes in the level of output (and consumption and disposal) of goods and services from a company, including effects both inside and outside the value-chain of those goods and services. It models the causal relationships originating from the decision to change (certain aspects, e.g. output, materials, energy inputs) of the goods and services and seeks to inform decision makers on the broader impacts of their decisions (Brander, 2015) namely the ones that intend to reduce overall global GHG emissions. Consequential LCA and the GHG Protocol Policy and Action Standard are examples of consequential approach.

Reference scenario: the scenario that reflects the situation in the absence of the proposed intervention and represents a prediction of the quantified amount of an input to or output from an activity resulting from the expected future behavior of the actors proposing, and affected by, the proposed activity. In the context of this framework, the reference scenario represents a likely deployment scenario of an emerging climate technology.

Sustainability claim: according to Cambridge Dictionary, a claim is “to say that something is true or is a fact, although you cannot prove it and other people might not believe it”. A sustainability claim will be an environmental or ethical claim. According to the UK Competition and Market Authority, environmental claims are claims “which suggest that a product, service, brand or business is better for the environment. They include claims that suggest or create the impression that a product or a service: has a positive environmental impact or no impact on the environment; is less damaging to the environment than a previous version of the same good or service; or is less damaging to the environment than competing goods or services.”

INTRODUCTION

The ECT Framework articulates the estimation, monitoring and attribution of the environmental and financial impacts of investing in emerging climate technologies. Its purpose is to provide visibility on the important role ECT investments have in achieving the transition to a zero-carbon economy. By providing methods to quantify the positive impacts of ECT investments, the Framework aims to facilitate the creation of incentives to accelerate the deployment of emerging climate technologies. This in turn should help address the recognition gap of the positive externalities of ECT investments through ESG rating systems and sustainability claims.

The Framework is applicable to investment activities that finance emerging climate technology development and organizations interested in supporting emerging climate technologies business models. The intended audience of this framework are project finance investors investing in ECT and companies willing to provide concessional finance to ECT projects. The Framework focuses on both upfront investment and the procurement of goods and services produced by ECT projects, as market creation and scaling is an integral part of the successful adoption of these technologies.

Emerging climate technologies are defined as technologies in stages 5 to 10 of IEA Technology Readiness Level (TRL) scale – the scale that measures the maturity of any given technology from the concept stage to scaling up the technology solution (see Annex 1 for more detail).

The Framework considers two cycles – investment and production – and applies to two main actors – investors and purchasing companies. "Investors" are considered here as Asset Owners and Asset Managers. Asset Owners can invest directly, or invest through dedicated funds, in ECT. For each one of the cycles and for each actor, there are associated impact metrics, attribution methods and reporting requirements. When reading this document, from page 14, "Req" is a requirement, "Rec" is a recommendation and "Gui" is guidance.

The Challenge

The Framework was developed in the context of a wider project aiming to address barriers and create incentives for investments in ECT. The project developed different outputs, which include:

1. This framework, containing the specification of minimum accountability requirements for investment and procurement in ECT related to:
   a) estimating and managing future impacts prior to or during the investment cycle;
   b) the monitoring of impact during the production cycle.
2. The ECT Initiative — a climate action initiative for Emerging Climate Technologies related to the need to accelerate the deployment for ECT.
3. A short report describing the rationale for company action on ECT, namely the need for early investments in ECT.
4. Four technology case studies (applications of the Framework) that show the application of the Framework to direct air capture (DAC), sustainable aviation fuel (SAF), long duration energy storage (LDES), and green hydrogen (GH).

Investors and companies interested in these topics should refer to those documents and materials.

The Framework is explicitly built on a substantial body of thought, standards, frameworks and metrics focused on the estimation, measurement and quantification of impact investments, linking and referencing them where appropriate. It articulates where existing standards or frameworks are applicable, prescribing their use, documenting their application and outputs and explaining links to other relevant work.

However, the existing body of work does not address the challenges related to emerging climate technology deployment, namely:

1. the significant technology and financial risks associated with the development of supply- chains and commercial systems at scale; and
2. the need to estimate and evaluate non-financial impacts associated with investment and deployment of emerging climate technologies.

Historically, low-carbon technologies have faced a critical shortfall in funding during the validation and early deployment stage, which has stalled technology development. During this stage, technologies are ready for their first infrastructure projects, however, often struggle to attract project financing because their products are still expensive compared to fossil alternatives and there is a perceived technology risk. Technologies therefore stall in their price declines, before reaching critical tipping points in market competitiveness that unlocks large-scale adoption.

ECT projects have difficulty obtaining capital because there are no established markets for their products at a premium, thus green products require subsidization to unlock market uptake at scale. Unlocking widespread adoption of these products and technologies requires reducing the Green Premium by bringing technologies to scale. Investment into large infrastructure projects may reduce the Green Premium of these products and increase their cost-competitiveness with fossil fuel incumbents. Backward-looking analysis of clean technologies has empirically shown that, particularly in early stages, greater deployment reduces the cost per unit, which encourages further deployment and drives exponential decline in unit cost (Kavlak *et al.*, 2018; Christiansson, 1995).

This is the reason why catalytic investment in emerging climate technology can help address challenge 1) above, and why it can have a significant positive climate impact. But investing in ECT lacks the recognition of the social benefits of such investments and there has been little effort in terms of recognizing this significant positive impact (Foxton *et al.*, 2015; France strategie, 2019). How can investment risks in impactful projects be recognized, even when the investment might not succeed? How can we overcome gaps in non-financial impact quantification and the lack of standardized metrics associated with investing in emerging climate technologies?

The Framework proposes new metrics with detailed methods to calculate and apply them. The Framework has been developed in partnership between CDP and Breakthrough Energy. The first application of the Framework will be to the BE Catalyst program. However, the Framework is intended to be fund-neutral and technology-neutral, and it will be possible for other investors to implement.

Approach

The Framework considers two distinct cycles in the life of an investment project: 1) the investment cycle; and 2) the production cycle. During the investment cycle, forward-looking positive impact metrics, that reflect system-wide impacts and are ideally calculated using a consequential approach[1], are estimated and communicated by investors. In the production cycle, negative impacts are reported as per current sustainability reporting guidelines; positive impacts are measured and reported according to current impact investment guidelines (IRIS+) and serve as a basis to fine-tune the forward-looking estimates used during the investment cycle to estimate impact. During the production cycle, an attributional approach is used, following established practice. The data gathered in these cycles, if publicly available, should help increase collective learning and speed the learning process on deployment of ECT. Table 1 below summarizes how the Framework addresses impact monitoring for each actor and cycle.

Table 1: Impact monitoring for various actors

Actor	Investment cycle	Production cycle
Asset-owner Asset-manager	Forward-looking (ex-ante) metrics and reporting requirements on impacts of investments in ECT, ideally using a consequential approach	Monitoring (Backward-looking or ex-post) and reporting of impact of investments in ECT, ideally using a consequential approach
Companies investing in ECT funds		
Companies procuring ECT products and services	N/A	Monitoring (Backward-looking or ex-post) and reporting of impacts of consuming, using an attributional approach

In the investment cycle, investments are made in a future asset, which is expected to produce a certain amount of goods or services and generate positive financial returns as well as positive and negative non-financial impacts. Investments in ECT will carry a level of risk — even if the project is successful in deploying the technology and leads to lower technology cost. ECT will still have to deal with risks related to market creation and scaling demand, creating networks, and coordinating different economic actors or meeting consumers expectations. Yet ECT investments are expected to be critical in achieving climate targets, generating positive externalities typically not considered in the communication of those investments. For this reason, investments in ECT are positioned as impact investments seeking to accelerate social benefits. Getting early-credit for these impacts is an important incentive for investors (intentionally seeking to generate them) and this has led to the emphasis on the development of forward-looking positive impact metrics, built on the existing impact investment frameworks (IRIS+) and forward-looking metrics (Mission Innovation, 2020; Prime coalition, 2018; Crane tool, 2021).

Forward-looking metrics are in high demand but can also generate a number of concerns for investors, companies and users of information. There is a fear of compromising competitive advantage, fear of legal challenges due to their inherent uncertainty (PwC, 2007), fear of reputational risk, or fear that information will be misinterpreted. Because different investors might want to communicate differently about their investments in ECT, the Framework provides a set of different forward and backward-looking metrics — some that try to calculate the ultimate (but inherently uncertain) impact while others provide proxy, but more precise, metrics of impact.

However, all these metrics should be part of a tool kit for investment decision making where future positive (and negative) non-financial impacts are modelled — just like financial models are used to analyze future financial returns of an investment. And just like financial modeling,

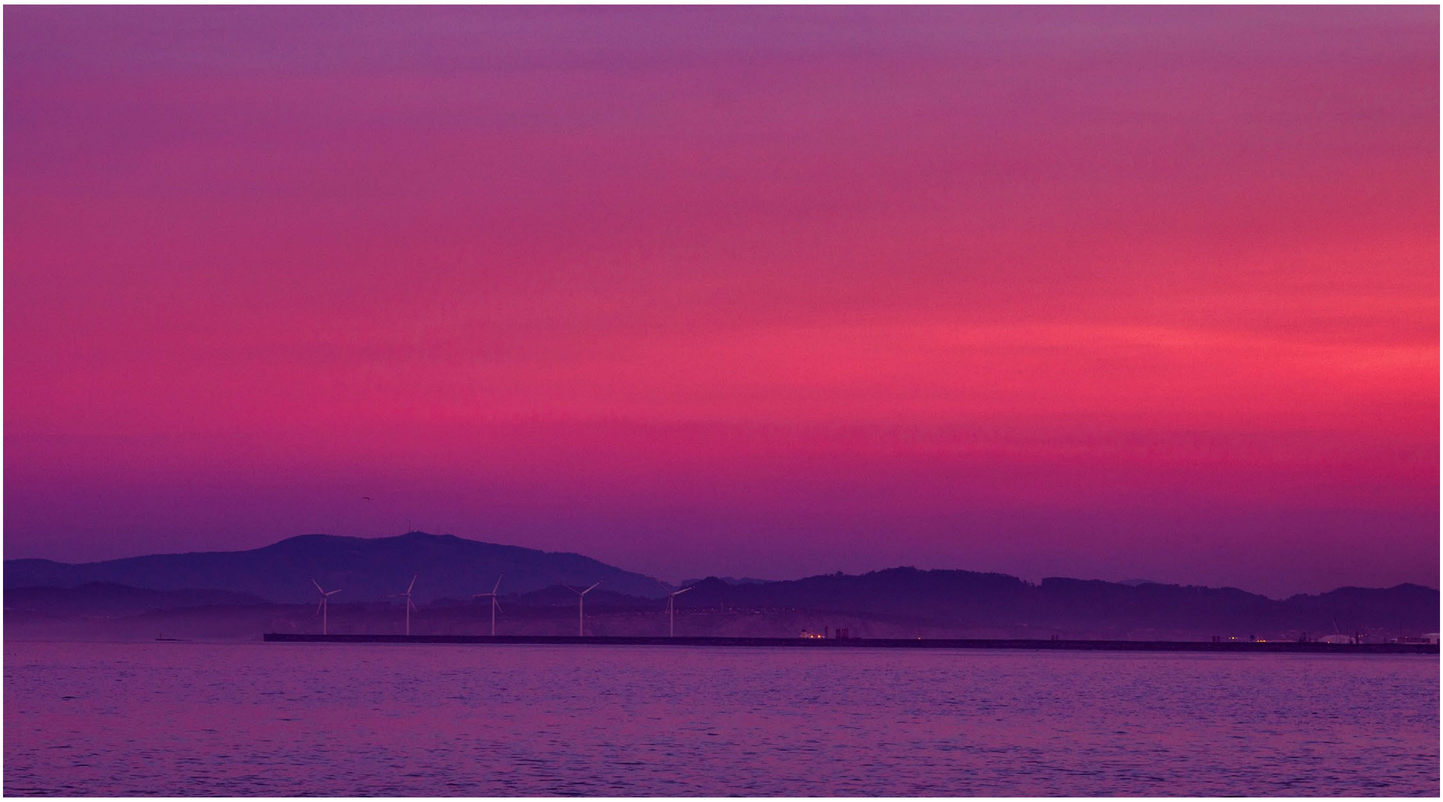
1 Due to a lack of consequential studies for the four case study technologies, it was not always possible to do it.

the quantification of these forward-looking impact metrics is inherently uncertain, speculative and prone to error. For this reason, the Framework provides methods that explain how to calculate each metric as well as reporting requirements and instructions on how to communicate forward-looking metrics. Asset Managers investing in ECT should use these tools to guide and communicate their investments; likewise, Asset Owners that put money in funds to invest in ECT, should require information from the funds aligned with this framework and may, themselves, report a fair share of the impacts.

The metrics will apply to different situations — technologies, geographies, energy supplies, etc. — and so the Framework provides high-level methodologies for each metric to be robustly tailored, step-by-step, for the purpose of each application. We start by a description of the metrics and how to calculate them, but this high-level methodology should be tailored, and technology specific methodologies have to be developed and validated for each metric. The technology-specific methodologies will then have to be applied to real investments and locations, which might require a further layer of specification or adjustments. The same methodologies for each metric should be used as a basis for backward-looking reporting.

This brings us to the production cycle, where investments have already been made and the assets should be producing goods and services. In this cycle, investors reap the benefits of their investment at risk - both financial and non-financial. This is where traditional backward-looking metrics of financial and non-financial reporting are used, using an attributional approach to impact quantification. During this phase, the Framework requires active monitoring and reporting.

The Framework also provides information on how companies procuring goods and services from ECT can quantify their impact. Due to their novelty, the ECT goods and services face challenges on how to attribute their climate and GHG benefits in terms of corporate GHG inventories and reports. These issues are briefly referred to but are expected to evolve considerably in the future. Once the infrastructure is built the production cycle procurement is more relevant for market creation and expansion than for the present problem of driving investment into ECT.



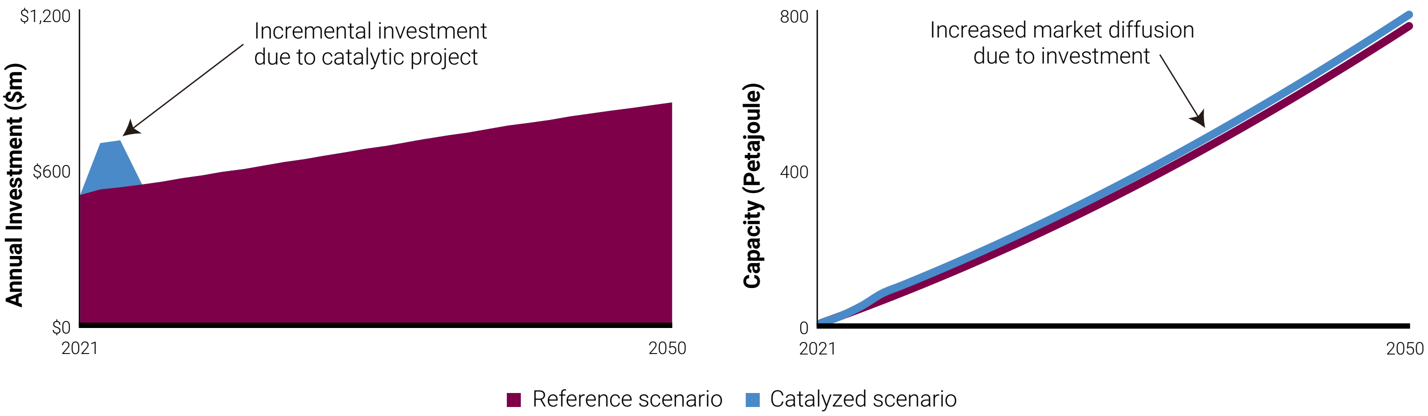
APPLICABILITY OF THE FRAMEWORK

This framework applies to project finance investors that set the acceleration of deployment of emerging climate technologies as one of their strategic goals. For the investment cycle, the following key criteria need to be met for it to be applicable:

1. The investors provide catalytic capital, which is the investment capital that is patient and accepts disproportionate risk and/or concessional returns relative to a conventional investment in order to generate positive impact and enable third-party investment that otherwise would not be possible.
2. The financed projects deploy technologies that can be considered as emerging climate technologies (see Annex 1).
3. Investment must provide additionality: it must increase the quantity or quality of the social or environmental outcome beyond what would otherwise have occurred. In the context of this framework, the provided capital must accelerate the deployment of a technology beyond what would be expected in a reference deployment scenario (see Figure 1).

If any of these three conditions is not met, then the Framework is no longer applicable.

Figure 1: Acceleration effect of catalytic investments in emerging climate technologies



Annex 3 includes a stepwise approach to assess a project's need of catalytic capital and hence eligibility for funding under ECT Framework.

Companies can channel money through impact investment funds by providing grants or loans, or through forward-procurement contracts. In all cases, companies can claim part of the impact of the funds, in accordance with rules established in this framework, that link impact to the extent the capital is provided on a concessional basis.

PRINCIPLES

The principles set out below are intended to guide the application of the Framework. This guidance has been derived from common principles used in impact investment measurement and management, and greenhouse gas accounting and reporting.

Intentionality: Investment made with an intentional desire to solve problems and to benefit society or the environment.

Evidence-based: Investment decisions should be based on evidence and data to drive intelligent investment design that contributes to measurable social and environmental benefits.

Relevance: Investors should select the most relevant information to inform their investment decision and its impact.

Conservativeness: Whenever the use of assumptions is required, the assumption shall err on the side of caution.

Consistency: Use consistent methodologies and data to allow for meaningful comparisons of metrics over time.

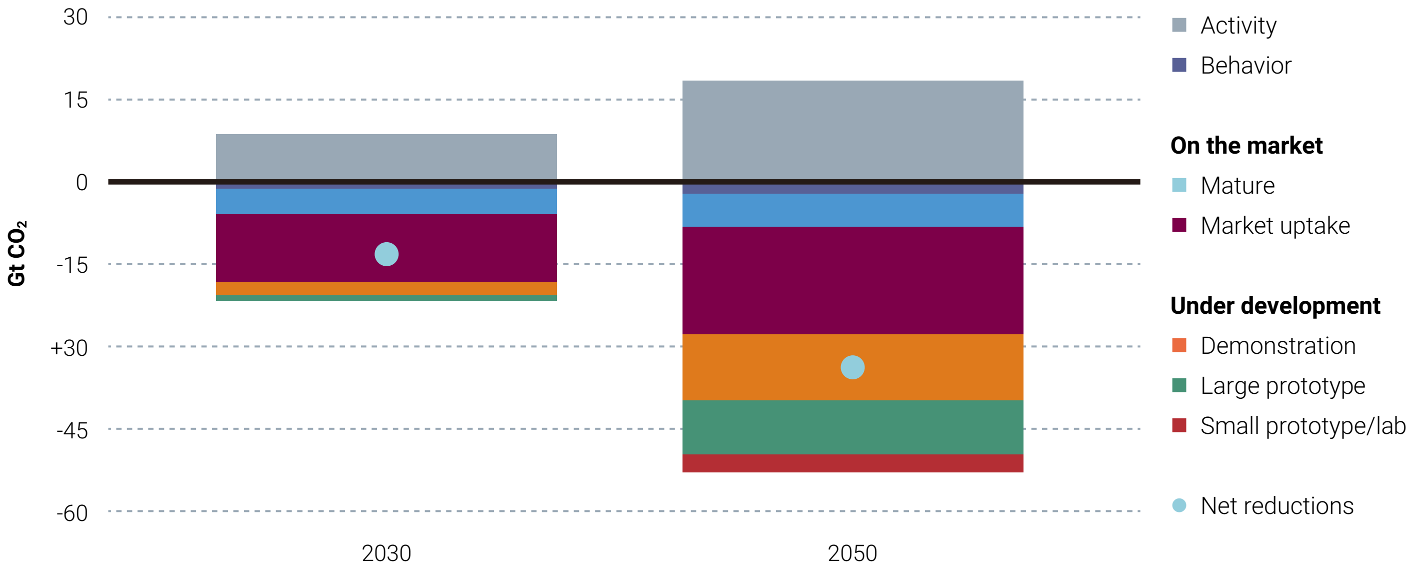
Verifiability: The data used to evaluate the impact of investments shall be verifiable and should be verified.

Transparency: If needed and whenever possible, methods, data and information should be provided publicly to enable others to see and understand how the Framework is applied. Data and information should be accurate, complete, timely, easily accessible and easy to understand. Whenever possible clear and plain language should be used and, where appropriate, provided in different formats such as visualizations, downloadable data sets, data-feeds, etc.

INVESTMENT CYCLE

According to the IEA, "Without a major acceleration in clean energy innovation, reaching net-zero emissions by 2050 will not be achievable. Technologies that are available on the market today provide nearly all of the emissions reductions required to 2030 in the NZE to put the world on track for net-zero emissions by 2050. However, reaching net-zero emissions will require the widespread use after 2030 of technologies that are still under development today. In 2050, almost 50% of CO_2 emissions reductions in the NZE come from technologies currently at demonstration or prototype stage" (IEA, 2021) (See Figure 2).

Figure 2: Global CO_2 emissions changes by technology maturity category in the net-zero emissions scenario (IEA, 2021).



Dr. Fatih Birol[2] characterized this reality as an energy innovation challenge facing the world and one of the innovation principles highlighted by IEA was mobilizing "private finance to help bridge the 'valley of death' by sharing the investment risks of network enhancements and commercial-scale demonstrators" (IEA, 2020).

The Framework addresses an important gap linked to this innovation challenge by focusing on impact measurement and its attribution to investors, an essential aspect for the recognition and incentivization of investment flows for the deployment of emerging climate technologies. The Framework articulates in a standardized format which positive impacts can and should be monitored and sets requirements for the screening, minimization and mitigation of potential negative impacts of the investments.

2 Executive Director of the IEA.

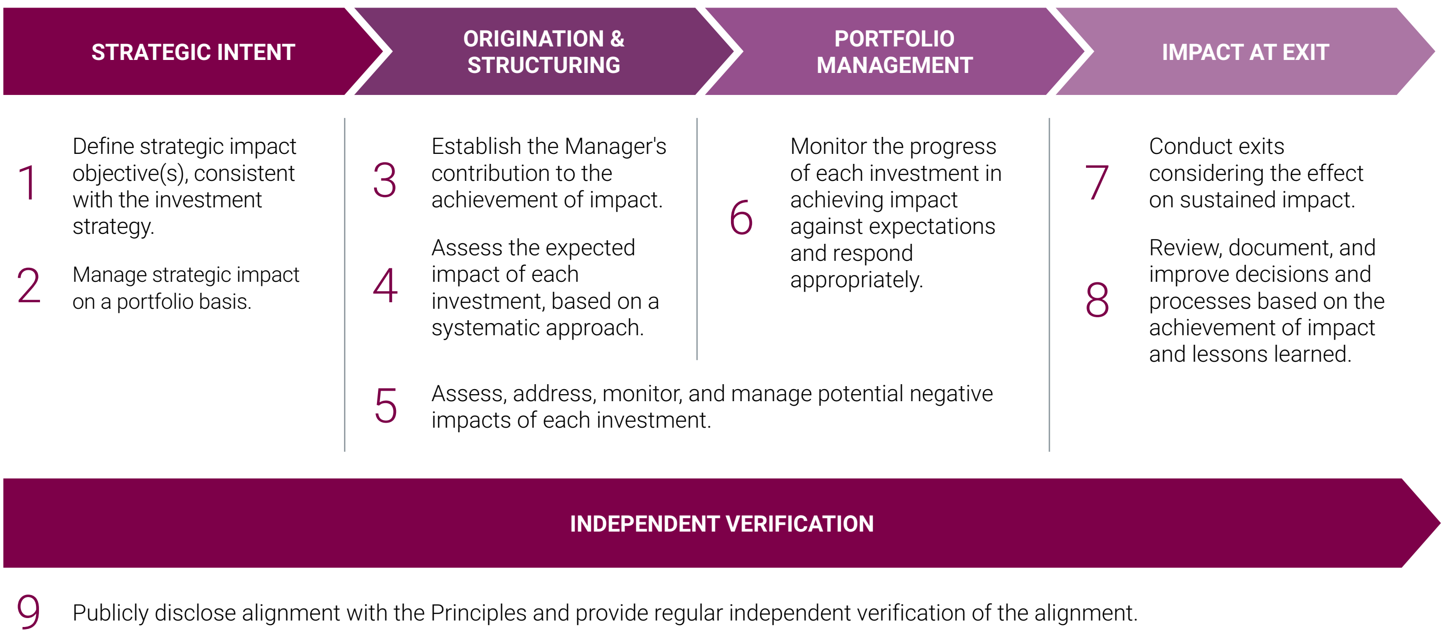
This is done considering the need to measure, manage and communicate impact both at fund and asset level, and the ex-ante estimate and ex-post monitoring of impact.

The following sections are built upon the IRIS+ Framework for impact investment measurement and management. Investors using this framework will contribute to the impact of investees by:

- **Signaling that impact matters:** by specifying clearly what their overall strategic goal(s) is (are). As a minimum the fund shall set a strategic goal of "accelerating emerging climate technologies deployment", but the fund can set other impact goals.
- **Engaging actively:** the fund shall engage with their investees to measure and manage both the impacts and risks associated with the project.
- **Growing new or undersupplied capital markets:** funds will be able to use this framework while there is a specific need and/or scarcity of catalytic capital to deploy a specific emerging climate technology.
- **Providing flexible capital:** investors will provide funds with different expectations and requirements on their financial conditions. These expectations and requirements are differentiated in the context of this framework and of the attribution of impact to different types of finance.

The Framework is aligned with the Operating Principles for Impact Management (OPIM) which have been developed by a group of Asset Owners, managers, and allocators. OPIM describe the essential features of managing investments with the intent to contribute to measurable social or environmental impact, alongside financial returns. The nine principles (see Figure 3 below) are considered the key building blocks for as robust impact management system.

Figure 3: Operating Principles for Impact Management



Source: International Finance Corporation/The World Bank 2019.

Rec.1

Impact metrics

For each strategic goal, the fund should use the IRIS+ Framework and its five dimensions of impact (what, who, how much, contribution and risk), to articulate its impact and determine a set of metrics that are appropriate for impact measurement and management.

Req.1

Investors shall adopt a strategic goal of catalyzing or accelerating the deployment of emerging climate technologies.

Rec.2

This goal should be measured/evaluated with a set of five technology neutral impact metrics which will characterize the positive impacts of the fund:

1. **Reductions in Green Premium:** Green Premium is defined as the difference in the final consumer price of a low-carbon solution and the final consumer price of the incumbent solution. Reductions in Green Premium are calculated as a % decline of an initial Green Premium (t=0) prior to investment and the forecasted Green Premium at time t after investment and are a market, system-wide indicator.
2. **Emissions Reduction Potential and Avoided Emissions:** Emissions Reduction Potential is a forward-looking estimate of the potential to mitigate greenhouse gas emissions of a given investment (Prime and NYSERDA, 2017), activity, product or service. Avoided Emissions is essentially the same concept but done on a backwards looking basis.
3. **Catalyzed emissions reductions:** GHG emission savings that are forecasted to occur because of the accelerated deployment of emerging climate technologies, compared to a reference uptake scenario, during a specified period.
4. **Direct Paris-aligned finance:** financial contributions by the investor to specific projects that are aligned with specified pathway trajectories and quantified financial needs to meet the Paris goals.
5. **Catalyzed Paris-aligned finance:** the total sum of investment which has been invested through the investee project.

The specific requirements related to the quantification and measurement of each of these positive impact indicators can be found in Annex 4.

Req.2

Investors shall:

1. further parametrize the generic methodologies at technology and asset level;
2. report the types of capital/finance provided and the financial conditions associated with capital provision to calculate and attribute impacts to individual investors, in accordance with the ECT Framework.

How the proposed impact goal and metrics fit within the IRIS+ Framework is presented in Annex 2.

Gui.1

Investors are welcome to measure other positive impact indicators, related to this framework's strategic goal or other strategic goals set by the investor. In this case, the IRIS+ should be used to help investors determine which impact metrics make sense for other goals. Examples of other impact indicators that can be considered include social impact metrics such as the number of green jobs created, or impacts related to achieving a 'Just Transition' for workers and communities negatively impacted by the shift towards a low carbon economy.

Managing risks

Risk is one of the five dimensions of impact, according to IRIS+ Framework, and it measures the likelihood that impact will be different than expected. This includes both risks that intended impacts will not be achieved as well as risks of unintended consequences. Consideration of impact risks throughout the investment lifecycle is important for all impact investors.

Req.3 The fund shall engage with their investees to measure and manage both the impacts and risks associated with the project.

Req.4 Catalytic capital investors shall also consider potential negative, market-distorting effects that could result from the effective subsidy provided via their financial concession[3].

Rec.3 To address these risks, funds should publish a clear risk assessment, risk management and risk communication policy for their investments. Investments should be screened against clearly defined safeguarding principles before investment decisions are made and should be monitored for any potential negative impacts during the project operation.

The sections below identify types of risks in more detail.

Uncertainty of intended impacts

Req.5 There is a risk that the impact metrics calculated and reported ex-ante may be under- or over-estimated. In alignment with "Principle 4 – Assess the expected impact of each investment, based on a systematic approach" of the Operating Principles for Impact Management[4], the Asset Manager shall seek to assess the likelihood of achieving the investment's expected impact. In assessing the likelihood, the Asset Manager shall identify the significant risk factors that could result in the impact varying from ex-ante expectations.

Some sources of uncertainty affecting the size of impacts are related to:

- Uncertainty of emission factors and emissions estimates due: 1) to underlying data limitations and variability (e.g. natural environmental variability making energy consumptions deviate from a set of standardized conditions); 2) geographical variability (e.g. significant variation of electricity emission factors, for example when comparing France with China);
- Uncertainty related to scenario choices, given that these are speculative possible futures, but unlikely to materialize;
- Uncertainty related to technology costs, which might strongly impact on the installed capacity and learning effects of a given investment and which arise from: 1) geographical price variability; 2) uncertainty about future price of basic inputs, e.g. energy and materials; and 3) uncertainty about the cost reductions brought by investment, reflected in the learning elasticity (ε);
- Req.6 Inherent uncertainty around the probability of success of any given project.

3 Tideline_Catalytic-Capital_Unlocking-More-Investment-and-Impact_March-2019.pdf
4 https://www.impactprinciples.org/9-principles

Gui.2 This risk shall be mitigated by transparency around methodology and implementing a continuous improvement policy, consulting with stakeholders and public on methodologies, as well as working with investees to collect market data to understand the impact of investments ex-post.

The Avoided Emissions Framework (AEF) (Mission Innovation, 2020) recommends some best practice for estimating avoided emissions that are equally relevant to the metrics included in this framework, such as: avoiding using single source data and arbitrary assumptions, performing various cross-checks and conducting independent reviews (see also chapter "Validation and Verification" and "Communicating and reporting impact").

Risks of unintended consequences

To mitigate any unintentional negative consequences of projects, this framework requires that:

Req.7 "For each investment the Manager shall seek, as part of a systematic and documented process, to identify and avoid, and if avoidance is not possible, mitigate and manage Environmental, Social and Governance (ESG) risks. Where appropriate, the Manager shall engage with the investee to seek its commitment to take action to address potential gaps in current investee systems, processes, and standards, using an approach aligned with good international industry practice. As part of portfolio management, the Manager shall monitor investees' ESG risk and performance, and where appropriate, engage with the investee to address gaps and unexpected events[5]."

Safeguarding principles is a tool that is widely used by the international development community to identify, prevent, and mitigate unintended negative consequences that may arise from a given intervention. Despite a relative diversity in safeguarding principles and approaches, there are some commonalities between them, which have become globally accepted best practices. The overview presented on Figure 4, which is based on The United Nations Development Programme's social and environmental standards (UNDP, 2014) and the Adaptation Fund's environmental and social policy (Adaptation Fund 2013) offers a good benchmark to what needs to be safeguarded.

Req.8 In applying the safeguarding principles, compliance with the local regulations shall be adhered to as a minimum. For example, for investors in EU, the EU Taxonomy[6] shall be used as a reference point. It offers Do No Significant Harm assessment criteria for investments in many low-carbon and enabling technologies. The assessment criteria are either in a form of quantitative thresholds or set as qualitative criteria, describing an action or set of actions to be demonstrated which avoid significant harm.

Another example of good international industry practice is the Gold Standard Safeguarding Principles[7] which are required to be adhered to by all projects seeking Gold Standard certification. They were derived from multiple international conventions, including UNDP's Social and Environmental Standards (SES), UN Environment's Environmental, Social and Economic Sustainability Framework and The World Bank's International Finance Corporation Performance Standard. Adopting these safeguarding principles as the screening criteria by a fund will help identify, prevent and mitigate negative, unintended consequences of financed projects.

5 Principle 5 of the Operating Principles for Impact Management.
6 https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu- taxonomy-sustainable-activities_en
7 https://globalgoals.goldstandard.org/103-par-safeguarding-principles-requirements/

Figure 4: Safeguarding principles and tools

SAFEGUARD PRINCIPLES
Activities must not have adverse effects on:

- Human rights
- Core labor rights
- Access and equity
- Marginalized and vulnerable groups
- Gender equity and women's empowerment
- Indigenous peoples
- Involuntary resettlement
- Protection of natural habitats
- Conservation of biological diversity
- Climate change
- Pollution prevention and resource efficiency
- Public health
- Physical and cultural heritage
- Lands and soil conservation

SAFEGUARD TOOLS
This can be ensured through:

Source: Verles et al., 2018

Market distortion risks

This is a case of potential unintended consequence specific to catalytic capital. As outlined in the TIDELINE report on catalytic capital[8], capital willing to accept disproportionate risk and/or concessionary returns can have market-distorting effects if not deployed appropriately. Evaluating potential positive and negative impacts of catalytic capital (including its built-in financial concession and the activities it supports) is essential to its effective use. By incentivizing contributions of concessionary capital, care should be taken by an investor not to allocate it in a way that creates an unequal competitive playing field or subsidizes inefficient enterprises and business models with little potential for significant impact and scale. As a general mitigation strategy, recommendations by Omidyar Network[9] can be applied. They encourage investors to examine whether they might be unduly influencing competition in a sector when deciding whether and how to deploy concessionary investment capital, and to try to ensure concessionary capital has clear intended impacts at the enterprise and/or market level.

Rec.4

8 Tideline_Catalytic-Capital_Unlocking-More-Investment-and-Impact_March-2019.pdf
9 Bannick, M.; Goldman, P. (2012). Priming the Pump: The Case for a Sector-Based Approach to Impact Investing. Omidyar Network.

Attributing investment cycle impacts to investors

In the context of this framework, "attribution methodology" refers to the allocation of impacts from individual interventions or from a portfolio of interventions between investors in a blended finance facility[10]. This is required so individual investors can claim their portion of the impacts achieved by the fund and link them to ESG reporting and sustainability claims and commitments. There is currently no single standardized method to do this, but the proposed methodology considers some existing approaches. Attributing certain impacts to investors' individual contributions into a fund does not replace the requirement for the fund to report its cumulative portfolio impacts.

The methodology described here assumes the use of blended finance — which in this context means a structuring approach that allows organizations with different objectives to invest alongside each other while achieving their own objectives[11] (whether financial return, social or environmental impact different, or a blend of both). Different investors in a blended finance structure will have return expectations, ranging from concessional to market-rate. The concessional or catalytic capital are investments that accept disproportionate risk and/or concessional returns relative to a conventional investment to generate positive impact and enable third-party investment that otherwise would not be possible[12]. Table 2 provides examples of concessional capital that can be used in a fund investing in emerging climate technologies.

Table 2: Concessional capital types and their application

Types of concessional capital	Application examples
Grants	Providing revenue subsidies (contract for differences); buying down CapEx costs
Direct offtake agreement	Directly procuring fuel or CO_2 at a set price that enables bankability.
Concessional debt	Subsidized debt to reduce CapEx financing costs and lower overall project weighted average cost of capital
Concessional equity	Subsidized equity to reduce CapEx financing costs and lower overall project weighted average cost of capital

Investors in a blended finance structure may have different financial return and "impact return" expectations. The term "catalytic capital" puts additional emphasis on the role such financing plays in generating impact that would not otherwise have been possible. Therefore, it is reasonable to assume that investors contributing catalytic capital expect to be rewarded with a higher share of impacts attributed to them relative to conventional investors. The proposed attribution methodology therefore incentivizes funders to move higher on the concessionality ladder in return for a higher share of impacts.

10 Please note that "attribution" is a term that appears in different context with slightly different meanings and implications. For example, one needs to distinguish "attribution" in the context of LCA, namely the question of attributing impacts to different products or different parts of the value-chain of a product; from "attributional" perspective to GHG inventories; to the attribution of impacts to a fund and its investors. Note also, that while in some context attribution concerns focus explicitly in avoiding double-counting and double claiming, in some other context this might not be avoidable.

11 https://www.convergence.finance/blended-finance

12 Tideline_Catalytic-Capital_Unlocking-More-Investment-and-Impact_March-2019.pdf

Attributing ECT Framework impacts at project level

The key premise of the methodology is that attribution of impacts should go beyond merely proportionally linking impacts to the face value of an investor's contribution in a project to accredit a higher level of impacts to funders that are foregoing a certain benchmark rate of return given the investment's inherent risk profile. By adapting attribution based on the level of concessionality that is offered, this approach allows providers of catalytic funds to establish a trade-off between financial returns on the one hand, and positive climate impacts (and the associated claims) on the other.

The methodology establishes attribution of climate impacts to specific financing contributions flowing through a fund structure to project-level investments. The methodology should be applied at the time the investment decision is made on the individual project level, offering investors clarity on attributable shares of the generated climate impacts certified under this framework. The methodology assumes that investment holdings of private equity and other financing instruments are not liquid at the time of investment. The methodology establishes project-level attribution in the context of the following financial instruments:

- Grants
- Concessional loans
- Concessional equity
- Direct offtake agreements

Defining the 'utility' of financial instruments

The proposed project-level attribution approach centers around the concept of 'grant equivalence'. This term refers to a quantification of the financial value of the concessionality element that is being offered over the lifetime of a financial transaction, compared to a benchmark return that would be realized in a non-subsidized setting. Put differently, this approach seeks to determine the 'distance from market' of an offered financing product, with the method allowing for the quantification of the share of capital that can be deemed as sub-market.

The approach to defining grant equivalencies is widely applied in Official Development Assistance (ODA) reporting by member countries of the OECD Development Assistance Committee[13]. Its general rationale is that if the net present value of offered finance is lower than the face value of the resources made available upon investing, then the difference should be considered a 'gift'. This gift portion is called a 'grant equivalent' if expressed as a monetary value, and a 'grant element' if expressed as a percentage of the total amount extended[14].

13 OECD (2021) Modernisation of the DAC statistical system. Available here
14 OECD (2021) Modernisation of the DAC statistical system. Available here

While available guidelines relate specifically to concessional lending activities, its general principles can also be extended to other financing instruments, including concessional equity investments as well as direct offtake agreements. Table 3 below summarizes the proposed approach for determining the grant element of the different financing instruments that are supported in this framework. Annex 5 contains a detailed methodology, outlining the steps that are to be considered when attributing impacts across these different financing instruments.

Table 3: Determining the grant element of different financing instruments

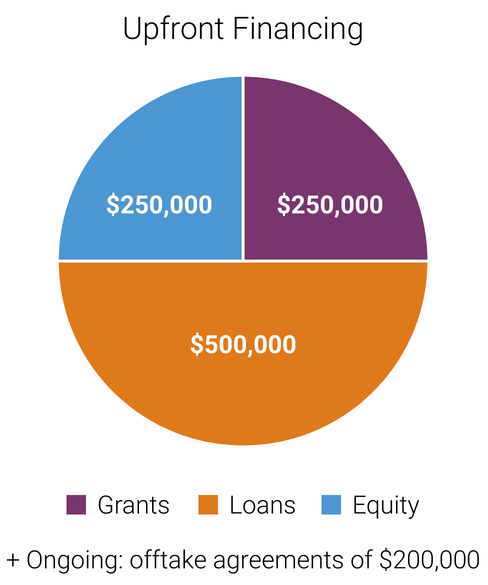
Instrument	Approach to determining the grant element
Grant	Given that grants represent non-repayable funding, the full amount of finance disbursed through upfront grants is to be deemed as fully concessional, representing a grant element of 100%.
Debt	For concessional loans, the grant element is calculated as the difference between net present value of a market-priced loan and a loan offered at softer terms. Several factors determine the grant element of loans, including: the interest rate; grace period (the period during which the loan does not have to be serviced); maturity (the duration of the loan); and a benchmark discount rate (used to determine the present value of future repayments at market terms). Given the full repayment of the principal amount, loan instruments inherently only offer partial concessionality, representing a grant element of less than 100%.
Equity	Concessional equity relates to equity investments that take on disproportionate risk given the return expectations. Where offered equity comes at a cost that is lower than a market-rate expected return, concessionality is introduced. Concessional equity investments will always have a grant element below 100%, given their ownership claim in the underlying asset.
Direct offtake agreement	The concessionality of direct offtake agreements can be defined as the Green Premium which the offtaker commits to pay to receive a certain service or product in the future. Hence, the Green Premium portion of the offtake contract is what gets attribution of impact. The Green Premium can be calculated by comparing the (discounted) costs associated with a base case service/product against the (discounted) costs associated with the purchase of a green alternative providing the same level of service. The resulting attribution needs to be deducted from the original attribution allocated to the initial funders of a project, given that direct offtake agreements do not provide any direct upfront capital.

The application of the proposed attribution approach can be illustrated on an example project-level investment that is supported by all four financing instruments as follows:

- Grants: US$250,000 (non-repayable)
- Concessional loans: US$500,000 (at 2.5% interest, 10-year duration, 5-year grace period)
- Concessional equity: US$250,000 (at 5.0% cost of equity)
- Direct offtake agreement: US$200,000 (with Green Premiums applied over a 5-year duration, starting in year 6)

As such, the example project is receiving US$1 million in upfront financing, in addition to benefitting from a long-term offtake agreement (see Figure 5).

Figure 5: Financing structure of a US$ 1 million project in an emerging climate technology



As per the steps presented for determining the benchmark discount rates for debt and equity alike, based on the assumed offered costs of debt (2.5%) and equity (5.0%), the benchmark rates result in the following percentages:

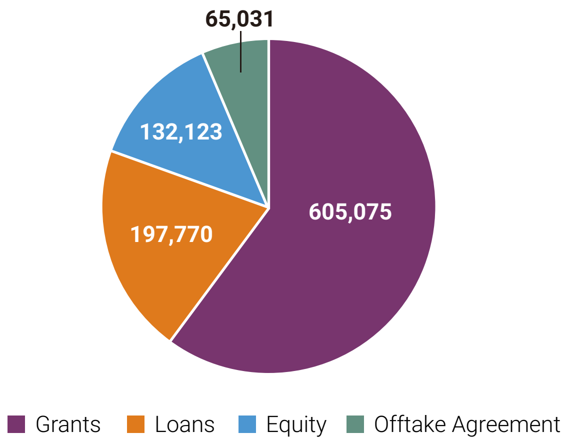
- Benchmark cost of debt: 5.21%
- Benchmark cost of equity: 9.5%

These inputs are subsequently used to determine the grant elements across the offered financing instruments, which amount to the following monetary values:

- Grants: US$250,000 (factor of 1)
- Concessional loans: US$81,713 (factor of 0.16)
- Concessional equity: US$54,590 (factor of 0.22)
- Direct offtake agreement: US$26,869[15] (factor of 0.13)

Figure 6 presents the resulting attribution of impacts, assuming the target project delivers a volume of 1 million tons of catalyzed emission reductions.

Figure 6: Attribution results across all four financing instruments



Investments	Attributed Units per $	Ratio to grant
Grants	2.42	1.00
Loans	0.40	0.16
Equity	0.53	0.22
Offtake Agreement	0.33	0.13

Attributing ECT Framework impacts at fund level

Although the precise attribution of impacts is possible only at project level, the fund may need to attribute and communicate impacts to investors already at the commitment stage when the funded projects and their capital structure have not yet been defined. As there are various funding structures that are applied to emerging investments, the resulting attribution approaches at fund level would have to be adapted to reflect different investment strategies. For example, while most funds may be structured like private equity investment funds that diversify investor capital across all investments, some funds may prefer to link specific investors with certain projects, meaning that different attribution approaches would apply depending on the applied capital allocation approach.

15 The Green Premium share is to be determined on a case-by-case basis. For the purpose of this example, a Green Premium of 25% equally spread out over the 5-year duration of the offtake agreement has been assumed.

PRODUCTION CYCLE

When the production cycle starts, the focus is on monitoring real impact delivered — actual emissions as well as avoided emissions — instead of the potential impacts investments might have in the future. As referred in the risk section, the impact results will be different from those estimated and this is part of the risk the Asset Managers will have to manage. Due to the nature of emerging climate technologies, the profit motive should be aligned with increased positive climate impacts. To improve overall knowledge about investments in emerging climate technologies and improve their general investability, it is vital to conduct active and rigorous monitoring of the impacts.

The first sub-section addresses the metrics used to monitor impact during this cycle, the second — how to attribute the impact to investors and the third sub-section describes how to attribute impact for final consumers of ECT goods and services.

Req.9

Impact metrics

The Asset Managers shall use the impact metrics established during the investment cycle, appropriate for each strategic goal, for impact measurement and management during the production cycle, in accordance with the IRIS+ Framework. For the strategic goal of catalyzing or accelerating the deployment of emerging climate technologies, the following metrics shall be used:

Req.10

1. Market level metric: Reductions in Green Premium;
2. Asset-level metrics: Avoided Emissions;

The specific requirements related to the quantification and measurement of these impact metrics are set in Annex 4, being that Asset Managers shall require that investees parameterize the methodologies at asset level. This should be publicly available.

The technology-specific impact metrics methodologies shall articulate the current links between each technology and its contribution to climate solutions and IRIS Impact themes and core metrics sets (Annex 2). For example, an Asset Manager investing in sustainable aviation fuel (SAF) should monitor the core metrics proposed by IRIS+ for the impact theme “climate mitigation” and the strategic goal of “mitigating climate change through clean mobility”, as explained in Annex 2.

Gui.3

Funds are welcome to measure other positive impact indicators, related to this framework strategic goal or other strategic goals set by the fund. In this case, the IRIS+ should be used to help investors determine which impact metrics make sense for other goals. Examples of other impact indicators that can be considered include social impact metrics such as the number of green jobs created or impacts related to achieving a ‘Just Transition’ for workers and communities negatively impacted by the shift towards a low carbon economy.

18 https://carbonaccountingfinancials.com/files/downloads/PCAF-Global-GHG-Standard.pdf

Attributing production cycle impacts to investors

Req.11 Attribution of positive and negative impacts to investors during the production cycle shall use established GHG accounting rules, namely the Global GHG Accounting and Reporting Standard for the Financial Industry[16] developed by Partnership for Carbon Accounting Financials.

The PCAF standardizes GHG emissions accounting for financial institutions and conforms with the requirements set forth in the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard for category 15 investment activities. The PCAF Standard defines the investors' share of emissions (or avoided emissions) as proportional to its exposure to the total company or project value (See Figure 7).

Figure 7: The general approach to calculate financed emissions according to PCAF Standard

$$\text{Financed emissions} = \sum_i \text{Attribution factor}_i \times \text{Emissions}_i \quad \text{(with } i \text{ = borrower or investee)}$$

$$\text{Attribution factor}_i = \frac{\text{Outstanding amount}_i}{\text{Total equity + debt}_i}$$

As a basic attribution principle, the investor accounts for a portion of the emissions of the financed project determined by the ratio between the investors' outstanding amount (numerator) and the total equity and debt of the financed project (denominator). This ratio is called the attribution factor. It does not differentiate between equity and debt as both contribute to total finance of the borrower or investee (and indirectly their emissions) and are, therefore, deemed equally important.

In case of an Asset Manager divestment from an asset or an Asset Owner divestment from a fund, PCAF rules will apply for debt and equity. As per current accounting principles, backward-looking metrics should cease to be reported once the divestment occurs and a certain position taken by another organization — which shall start reporting that impact.

It should be noted that in case of divestment or selling by an Asset Owner or Asset Manager of their takes in a ECT asset, forward-looking impacts previously communicated do not need to be revisited — if the investment has already been made, then the enabling and catalytic effect communicated by the metrics is considered appropriate and reflects the time and quality asymmetry of forward-looking metrics. Likewise, grants and off-take agreements impact allocation of forward-looking metrics, will not be revised. Grants currently have no impact attribution once assets starts operating (grants are not considered under PCAF) and off-take agreements will have to the extent companies actually purchase and consume the goods and services — which is dealt in the next section. Grant investors will still be eligible for receiving ongoing reports related to the impact of their initial investment and to communicate about this impact, if they wish so.

To the extent that ECT assets are less carbon intensive than "current economy" assets, having these assets in their portfolio should contribute for an Asset Owner/Manager to meet a portfolio decarbonization target aligned with meeting the Paris-agreement goals by 2050. For real economy companies, that invest in ECT assets and become "Asset Owners" the real value of these actions is to have options in the mid-term future to continue their decarbonization.

19 http://carbonyield.org/wp-content/uploads/2018/01/Carbon-Yield-Methodology.pdf

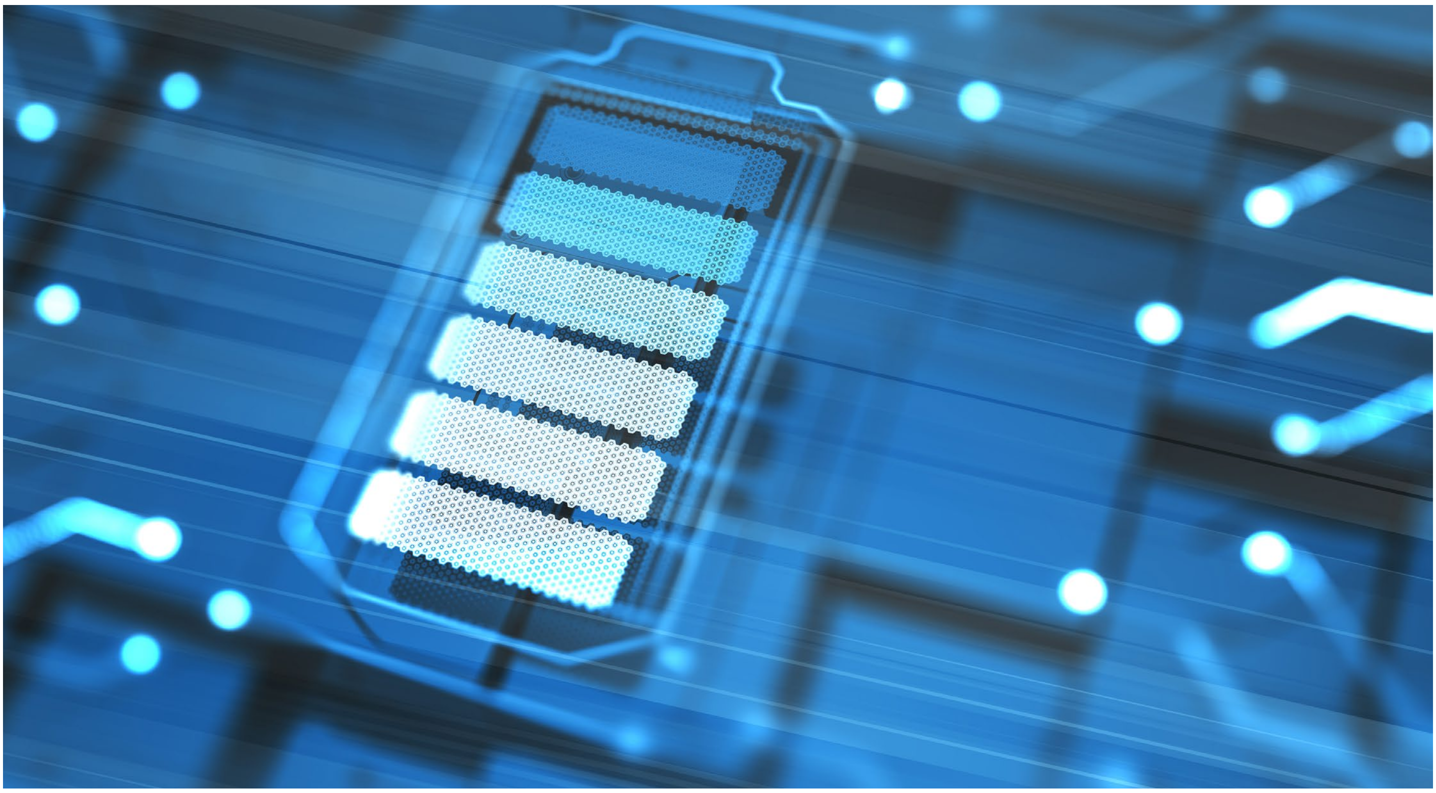
Attributing impacts to consumers of ECT goods and services

Req.12 For consumers of ECT goods and services current GHG accounting rules and metrics shall apply, namely the accounting and reporting of Scope 1, 2 and 3 emissions.

Req.13 CatER, ERP, and avoided emissions shall not be applicable to consumers of ECT goods and services during the production cycle.

Gui.4 The Green Premium paid by the products and services may be reported, on an annual basis, as well as Direct Paris-aligned finance in the form of the total amount of Green Premium paid in exchange for the ECT goods and services.

Pending on how the accounting of the purchase and consumption of ECT goods and services is done, procurement should allow companies to meet their short to mid-term science-based mitigation targets and long-term carbon neutrality goal. As mentioned in previous chapter, the benefits are to have technological and economically viable options to continue in their deep-decarbonization pathways. Another benefit is the ability to reflect these purchases in terms of a company GHG accounts. To the extent GHG accounting standards allow for it, they create incentives or barriers to market adoption of the new products and services. When barriers exist, GHG accounting standards should evolve — but will do it in ways that are hard to predict now. Current focus is on presenting existing practices and no considerations are made on future developments in GHG accounting. Some brief examples of current challenges in the corporate GHG accounting world are: 1) new GHG Protocol Standard on removal accounting and how to consider removals in GHG accounts as well as target setting; 2) options on the accounting of biogenic emissions and their impact in terms of SAF use which might imply that SAF might be considered a renewable fuel, but not necessarily "carbon neutral"; 3) Scope 3 accounting and the use of book and claim systems, which currently do not exist for Scope 3 emission accounting standards and which might facilitate increased demand for SAF by corporate clients.



REPORTING IMPACT

Asset Managers and owners shall monitor and annually report on the progress toward the achievement of the stated goals of catalyzing ECT deployment. The monitoring and reporting happens at different levels, namely at portfolio/fund level and asset level, depending on the impact metrics.

Reporting requirements for Asset Managers

Req.14 Asset Managers shall comply with Principle 6 — "Monitor the progress of each investment in achieving impact against expectations and respond appropriately" of the Operating Principles for Impact Management. The principle states that the Asset Owner or Manager shall monitor progress toward the achievement of positive impacts in comparison to the expected impact for each investment. In line with the principle, progress shall be monitored using a predefined process for sharing performance data with the investee

The reporting requirements for Asset Managers are presented in following paragraphs.

Req.15 **A. General reporting requirements**

Asset Managers shall:

A.1 report on an annual basis their climate impacts based on available standards and best practices for climate and sustainability reporting. Reporting shall be done on an annual basis, shall be available to the general public, and comprise all impact metrics and indicators, except when noted otherwise, aggregated from impact data reported by their investees.

A.2 report in accordance with established principles for reporting environmental & climate change information, e.g. the principles of the CDSB Framework (CDSB, 2019) or TCFD recommendations (TCFD, 2017);

A.3 report information related with their theory of change, strategic impact goals and alignment with the ECT Framework.

A.4 if necessary, provide contextual information in the form of commentary and notes to any of the quantitative reporting metrics reported, for the user of information to better understand their relevance;

A.5 characterize, document, and transparently communicate the uncertainty inherent to impact indicator calculations (see Annex 6), namely in the methods, data and assumptions used in those calculations, as well as the approaches to minimize it. This is particularly relevant to forward-looking estimates of impact.

A.6 report transparently their own confidence level assessment of the degree to which the calculated impact indicator is a fair representation of the true impact of the fund (see Annex 6).

Req.16

B. Reporting ex-post impact metrics

Asset Managers shall:

B.1 report their Scope 1, 2 and 3 emissions (category 15) in accordance with PCAF;

B.2 report information about the current investment portfolio, namely:

a) Number of projects invested in per technology area and technology pathway since the fund started and number of companies added during reporting year;

b) Total amounts invested and type of capital invested since fund started and amounts added during reporting year;

c) Types of capital invested and geography (per country reporting) since fund started and amounts added during reporting year;

d) Total amount of "Direct Paris-aligned finance" invested since fund started and amounts added during reporting year;

e) Total amounts of "Catalyzed Paris-aligned finance" invested since fund started and amounts added during reporting year.

B.3 report total avoided emissions calculated in accordance with PCAF rules, aggregated from avoided emissions reported from each investee and separately from their Scope 1, 2 and relevant 3 emissions. Avoided emissions shall be calculated by the investees using the same methodologies specified by the Asset Manager for the calculation of ERP but using primary data from each of the investees, namely, primary GHG emission factors and production data. The Asset Manager and the investee shall agree how the fund-level methodology is applied to the investee prior to the first report, as well as any subsequent changes thereafter. This shall outline how often data will be collected; the method for data collection; which data is collected and its sources; responsibilities for data collection; and how, and to whom, data will be reported[17]. When monitoring indicates that the investment is no longer expected to achieve its intended impacts, the Manager shall pursue appropriate action.

Rec. 5

B.4 report other information as required by the IRIS+ Framework set of core metrics and as defined in the technology-specific methodologies.

Asset Managers should:

B.5 collect cost data related to the investment projects they are investing in and report levelized costs of technology averages and spreads, based on their investment experiences. This data might be under confidentiality clauses. Asset Managers should anonymize information or report it in aggregated form (e.g. using averages and spread) or delegate on another entity (e.g. a governance structure for this framework) the task of regularly monitoring and reporting on levelized cost data for emerging climate technologies.

17 In alignment with Impact Principle 6 "Monitor the progress of each investment in achieving impact against expectations and respond appropriately", see https://www.impactprinciples.org/9-principles.

Gui.5

C. Reporting forward-looking impact estimates

C.1 Asset Managers may communicate forward-looking impact metrics and statements of investments made during the investment cycle. In this case, Asset Managers shall include contextual notes about the uncertainty and limitations of forward-looking metrics and statements and include appropriate language that allows the clear identification of such information. Asset managers shall include appropriate disclaimers about forward-looking information in communication materials and whenever required by law, the statements shall comply with local regulations.

C.2 Metrics estimating the forward-looking impact of investments made during the reporting year include:

a) Catalyzed Emissions Reductions per technology and technology pathway.

b) Total Emissions Reduction Potential per technology and technology pathway.

Rec.6 C.3 The data generated from the investees and/or from research done to quantify the actual impact of investments, shall be used to update or correct any over or under-estimates that occur in the ex-ante application of the methodologies and information about such corrections shall be included in annual reports. Data generated by the investees include: energy and material consumption data, project specific emission factors, costs, installed capacity, production and any other data that might be needed for the parametrization of the generic technology methodologies to the project.

Req.17 C.4 The forward-looking positive impact metrics suggested by this framework shall be reported separately from the Asset Manager or the investees own Scope 1, 2 and 3 emissions, and shall not be subtracted from its own emissions or linked to them.

D. Reporting system-level impacts

Req.18 D.1 Asset Managers shall report system-wide impact metrics relevant to this framework, namely:

a) Measured reductions in Green Premiums;

b) Global technology deployment curves and global market technology investments and how they compare with reference scenarios used to establish Catalyzed Emission Reductions and Learning rates;

Req.19 Note: Asset Managers may delegate on another entity (e.g. a governance structure for this framework) the task of regularly monitoring and reporting on information in requirement D.1 and simply refer to it within their annual reports.

D.2 If reporting the forward-looking impact metrics defined in C.2, the asset managers shall report the results of the active ex-post monitoring for those impact metrics and demonstrate, to the extent possible, its "catalytic" impact through contextual disclosures, namely the ones mentioned in D.1. This reporting shall be done with a minimum frequency of 3 to 5 years, be based on agregation of data reported by investees and should include:

a) Ex-post estimation of Catalyzed Emissions Reduction per technology and technology pathway. See "Annex 4.5 — Catalyzed emissions reductions" for further information.

b) Total Avoided Emissions of investees per technology and technology pathway.

c) Reductions in Green Premium and Levelized Cost of Technology;

An example of how to report the impacts of ECT investments can be found in Annex 6.

18 For example, companies investing through funds.

Req.20

Reporting requirements for Asset Owners[18]

Asset Owners that manage their own assets in ECT shall follow the same requirements applicable to Asset Managers, as per previous section.

The reporting requirements for Asset Owners investing through Asset Managers are presented in following paragraphs.

Gui.6

A. Reporting backward-looking impact metrics

Asset Owners may:

A.1 report proportionally to their investment, in accordance with PCAF, the Scope 1, 2 and 3 emissions of the funds they have invested in as their Scope 3 emissions (category 15);

A2. Disclose their actions — deployment, financial support, engagement and policy — in support of the deployment of ECT.

Gui.7

B. Reporting forward-looking impact estimates

B.1 Asset Owners may communicate forward-looking impact metrics and statements of investments made into specific funds investing in ECT. If Asset Owners report forward-looking metrics, they shall:

a) Quantify the portion of impact the asset owner can claim from its investment using information from their Asset Managers based on the attribution rules defined in this framework;

b) Include contextual notes about the uncertainty and limitations of forward-looking metrics and statements and include appropriate language that allows the clear identification of such statements and figures.

c) Include appropriate disclaimers about forward-looking statements in communication materials and whenever required by law, the statements shall comply with local regulations.

B.2 Metrics estimating the forward-looking impact of investments made during the reporting year include:

a) Catalyzed Emissions Reductions per technology and technology pathway;

b) Total Emissions Reduction Potential per technology and technology pathway.

B.3 Asset Owners may correct previous forward-looking estimate, whenever there is evidence that this have been systematically over or underestimated.

Req.21

B.4 The forward-looking positive impact metrics suggested by this framework shall be clearly reported as separate from the Asset Owners own Scope 1, 2 and 3 emissions, and shall not be subtracted from its own emissions, incorporated into narratives giving the impression that they can compensate in anyway the asset owner climate impact or linked to the corporate GHG emission inventory in any other way.

18 For example, companies investing through funds.

Gui.8 **C. Reporting system-level impacts**

C.1 Asset Owners may report system-wide impact metrics relevant to this framework, namely:

a) Measured reductions in the final marketplace of Green Premiums as communicated to them by Asset Managers;

b) Global technology deployment curves and Global technology investments and how they compare with reference scenarios used to establish Catalyzed Emission Reductions and Learning rates;

Note: Asset Owners may delegate on another entity (e.g. their Asset Managers or a governance structure for this framework) the task of regularly monitoring and reporting on information in requirement D.1 and simply refer to it within their annual reports.

Rec.7 C.2 If reporting the forward-looking impact metrics defined in B.2, Asset Owners should report notes or narrative disclosures on the results of the active ex-post monitoring by Asset Managers of those impact metrics and their "catalytic" impact through contextual disclosures. The disclosures should be done with a minimum frequency of 3 to 5 years and be based on the data and communication of Asset Managers impacts according to paragraph D of "Reporting requirements for Asset Managers" section.

An example of how to report the impacts of ECT investment can be found in Annex 6, as well as an example of how uncertainty can be communicated.

CLAIMS AND COMMUNICATION OF IMPACT

Sustainability claims are environmental or ethical claims "which suggest that a product, service, brand or business is better for the environment. They include claims that suggest or create the impression that a product or a service: has a positive environmental impact or no impact on the environment; is less damaging to the environment than a previous version of the same good or service; or is less damaging to the environment than competing goods or services" (UK CMA, 2021).

There are two main broad categories of sustainability claims: 1) 'assured claims', which are claims that result from an assurance process against a standard; and 2) 'marketing claims', which are claims that can be used to promote an aspect of, or relationship with, a standard, where the claims are standardized. It is not the objective of this framework to standardize specific assured or marketing claims, but the reader can refer to available standards to better understand if metrics proposed here can play a role. A particular challenge faced while developing this chapter is that standards on claims mentioned below are currently evolving and have not yet been finalized.

Some of the most frequent claims relate to being carbon neutral, climate neutral, net-zero or "Paris aligned". Often, these claims have standards that specify minimum conditions companies might need to fulfil. However, it is equally possible for companies to claim something without following a specific standard, which can introduce confusion in the market. Sustainability claims are dynamic and their meaning and value for companies keeps changing.

In coming years investments in Emergent Climate Technologies have the potential to be linked to specific claims, for example, claims of contributing to Paris-aligned finance; claims to be a "Paris-aligned company"; or as contributing to meet a science-based target (SBT) or carbon neutrality goals. There is evidence that ECT will need to be deployed at scale for companies to continue to decarbonize and meet their SBTs beyond 2030. ECT investments can and should also be recognized by sustainability ratings and assessments that have a forward-looking orientation. For example, the ACT Framework[19], explicitly recognizes material and intangible investment categories as important dimensions of the transition and ECT investments should be able to be recognized in these two categories. Thus, as exemplified, the different metrics proposed in this framework can link to different types of claims although it is not possible to fully specify how this link can happen.

Rec.8 In all cases, to ensure investments in catalyzing technologies are appropriately communicated and accurately and transparently reported on, the following best practice guidance should also be used when making claims:

- Claims must be accurate and not over-exaggerate achievements (ACT, 2020);
- Claims must be robust, and based on a generally accepted methodology (Transparency One, 2018);
- Companies must provide access to the information underlying a claim and make it comprehensible. Methods, data sources, or assumptions involved in reaching a sustainability claim should be included (ACT, 2020);
- Companies should communicate claims via several different channels and, when space is limited, provide links to more detailed information (ACT, 2020).

Req.22 There are a number of examples of what Asset Owners and managers should not do based on some of the metrics in this framework. Asset Owners and managers shall not:

- Claim to have offset their Scope 1,2 or 3 emissions by having funded a certain amount of avoided emissions or Catalyzed Emission Reductions;
- Claim to be a net-zero company solely for having funded avoided emissions or removal technology;
- Claim to be a fully Paris-aligned company because of particular investments made.

19 Developed by the ACT — Assessing low-Carbon Transition initiative.

VERIFICATION

Req.23 **For the investment cycle impact quantification, given the systematic uncertainties facing any forward-looking analysis, the ex-ante estimations of impact shall be independently validated by a third party. Validation is a "process for evaluating the reasonableness of the assumptions, limitations and methods that support an environmental information statement about the outcome of future activities" (ISO, 2020). This provides for scrutiny of the assumptions, methodology and data sources; adds credibility to the process; and may identify any errors in the assumptions or calculations. This validation can be performed by either an independent third-party external expert, an internal expert or committee, or by an external panel of reviewers.**

Req.9 Validation can be carried out through a variety of standards. It is recommended that ISO 14065:2020 "General principles and requirements for bodies validating and verifying environmental information (ISO, 2020) is used. However, local validation and verification standards might exist. To avoid costly duplication of procedures, when an investee already has to validate or verify in accordance with a local standard, it will not need to replicate the process in conformance to ISO 14065, provided they can be considered as reasonably equivalent. This determination shall be done at fund level and noted in their annual report, when applicable.

Req.24 Baseline scenarios shall be validated by an external expert panel, constituted from experts from reputable organizations that, by the nature of their mandate, frequently collect, analyze and use data on technological innovation and technological change.

Req.25 During the production cycle, to certify that impacts have been realized, the reporting from the investees' projects shall undergo independent 3rd-party verification on a regular basis, with a minimum 5-year cycle. Verification is a "process for evaluating an environmental information statement based on historical data and information to determine whether the statement is materially correct and conforms to criteria" (ISO, 2020). The same principle and requirement on equivalence between different verification and audit standards used for validation (see above) applies to verification.

Req.26 Annual reports from Asset Owners and Managers, shall equally be subject to independent third-party verification on the same minimum five-year cycle. The Operating Principles for Impact Management (Principle 9) explicitly requires regular independent verification.

REFERENCES

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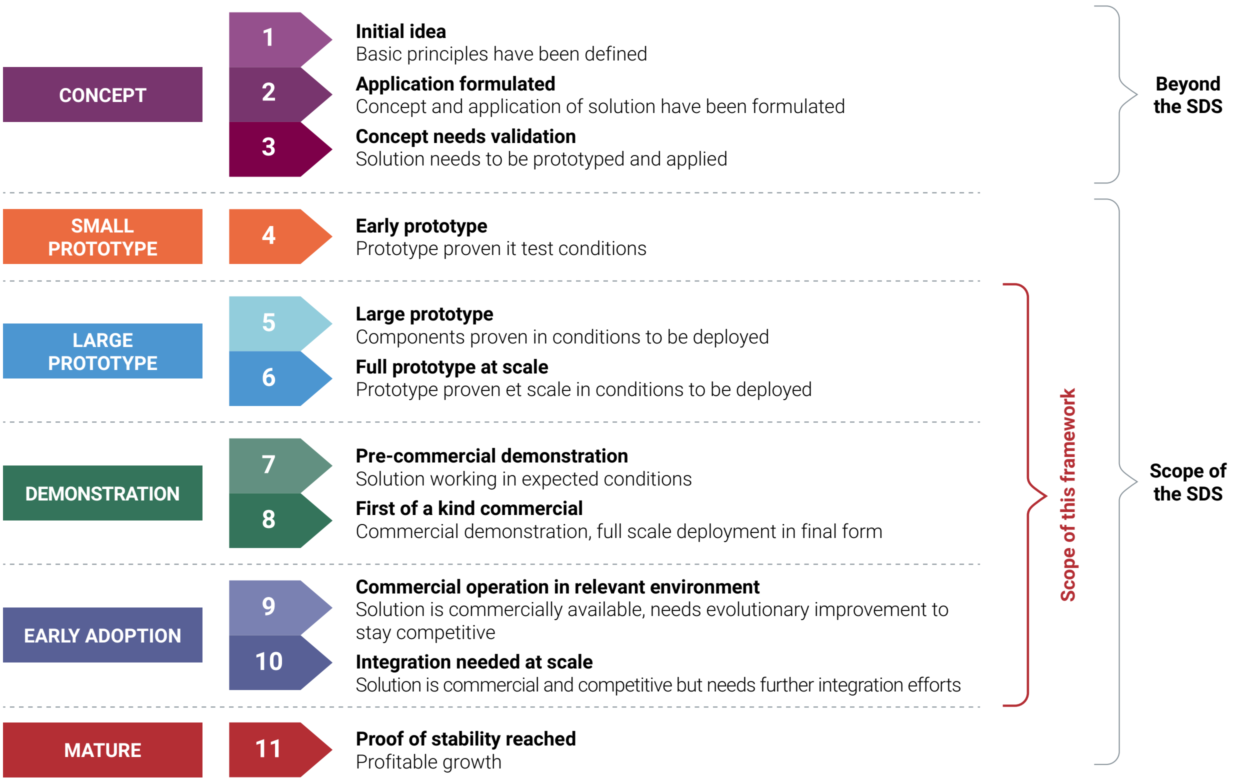
ANNEX 1 – TECHNOLOGY READINESS LEVEL SCALE APPLIED BY THE IEA

To measure the maturity of any given technology, we have adopted the Technology Readiness Level (TRL) scale by the IEA. This scale has been introduced in IEA "Innovation Gaps" report (IEA, 2019) and used subsequently to identify "Innovation needs in the Sustainable Development Scenario" (IEA, 2020). In (IEA, 2019) innovation challenges (or gaps) "that need to be overcome to reach the level of performance or deployment of a technology necessary to reach the Sustainable Development Scenario", were identified. The existing gaps are "ranked along an extended TRL scale, that goes from the concept stage to scaling up the technology solution". The Technology Readiness Level scale has the following steps:

1. **Initial idea**: basic principles have been defined
2. **Application formulated**: concept and application of solution have been formulated
3. **Concept needs validation**: solution needs to be prototyped and applied
4. **Early prototype**: prototype proven in test conditions
5. **Large prototype**: components proven in conditions to be deployed
6. **Full prototype at scale**: prototype proven at scale in conditions to be deployed
7. **Pre-commercial demonstration**: solution working in expected conditions
8. **First-of-a-kind commercial**: commercial demonstration, full-scale deployment in final form
9. **Commercial operation in relevant environment**: solution is commercially available, needs evolutionary improvement to stay competitive
10. **Integration at scale**: solution is commercial but needs further integration efforts
11. **Proof of stability**: predictable growth

Figure A1.1: Technology readiness level scale applied by the IEA



Source: IEA, 2020

In the ECT Framework, when talking of emerging climate technologies, we refer to technologies in **stages 5 to 10** of the IEA scale.

References

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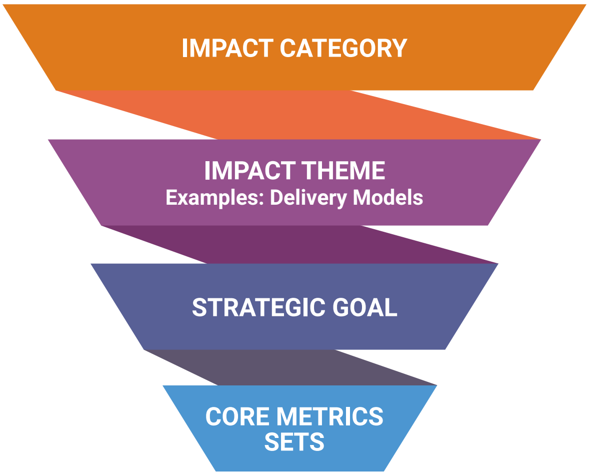
ANNEX 2 – APPLICATION OF IRIS + FRAMEWORK

This Annex presents how the IRIS+ Framework can be applied by an investment fund seeking to accelerate technology deployment in accordance with this framework.

Figure A2.1: Illustration of classification hierarchy[20]



The IRIS Framework has a complete taxonomy articulating Impact categories, impact themes, strategic goals and core metric sets, which can be used and referenced in setting impact metrics. Impact categories align with generally accepted industrial classification schemes and the impact categories which this framework focuses on is "Climate". Impact themes "help describe a purpose-driven approach to contributing to social or environmental impact within a broader Impact Category. Each theme is based on macroeconomic topics or trends that investors can use to identify and assess investment opportunities and that enterprises can use to frame and communicate their work". In the Climate category Impact Themes include "Climate Change Mitigation" and "Climate Resilience and Adaptation" — technological investments can fit in one or both themes. Strategic goals include common strategies impact investors deploy to achieve social or environmental impact objectives and include things such as mitigation of climate change through: clean mobility; clean energy and heat production; sustainable manufacturing; sustainable agriculture; carbon capture and sequestration.

Please note that this framework is proposing a new strategic goal of "accelerating the deployment of emerging climate technologies" with its own theory of change and that this strategic goal does not currently exist within the IRIS+ and overlaps with others in the IRIS+ Taxonomy. For example, investments in SAF technology can accelerate the deployment of SAF capacity as well as contributing to "Climate Change Mitigation through clean mobility". In this case, the IRIS+ Framework already provides a core set of metrics that should be referenced by the investors for measuring their impact. The technology specific methodologies should include references to these links. An example is provided below of some of the metrics proposed in IRIS+ for "Climate Change Mitigation through clean mobility".

20 https://s3.amazonaws.com/giin-web-assets/iris/assets/files/iris/2021-05-27_IRIS-FND_Taxonomy-Final-R3.pdf

Table A2.1: Example of IRIS+ metrics for “Climate Change Mitigation through clean mobility”

Core Metric Set		
Key question	Key contribution	
WHAT is the goal?	Objective of intervention	Why is this important? To clarify the objective to be achieved with the investment or enterprise in order to be able to measure progress towards that goal. Strategic Goal: Mitigating Climate Change Through Clean Mobility Outcome: Reduced GHG emissions, measured by Greenhouse Gas Emissions Avoided or Reduced (PI2764)
	Outcome indicator	Why is this important? To understand the key indicator that will be used to measure the outcome, which is a critical step in measuring progress toward the Strategic Goal. IRIS DATA NEEDED: Greenhouse Gas Emissions Avoided or Reduced PI2764 FORMULA / CALCULATION GUIDANCE: Calculate the amount of greenhouse gas (GHG) emissions avoided or reduced during the reporting period, along with a threshold and baseline number for comparison, using the following steps: 1. Identify the threshold for the amount of Greenhouse Gas Emissions Avoided or Reduced (PI2764). The threshold is a number at which outcomes are "good enough" or meet a minimum acceptable standard. Thresholds may reflect industry standards or peer benchmarks. 2. Identify the baseline for the amount of Greenhouse Gas Emissions Avoided or Reduced (PI2764). The baseline is the amount of Greenhouse Gas Emissions Avoided or Reduced (PI2764) in the prior period. 3. Identify the amount of Greenhouse Gas Emissions Avoided or Reduced (PI2764) during the reporting period. Notes: 1) See metric usage guidance in Greenhouse Gas Emissions Avoided or Reduced (PI2764) for details on calculation andrelated usage guidance. 2) The threshold and baseline calculated can help to understand current performance against industry benchmarks and your own past performance. Level of outcome (both for baseline and for current period) for the target stakeholder group must be noted, as must threshold (outcome objective level) must also be noted. For more on thresholds, see the Impact Management Project. 3) Organizations may find WRI's Estimating and Reporting Avoided Emissions and the GHG Protocol for Project Accounting helpful in calculating this metric.
	Importance to stakeholder	Why is this important? To understand the extent to which impact and value are created, identify the risk of negative impact and unintended outcomes, and uncover ways of maximizing social and environmental value creation. This metric may also uncover other effects or outcomes that target stakeholders perceive. IRIS DATA NEEDED: Importance of Outcome to Stakeholders (OI5495). FORMULA / CALCULATION GUIDANCE: Describe the value or importance of the outcome being sought by the intervention or investment from the perspective of those affected. Note: GHG emissions have global-scale impact, and so in this strategic goals, organizations should rely on scientific evidence to determine the importance of reducing greenhouse gas emissions to people and planet. Some of this guidance can be found in the Overview section of this Strategic Goal.

<table>
<tr><th colspan="3">Core Metric Set</th></tr>
<tr><th>Key question</th><th>Key contribution</th><th></th></tr>
<tr><td>WHO is affected?</td><td colspan="2">Because the intended effects of climate change mitigation efforts are effectively global for both people and planet, there is no specific "WHO" for this Strategic Goal. Organizations who wish to specify a particular target stakeholder may do so with the following metrics: 1) Organizations should use the following metrics for both social and environmental stakeholders: Target Stakeholders (OD7212), Target Stakeholder Setting (PD6384), and Target Stakeholder Geography (PD6424). 2) If the project has a focus on people, organizations are encouraged to additionally use Target Stakeholder Demographic (PD5752) and Target Stakeholder Socioeconomics (PD2541). 3) If the project has a focus on planet, organizations are encouraged to additionally use Target Area Ecoregion (PD2854) and Target Area Protected Status (PD1676).</td></tr>
<tr><td rowspan="2">HOW MUCH change is happening?</td><td>Scale</td><td>KEY INDICATORS: Total greenhouse gas (GHG) emissions avoided and reduced

Why is this important? To understand the scale of greenhouse gas emissions avoidance and reductions.

IRIS DATA NEEDED: Greenhouse Gas Emissions Avoided or Reduced (PI2764)

FORMULA / CALCULATION GUIDANCE: Identify the amount of Greenhouse Gas Emissions Avoided or Reduced (PI2764) during the reporting period.

Notes: 1) Because the intended effects of climate change mitigation efforts are effectively global for both people and planet, there is no specific "WHO" for this Strategic Goal, and therefore no project-level "HOW MUCH: Scale" calculation (as the HOW MUCH: Scale calculation generally focuses on how many stakeholders are experiencing the outcome). Instead, organizations are encouraged to calculate their total GHG emissions avoidance and reduction in relation to the total GHG emissions produced within their sector per year. 2) See metric usage guidance in Greenhouse Gas Emissions Avoided or Reduced (PI2764) for details on calculation and related usage guidance. 3) Organizations may find WRI's Estimating and Reporting Avoided Emissions and the GHG Protocol for Project Accounting helpful in calculating this metric.</td></tr>
<tr><td>Depth</td><td>KEY INDICATORS: Percent change in Greenhouse Gas Emissions Avoided or Reduced

Why is this important? To understand the extent of change in outcome being experienced by people and planet.

IRIS DATA NEEDED: Greenhouse Gas Emissions Avoided or Reduced (PI2764)

FORMULA / CALCULATION GUIDANCE: Calculate the amount of greenhouse gas (GHG) emissions avoided and reduced between the prior and reporting periods using the following steps: 1) Calculate the Greenhouse Gas Emissions Avoided or Reduced (PI2764) in the prior period. 2) Calculate the Greenhouse Gas Emissions Avoided or Reduced (PI2764) in the reporting period. 3) Calculate the percent change in Greenhouse Gas Emissions Avoided or Reduced (PI2764) between the prior and current reporting periods: (Greenhouse Gas Emissions Avoided or Reduced [PI2764] in the reporting period - Greenhouse Gas Emissions Avoided or Reduced [PI2764] in the prior period) / Greenhouse Gas Emissions Avoided or Reduced (PI2764) in the prior period x 100

Notes: This measure should include greenhouse gas emissions reductions from direct and indirect sources (Scopes 1-3). Organizations may find The GHG Protocol for Project Accounting helpful in calculating this metric.</td></tr>
</table>

Core Metric Set	
Key question	**Key contribution**
What is the CONTRIBUTION?	As noted by the Impact Management Project, investors can use a range of strategies to contribute to impact, often in combination: 1) Signal that measurable impact matters; 2) Engage actively; 3) Grow new or undersupplied capital markets; 4) Provide flexible capital. For further details refer to How Investors Manage Impact.
What is the impact RISK?	Risk factors for investments aiming to reduce greenhouse gas (GHG) emissions by offering affordable and equitable climate-friendly modes of transportation for both passengers and goods include: Execution Risk: Often, time-consuming, capital-intensive research and technology will be needed to electrify the transportation system. Investees working on advanced battery technology, researching alternative fuels, developing software and hardware for autonomous vehicles, or experimenting with more efficient materials and processes for manufacturing electric vehicles may not show immediate positive results. This risks loss of investor confidence and capital, abruptly stalling such critical initiatives. External Risk: Investments in this Strategic Goal face External Risk from policy and supply chains. In terms of policy, the regulatory landscape is a significant risk factor in expanding clean mobility. So far, government policy action has been insufficient to achieve commitments made under the Paris Agreement. A policy landscape advantageous to clean mobility could include a tax or price on GHG emissions and tightened regulations on fuel efficiency for passenger and commercial vehicles. On the other hand, policies that reduce subsidies or eliminate tax credits before clean transport becomes commercially viable can adversely impact transition timelines. Stakeholder Participation Risk: Electric vehicle (EV) infrastructure is expensive to build, and some investors are reluctant to commit capital to a small market. Investors are often left without a clear way to prioritize within their portfolios between the cars themselves, charging stations, or other elements of infrastructure critical to making electric vehicles a more widely used technology. Lack of regulation, planning, and coordination at the city, regional, and national levels can hinder the deployment EV infrastructure at scale. Endurance Risk: Global economic uncertainty and volatile (lower) oil prices are bad news for an electrified transportation system, making electric vehicles and alternative fuels less competitive and lengthening the transition towards clean mobility.
Additional Metrics, for high-level understanding of other effects (including other stakeholder groups)	
	- Greenhouse gas emissions of product compared to product replaced - Greenhouse gas emissions reduction strategy - Greenhouse gas types - Sources of greenhouse gas emissions mitigation - Social and environmental targets - Number of passengers - Passenger injuries and fatalities - Passenger satisfaction - Quality of service for passengers - Average speed of vehicles - Average daily traffic (vehicles per day) - Length of roadway built or improved - Amount of freight handled - Amount of cargo handled - Cargo and passenger wait time - Percent of revenue generated from socially and environmentally positive products and services

In addition to the IRIS+ metrics - when they have been defined – the investor shall consider the metrics of the strategic goal proposed in the ECT Framework and detailed, using the IRIS+ Framework structure, in the table below. Please note that the metrics are not IRIS+ catalogue metrics, but merely a proposed mapping of the ECT Framework metrics to IRIS+.

Table 2.2: Mapping of the ECT Framework metrics to IRIS+

Key question	Key contribution	IRIS data needed		Application to fund
		IRIS metric code	IRIS metric name	
WHAT is the goal?	Objective of intervention	Accelerating emerging climate technologies deployment in comparison to reference deployment. Outcome: accelerated deployment of emerging climate technologies measured as reductions in the Green Premium of the technology goods and services		For each project the fund should assess to what degree it contributes to accelerate further investments or market adoption of a climate technology. These investments will generate avoided emissions in the future and help meet Paris goals, the purpose is to accelerate that avoidance.
	Outcome indicator	-	Reduction of Green Premium – an expected consequence of acceleration, is a faster reduction of the Green Premium of goods and services associated with the climate technologies.	Green Premium reductions are a significant contribution to the scaling of emerging climate solutions, as they drive further climate adoption (positive feedback loops) and increase the attractiveness of investing in such solutions. Investments that do not lead to Green Premium reductions, will not lead to the desired acceleration effect.
	Importance of stakeholder	OI5495	Importance of outcome to stakeholder	Very important. To meet Paris goals 58% of emissions reduction connected to energy are reliant on technologies that are in the early adoption of demonstration phase (IEA, 2020). A significant number of sectors will rely in 10 to 15 years time on these technologies to structurally reduce their emissions. If these technologies are not deployed and brought to compete in cost with fossil competitors, decarbonization targets will be at risk.
WHO is affected?	Because the intended effects of climate change mitigation efforts are effectively global for both people and planet, there is no specific "WHO" for this Strategic Goal. Organizations who wish to specify a particular target stakeholder may do so with the following metrics: ◥ Organizations should use the following metrics for both social and environmental stakeholders: Target Stakeholders (OD7212), Target Stakeholder Setting (PD6384), and Target Stakeholder Geography (PD6424). ◥ If the project has a focus on people, organizations are encouraged to additionally use Target Stakeholder Demographic (PD5752) and Target Stakeholder Socioeconomics (PD2541). ◥ If the project has a focus on planet, organizations are encouraged to additionally use Target Area Ecoregion (PD2854) and Target Area Protected Status (PD1676).			
HOW MUCH change is happening?	Scale	PI2764	Total greenhouse gas (GHG) emissions avoided and reduced.	This metric can be calculated ex-ante (at fund level and for a given allocation mix of investments) and ex-post (at project level and in accordance to fund contribution). Calculations will generically follow the Avoided Emission Framework Methodology.
	Depth	-	Catalyzed Emissions Reductions.	This metric can be calculated ex-ante (at fund level and for a given allocation mix of investments), as well as monitored ex-post. The ex-post monitoring can be used as a metric of how much change is happening.
		-	Reduction of Green Premium.	Reduction of Green Premium can tell us how much the final prices of alternative products or services are starting to be competitive with their fossil counterparts.
What is the Investee CONTRIBUTION?	Investee contribution	-	(As a minimum, all the indicators referred to here, with exception of Green Premium).	Investees should monitor the core impact metrics required at fund level. The fund should engage with investees requiring the regular monitoring of these impact metrics and the importance of measuring them.
		FP9049	Cost of Goods Sold: Value of direct expenditures attributable to the production of the goods sold by the organization during the reporting period.	Instead of Green Premium investees should report data used for the calculation of Green Premium such as cost and price data.
		PI7643	Purchase Price of Product or Service Sold	Instead of Green Premium investees should report data used for the calculation of Green Premium such as price data.
	Investor contribution	-	Signal that measurable impact matters.	Funds should engage with their investees and require minimum reporting obligations related to the measurement of impact and appropriately direct the investee strategy decisions in order to strengthen their impact.
		-	Engage actively.	Funds should engage with their investees and require minimum reporting obligations related to the measurement of impact and appropriately direct the investee strategy decisions in order to strengthen their impact.
		-	Grow new or undersupplied capital markets: Direct Paris-aligned finance.	This framework is applicable while there is a clear need and undersupply of finance and investments can be considered "catalytic". Once the technology costs, business model and markets have been established, finance is expected to normally flow to this type of investments.
		-	Grow new or undersupplied capital markets: Catalyzed Paris-aligned finance.	While investments are catalytic, the funds can also quantify the leveraged capital (other capital contributions to the investments in which they participate) as a metric.
		-	Provide flexible capital: Types of capital provided.	Different types of capital have different catalytic impacts, and this is a key aspect of this framework. This is discussed in the attribution chapter.
What is the impact RISK?		-	Technology risk and investee risk.	To address financial and sustainability risks, all funds should publish a clear risk assessment, risk management and risk communication policy for the investments they do. Specific investments should be screened on specific sustainability principles (see corresponding Annex) before investment decisions are made.
		-	Uncertainty of impacts.	There is a risk that the impact metrics may be under- or over-estimated. This risk shall be mitigated by transparency around methodology (embracing improvement suggestions), implementing a continuous improvement policy, consulting with the EAG and public consulting on methodologies, as well as working with investees to collect market data to understand ex-post the impact of investments and by calculating estimate risk at fund level (more diversification, less risk).

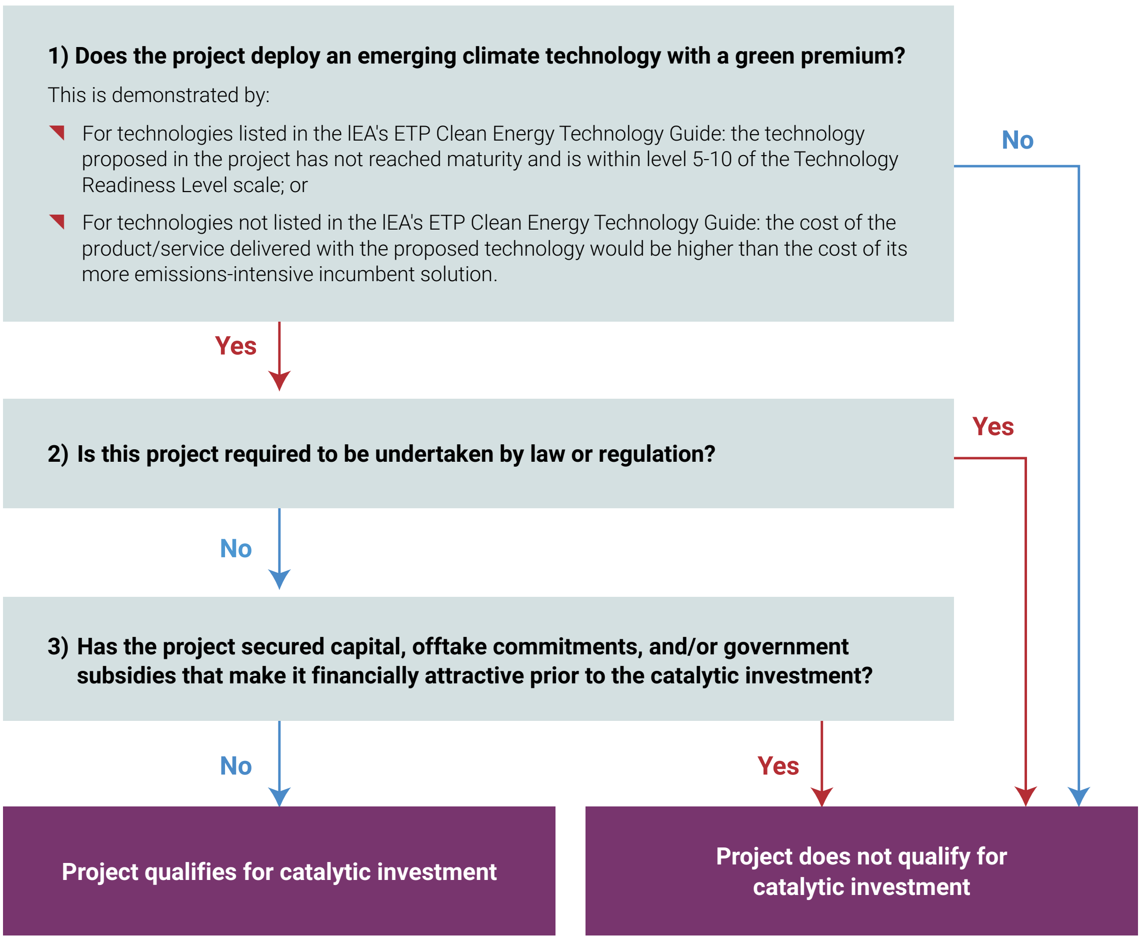
References

IRIS+ System, https://iris.thegiin.org/fundamentals-and-core-concepts/; IEA (2020); "Clean Energy Innovation.", IEA, Paris. Available at: https://www.iea.org/reports/clean-energy-innovation

ANNEX 3 – ASSESSING ELIGIBILITY OF PROJECTS FOR ECT FRAMEWORK FUNDING

For an investment to have impact, it must provide additionality: it must increase the quantity or quality of the social or environmental outcome beyond what would otherwise have occurred. In the context of ECT Framework, this is stipulated by applicability criterion 3: the investment should accelerate the deployment of a technology beyond what would be expected in a reference uptake scenario. This stepwise approach builds on the UNFCCC CDM Methodological Tool for the demonstration and assessment of additionality and helps to determine which projects qualify for ECT Framework funding and recognition.

Figure A3.1: Eligibility assessment flowchart



Notes:

Step 1 assumes that deploying an emerging climate technology in a project faces barriers (e.g. investment, technological or barriers due to prevailing practice) that would prevent the implementation of the proposed project activity without catalytic investment.

Step 2 ensures that the proposed project is not the only alternative that follows mandatory regulations.

Step 3 ensures that the existing barrier is not eliminated through growing demand on the market (e.g. secured capital or offtake guarantees) and/or any subsidies/fiscal incentives to less emissions-intensive technologies over more emissions-intensive technologies. Assessment should be carried out in line with Step 2: Investment analysis of the CDM Methodological Tool for the demonstration and assessment of additionality.

ANNEX 4 – IMPACT METRICS METHODOLOGIES

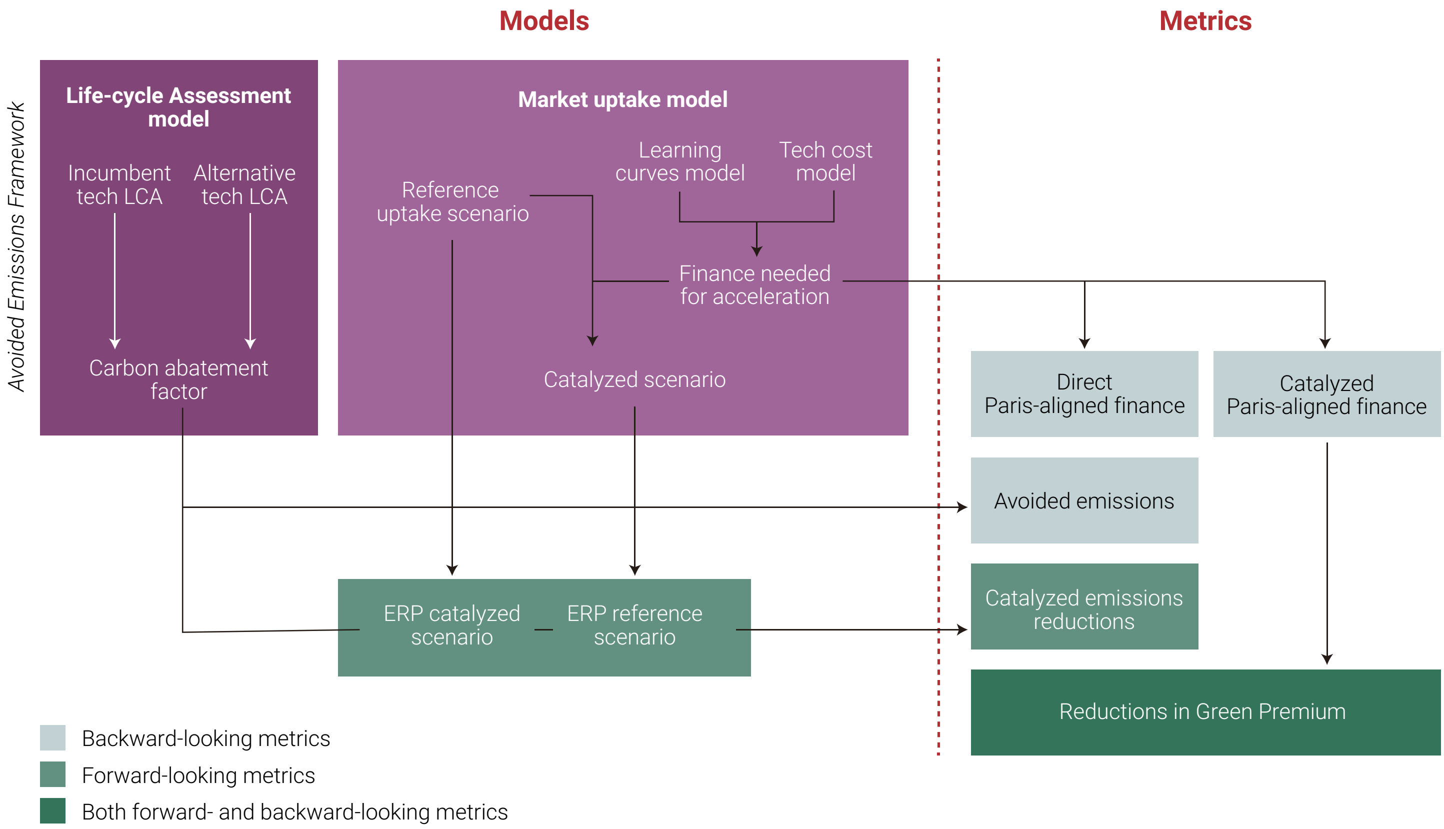
4.1 - Introduction

This Annex details the different methodologies that are used to estimate the key impact metrics required by the ECT Framework. The methodologies are generically described and will require further specification at technology and asset level.

Specification of the methodologies is needed for forward-looking estimates at technology level — emission factors, market sizes, and market dynamics must be specified. Further specification is required of the technology level methodologies to asset-level for the ex-post monitoring of the impact metrics.

Some of the metrics are linked and are needed as inputs to calculate other metrics. Figure A4.1 presents a diagram of the key components of each of the models and how they are linked to create the metrics.

Figure A4.1: Diagram showing how the different variables and methodologies are linked to create specific metrics at technology level



Backward-looking metrics are: Direct Paris-aligned finance, Catalyzed Paris aligned finance and Avoided emissions. Forward-looking metrics comprise Emission Reduction Potential and Catalyzed emissions reductions. Projection of reduction in Green Premium is a forward-looking metric. Green Premium is also used as a backward-looking metric. The backward-looking Green Premium is a system level metric proposed to monitor if the goal of acceleration and achieving technology cost reductions, contributing for the technology to become financially viable without concessional finance, is being achieved or not. Table A4.1 presents the metrics and how they are classified as backward or forward-looking as well as organizational/project focused.

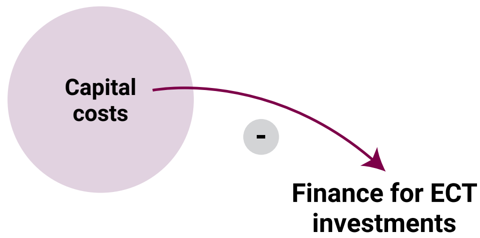
Table A4.1: Classification of impact metrics as backward- or forward-looking and project- or technology-focused

Metric	Backward-looking	Forward-looking	Project-level	Technology-level
Direct Paris-aligned finance	✓		✓	
Catalyzed Paris-aligned finance	✓		✓	
Emission Reduction Potential		✓	✓	✓
Avoided Emissions	✓		✓	
Catalyzed Emissions Reductions		✓		✓
Green Premium	✓	✓		✓

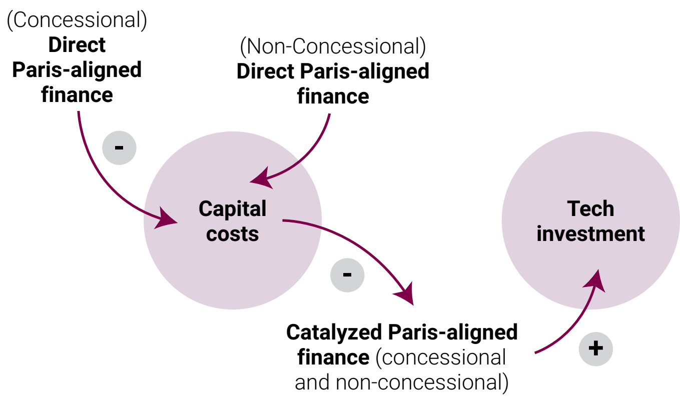
The overall simplified theory of change can be explained as follows:

A. Financing dynamics:

1. With no intervention, ECT will face high capital costs due to inherent technology and business risks; the higher capital costs imply less money flows to deploy the technology and the deployment curve moves slow;



2. Mobilizing concessional Paris-aligned finance to invest in ECT will decrease capital cost in relation to the reference case of non-concessional investments (blended finance) and this increases the volumes of money available to create “investment peaks”;

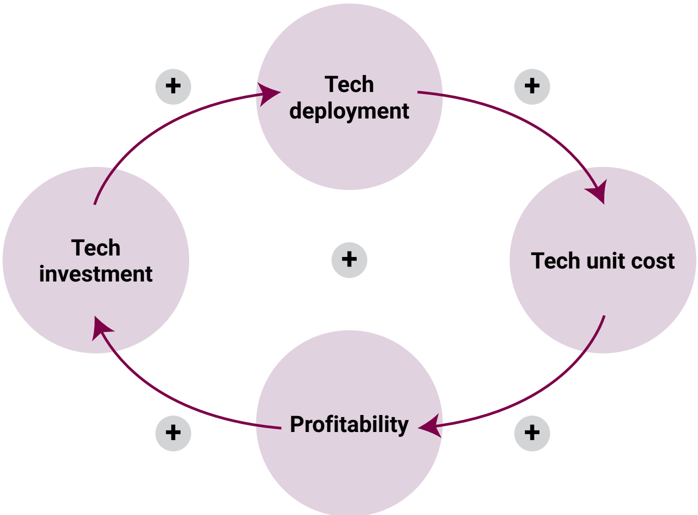


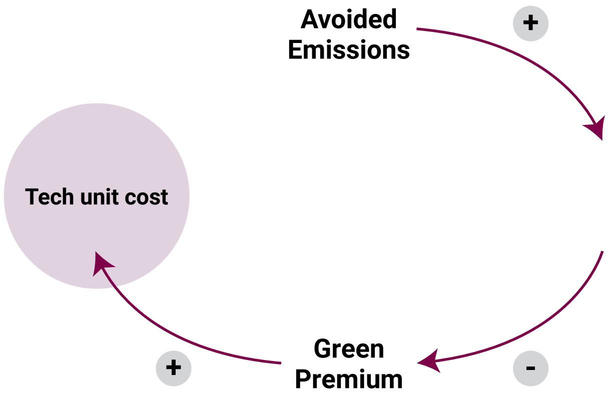
3. Investments peaks aim to activate ECT deployment dynamics (see p.43), leading to an acceleration of the deployment curve;

B. ECT deployment dynamic:

4. The more we invest in each technology, the more it will be deployed and the more it is deployed the more the unit costs of the unitary technology costs are reduced; if cost reduce, profits, sales or both should increase and overall profitability increases, which should attract more investors (if technology succeeds);

5. If technology costs and the Green Premium decrease, then there should be increased demand for ECT products. This increased demand results in more avoided emissions. The acceleration of the avoided emissions achieved by the technology deployment, are called catalyzed emission reductions.





The metrics proposed measure both individual actions — or inputs like Direct Paris-aligned finance into ECT project investments, which can be taken as proxies of impact — as well as system-level impacts — like Green Premium reductions and Catalyzed Emission Reductions. Due to the complexity of the economic system, many things happen between actions or inputs (such as Direct Paris-aligned finance) and final measurable system-level impacts (such as the Green Premium reduction and CatER). As such, the exact attribution cannot be done and results depend on assumptions and are inherently uncertain. The attribution of impacts across a given emerging climate technology value chain is not considered within the Framework. For example, positive impacts derived from bringing green hydrogen into the marketplace for transportation purposes, are credited to investors of hydrogen electrolyzer projects, although it is clear that infrastructure projects will also be needed to produce storage and distribution facilities, as well as a range of other technologies that will facilitate hydrogen vehicle use[21].

21 Although this challenge was discussed within the project team they were considered too intractable to address in a timely manner within the project time-frame. For this reason, the way to address this issue is to assume that double counting and double claiming of impacts can occur, but that this need to be completely separated from attributional footprints.

4.2 - Reference uptake scenario

The reference uptake scenario is a key component of the Emissions Reduction Potential, Green Premium and Catalyzed Emissions Reductions (CatER) metric calculations. As such, it is described as a separate and distinct element, despite not being an impact metric.

Defining the reference uptake scenario

One of the key questions is how to consider the role of current and future policies into the scenario. The following options are defined as a starting point for discussion:

1. Low-uptake scenario: current deployment reflects current policies, but these are insufficient to meet Paris-agreement goals. In this case, non-mature technology deployment might be delayed by several decades until the second half of the century and its deployment rates in next 30 years are negligible.
2. Middle-of-the-road scenario: policy drivers have a significant influence in driving the energy transition (e.g. Rao and Kishore, 2009) and the uptake of non-mature technologies, as well as voluntary action by companies and investors, even when not directly designed for that purpose. Climate policy and policy designed specifically for the deployment and uptake of non-mature technologies will only increase at accelerating pace in the following decades. The future pathway is likely to be a combination of the current insufficient policies forecasted to reach 3 to 4°C and the aspirational scenario that meet 1.5°C.
3. Paris-compliant scenario: given increasing social pressure to address climate change, governments will implement aggressive climate policies in line with some of the most ambitious transition scenarios, e.g. IEA Net-zero scenario or P1 type of scenarios that reach 1.5°C.

The reference uptake scenario is constructed as a middle-way scenario between a fully compliant and ambitious scenario to meet 1.5°C and a current policy scenario, heading to 3 to 4°C. In the initial application, the reference scenario is constructed from the IEA Net Zero by 2050 (NZE) (IEA, 2021). To achieve a middle-way scenario, the 2050 NZE capacity and carbon price is shifted to 2095, with interim deployment estimates also shifted based on the U.S. Interagency Working Group Social Cost on social cost of Carbon[22] as interim carbon prices. The reference uptake scenario is then accelerated by a certain amount of time by catalytic investments.

The method described in the previous paragraph yields only four penetration point estimates per technology pathway. To estimate impacts of investments on the baseline for every year between now and 2050, a Bass diffusion curve can be applied to the market penetration point estimates.

Linking the reference uptake curve and the learning curve

The reference uptake curve describes the uptake of the climate technology in the economy through time for a given scenario. The curve assumes a series of policies and incentives. It is possible to link the market uptake and the learning curve through the learning rate, which is a constant that is integral to both models.

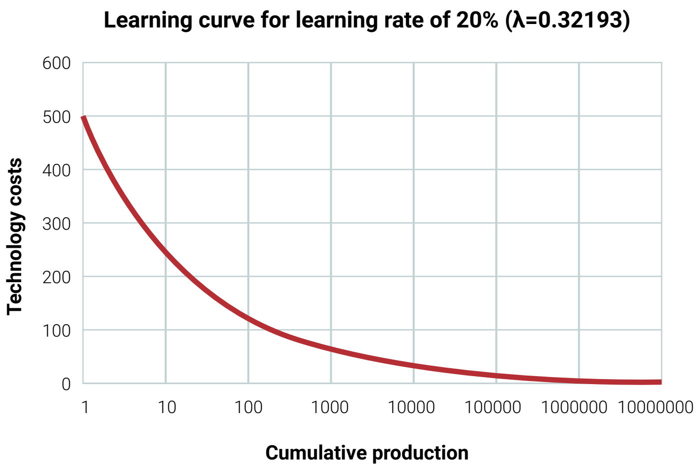
Learning curves relate historically observed reductions in the cost of a technology to the cumulative capacity installed or the cumulative number of units produced/ sold[23]. They have been widely adopted to analyze the technological progress of technologies, from airframes (Wright, 1936), shipbuilding (Rapping, 1965) to renewable energy technologies (e.g. Rubin *et al.*, 2015). Figure A4.2 shows a learning curve with a learning rate of 20%[24]. Learning curves have been established in many empirical studies and "illustrate the benefit of early investment and policy interventions in emerging technologies as well as the need for an initial market in order to allow emerging technologies to accelerate their cost reductions and reach cost competitiveness with existing technologies in the market earlier" (Wiesenthal *et al.*, 2012).

22 Technical Support Document: Social Cost of Carbon, Methane, (whitehouse.gov)

23 Different explanatory variables are possible, with learning curves having been built against time (Moore's law), cumulative production, annual production, or capacity. To the extent all these variables are interlinked it is possible to transform the expression to incorporate different explanatory variables

24 Learning index and leaning rates are related in the following way: $\lambda = \ln(1\text{-}LR)/\ln(2)$

Figure A4.2: Learning curve showing the technology cost plotted vs. cumulative production for a learning rate of 20%



The governing equation for the learning curve is:

$$C = a[\,Q_t\,]^{-\lambda}$$

The learning rate, λ, in the learning curve is the same as that from the Bass diffusion equation, and thus connects cost declines with market adoption. The learning curve equation constant, a, can be interpreted as a "first unit cost" that is solved for with known pairs of cost and quantity. To apply the learning curve model parameter a needs to be estimated, usually form engineering and financial models estimating CAPEX required to build the first units or from real project data.

For every increase in capacity described by the reference uptake scenario, a certain investment amount as well as technology cost reduction can be derived. The learning curve can be expressed in terms of Cumulative installed capacity (or annual production) Q_t and levelized technology costs (instead of MC)

Most relevant, the amount of new capacity that is added each year $\frac{\Delta Q_t}{\Delta t}$ is a function of the Investment in that year $I_{\Delta t}$, or the investment flow *i* during the period Δt

$$\frac{\Delta Q_t}{\Delta t} = f(\,I_{\Delta t}\,) = f(\,i.\Delta t\,)$$

and we can substitute cumulative capacity Q_t by cumulative investment

$$C = B[\,I_t\,]^{-\lambda}$$

Where I_t is cumulative investment at time t and B is a constant that reflects how much capacity can be built per unit of CAPEX. The catalytic effect is related with effectively running the clock faster by increasing investment flows, forcing the technology cost reduction in the learning curve model to "run faster".

To recap: based on learning curves that relate Marginal Cost of production (or Levelized Technology Costs) to cumulative production (or production capacity) one can plot cumulative capacity changes and derive a certain investment flows. Thus, an investment flow curve can be calculated, that relates technology costs to cumulative investments. The key assumption here is that we can effectively substitute time for investment and the clock can run faster, by increasing investment flows.

With the baseline technology diffusion scenario, a "baseline investment" scenario can be derived. The catalytic investment scenario is established by providing "shots" of investments. These shots of investment basically cause an acceleration along the learning curve.

To recognize that not all of a given investment will be directly translated into learning in the market, we apply the concept of convex costs of adjustment (Hayashi, 1982). For investments made at a pace of $500 million over two years, we assume an efficiency of investment of 70%, meaning that we assume 70% of that investment is expected to translate into market-wide learning. Investments of larger amounts per year are relatively less effective, following a convex function defined by:

$$\frac{\text{Initial cost per unit}}{\left(\text{Initial cost per unit} + \text{Investment amount} * \frac{\alpha}{\text{Initial capacity}}\right)}$$

Where alpha (α) is an arbitrary parameter used to calibrate efficacy. In our case α is used to calibrate the efficacy of investments such that an investment of $500 million over two years yields an efficacy of 70%.

In this case, the cumulative investment function is transformed to

$$C = B[\,0.7 * I_t\,]^{-\lambda}$$

The investment efficacy will decrease below 70% as capital investment increases to higher than a pace of $500 million over two years.

Limitations of the model

Energy system models and scenarios derived from them are key research tools to understand the transition and the necessary changes that need to occur at system level to reach certain goals. However, scenarios are not predictions about the future but are rather a description of possible futures and potential causes and consequences of that future. By relying on scenarios to measure the acceleration effects the measurement is uncertain – although it can give the impression of being precise. For this reason, multiple middle-of-the-road scenarios should be assessed and evaluated, to understand the impacts of future randomness on forward-looking indicators.

Furthermore, market uptake parameters and learning rates are difficult to estimate, namely (Wiesenthal *et al.*, 2012):

- Learning rates vary significantly across various studies and data sets;
- Calculating learning rates from historical data has several methodological problems: it is possible to calculate different learning rates by changing the starting and ending point of the analysis and the choice of including or excluding outliers; this results that the calculation of learning rates for individual energy technologies shows a distribution of learning rates within a single technology that is nearly as broad as that across technologies (McDonald and Schrattenholzer, 2001);
- It is difficult to determine if a learning rate is representative and there are practical challenges in their calculation namely difficulty in accessing market data such as technology costs, technology configuration, installed capacities, etc., as usually considered business sensitive information;
- It is challenging to distinguish the effects of learning from other factors, e.g. economies of scale;
- Learning rates might vary with time and can vary significantly;
- Learning rates might vary geographically and is unclear if they are global phenomena or if different regions learn at different rates.

In addition, the parameter used to recognize the efficacy of investment is based on expert judgement and its value is uncertain.

Finally, the entire Framework assumes that "reaching net-zero emissions will require the widespread use after 2030 of technologies that are still under development today" (IEA, 2021). However, other independent research groups researching possible transitions to net-zero do not necessarily reach this conclusion and instead independently conclude that by scaling up existing technologies, to end emission sources and strengthen natural carbon sinks, Net Zero could be reached by 2040 or earlier. This includes roadmaps and research such as Project Drawdown (2017) and its review (2020), project One Earth (2019), Carbon Tracker's 7 feedback loops (2021), several peer-reviewed articles (e.g., Jackobson *et al*, 2009 and 2017) and The Global 100% Renewable Energy Strategy Group Declaration" co-signed by 46 researchers (2021). The purpose here is not to go into controversies about the possibility or not of 100% renewables for the entire energy system across all sectors. Instead, we acknowledge that the Framework is based on an assumption about the future — which is that new energy technologies that are not yet mature will be needed to fully decarbonize — but that others might have a different view about how the future should or is likely to evolve.

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4.3 - Avoided Emissions and Emissions Reduction Potential (ERP)

In this annex, we start by drawing a distinction between "Avoided Emissions" and "Emissions Reduction Potential" (or Potential Avoided Emissions) and then detail how the Avoided Emissions Framework (AEF) (Mission Innovation, 2020) can be applied to produce both.

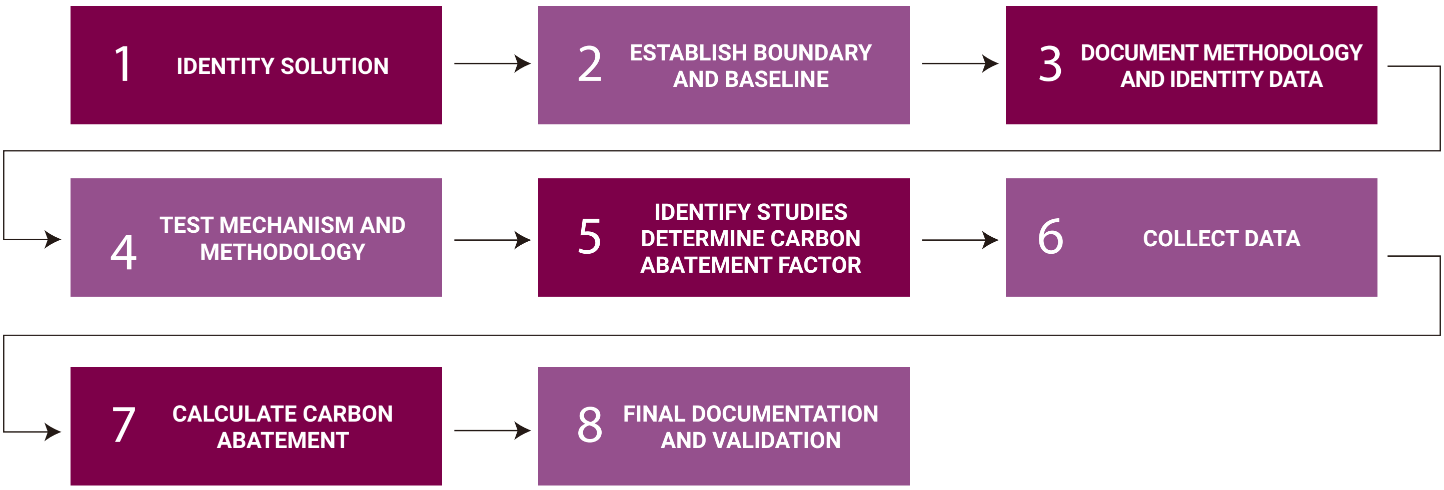
Conceptually, avoided emissions (or emission reductions measured against an agreed baseline) appear when a solution (product or service) enables the same function to be performed with significantly less GHG emissions. The method of measuring avoided emissions is to compare a baseline scenario without the enabling solution with a scenario using the enabling solution, where the baseline represents the 'Business as Usual' (BAU) scenario" (Mission Innovation, 2020). Historically, this concept has been applied in the Clean Development Mechanism to generate "Certified Emission Reductions" (CERs), where these types of credits were issued based on the monitoring of projects that had the potential to generate emission reductions compared to a given pre-established and pre-agreed baseline. In this way, we can link -avoided emissions"-to an ex-post measurement of a given activity that reduces emissions compared to a baseline.

Emissions Reduction Potential is an ex-ante estimate of the potential to mitigate greenhouse gas emissions of a given investment (Prime and NYSERDA, 2017), activity, product or service. This concept is equal to the quantification of avoided emissions[25] but is done as a forward-looking estimate. It has been thoroughly characterized in the context of emerging climate technologies by Mission Innovation(2020)[26].

For this reason, the ECT Framework has adopted the AEF as the guidelines to estimate Avoided Emissions[27] and thus, also, Potential Avoided Emissions. In the following we describe briefly the methodology proposed in the AEF. Funds wishing to estimate Avoided Emissions as well as Emissions Reduction Potential should use the AEF as the starting point for specifying their methodologies. Additional requirements on how to apply AEF, specifically requirements about the potential market adoption of a specific technological solution, are set in the Catalyzed Emissions Reduction section.

The steps to quantify avoided emissions are shown in Figure A4.3 (Mission Innovation, 2020) and the subsequent paragraphs detail any requirements and conditions for each step. These methodologies can be generically applied to pre-selected investable "technological solutions", as well as to specific projects/ investees in which the fund invest. Nevertheless, the type, detail and quality of information that needs to be used for each purpose might differ.

Figure A4.3: Steps for quantifying Avoided Emissions, according to Mission Innovation (2020)



25 For the use of Potential Avoided Emissions terminology see for example e.g. Zhai *et al.*, 2012; Vontobel, 2018; and Mission Innovation, 2020.

26 Mission Innovation is an initiative led by "The Research Institutes of Sweden (RISE) together with the Swedish Energy Authority, the Carbon Trust, and other partners, to provide an assessment framework that is able to identify companies, system solutions and technologies that have significant ability, or potential, to contribute to reduce greenhouse gas (GHG) emissions in society, so called avoided emissions."

27 The methodology can be found in "Chapter 3 – Methodology", pp. 26.

(1) Identify solutions to be assessed

Technology level: It is up to each fund to decide which solutions and technologies it will invest in. A fund complying with the ECT Framework shall clearly identify the emerging climate solutions and technologies in which it is seeking to invest. Funds might want to perform a screening by doing rough calculations of the Emissions Reduction Potential enabled by each solution or technology. This can be done for example through literature review, eliciting expert-opinion or, estimates of the Emissions Reduction Potential done by third parties (e.g. see https://www.misolutionframework.net/Innovations).

Project level: Each fund will also need to select the concrete projects/investees it will invest in. Before engaging in detailed estimates of the Emissions Reduction Potential of each project, a company can screen projects to determine if a project has potential to match with their impact investment objectives. There are different methods to do this screening, for example as described in (Prime and NYSERDA, 2017) "3. Climate impact assessment in down selection".

(2) Establish system boundary, carbon saving mechanism, and reference scenario

For each solution, technology, or project, establish "what is the mechanism that is causing the enabling effect… and is the enabling effect directly attributable to the solution? Establish the system boundary, reference baseline[28] and functional unit." (Mission Innovation, 2020). For any given technological solution, the functional unit should, in principle, be the same at fund or project level. However, system boundaries, baselines and other factors might differ depending on its application at fund level or project level. For example, a fund should establish the Emissions Reduction Potential of investing in an emerging climate technology, using global market figures and global average emission factors. However, the same estimation of Emissions Reduction Potential at project level might need to take into consideration its actual (local/regional market), local emissions factors and value-chains, etc. The reference scenario should clearly identify the incumbent solution/technology which will be substituted by the new one.

(3) Document methodology and identify data requirements

Technology level: The specification of the AEF to an emerging climate technology should be done by each fund. To the extent possible, different funds working with the same technology should follow the same AEF technology specification, which should document the carbon saving mechanism and the calculation methodology in a thorough and complete way. "This will help to formalize the process, allow the methodology to be reviewed, and identify what data is required for the calculation." (Mission Innovation, 2020). As mentioned in a previous point, at the fund level, specifying the AEF for one specific solution or technology should consider global average values and scenarios. These values might change in time, as further information is gathered at project level that can lead to updates or a re-assessment of those reference values.

Project level: At project level, the same AEF technology specification should be used, but tailored or parameterized to consider specificities at project level that might differ from the global methodology applied at fund level (see step 5). Data sources shall be, to the extent possible, project- and market-specific. These tailored differences shall also be documented. Information gathered at project level might be used to refined and reassess the global calculation process at fund level on a periodic basis.

(4) Test mechanism & methodology

Technology level: The proposed methodologies shall be reviewed, using independent (internal or external) reviewers, and product specialists to test that the assumptions and proposed methodology are valid and reasonable. Although this step is proposed to be applied to the fund level methodology, it can be applied in further parameterizations of the method, e.g. when calculating Avoided Emissions for a specific technology project.

Project level: The proposed modifications from the fund level methodology shall be justified and reviewed by an independent third party[29]. This review should happen after step 6.

28 Or reference scenario of the incumbent technology.
29 To learn more about 3rd party verification, see for example CDP guidance and case studies on 3rd party verification at https://www.cdp.net/en/guidance/verification.

(5) Identify studies and determine the carbon abatement factor

The carbon abatement factor shall be calculated as

$$\text{Carbon abatement factor}_y = \text{Emissions of incumbent technology per functional unit}_y - \text{Emissions of alternative technology per functional unit}_y)$$

Where *y* is the year.

Technology level: for ex-ante estimation of the carbon abatement factor "Conduct research to collect data and studies that provide a quantitative basis for the calculation of the carbon abatement factor. These may be academic studies, other published reports, or internal project studies. The calculation of the carbon abatement factor should include the reference to the BAU[30] baseline, the direct solution emissions, and rebound effects (where these can be quantified)" (Mission Innovation, 2020).

Project level: The general principle to apply is that data needed for calculation at technology level should be updated to be more representative of a project-specific situation. This should be done whenever it is practically possible and if using technology-level data would misrepresent the actual project level situation. Ex-ante calculations at project-level can be done with some adjustments related to country or region-specific emission factors or other factors. Ex-post project level calculations should take into consideration, to the extent possible, the real emissions produced along the value-chain of the product. This should be possible for some portions of direct and indirect emissions of the product or service. However, for some portions of indirect emissions, it might not be possible to rely on actual emission factors and so, literature values may be used. It should be assessed on a case-by-case basis to what extent there should be an investment to get to actual emission factors across the value-chain based on their overall significance for the final footprint. In general, we will distinguish an "Estimated" Carbon abatement factor as one that is largely sourced from secondary data (published figures from literature or databases) and a "measured" carbon abatement factor as one that is largely sourced from primary data and where emissions calculated from primary data are the most material.

(6) Collect data (for volumes of the solution, activity data and other data needed)

"Complete the data collection related to the carbon abatement factor, and collect the data required to determine the volumes of the solution." (Mission Innovation, 2020).

Technology level: in the context of the Emissions Reduction Potential calculations (ex-ante) technology level, volume data shall be estimated based on the application of the reference uptake scenario (see Catalyzed Emissions Reductions method). Emission factors shall be collected from life-cycle assessment studies considering emissions along the entire value-chain of the solution/technology. This LCA should, ideally, be a consequential LCA, although, in the absence of such studies, attributional LCA's can be used instead[31]. For ex-post volume data shall be calculated as an aggregate of production volumes of each of the investees.

Project level: for the calculation of avoided emissions, volumes, emission factors, energy consumption and other data needed to calculate the carbon abatement factor shall be collected from the investees, when appropriate.

30 In the ECT Framework we refer to BAU as reference scenario.

31 In the methodology work, not many consequential LCAs were found for the technologies in question. For this reason, attributional LCAs were used instead.

(7) Calculate carbon abatement factor, Emissions Reduction Potential and/or Avoided Emissions

Technology level: once carbon abatement factors are established, the Emissions Reduction Potential can be calculated using the formula applied to each technology the fund is investing in

$$ERP_{tech} = \sum_{y=1}^{n} (\text{ Estimated Volume Scenario}_y * \text{Estimated Carbon Abatement Factor}_y)$$

"The total carbon abatement can now be calculated by multiplying the carbon abatement factor by the volume for each solution, and then summing the results for all the products being assessed. At this stage, where considering a portfolio of solutions, it is important to check for overlap between solutions, so that there is not double counting of the same avoided emissions being delivered by different solutions" (Mission Innovation, 2020).

We deviate from the recommendation given by the AEF of incorporating a probability of success factor, because this is already considered in the efficacy of investment, when determining the capacity that a flow of $500 million investment can result in.

Ex-post Avoided Emissions shall be calculated every year on an individual basis per project and aggregated across the portfolio to provide a fund level Avoided Emission figure.

$$\text{Avoided Emissions}_{project,y} = \text{Measured Volume} * \text{Measured Carbon Abatement Factor}_y$$

$$\text{Avoided Emissions}_{fund} = \sum_{P=1}^{n} (\text{Avoided Emissions})_P$$

Project level: The ERP of a project can be calculated as

$$ERP = \sum_{y=1}^{n} (\text{ Estimated Volume Scenario}_y * \text{Estimated Carbon Abatement Factor}_y)$$

As indicated previously, the main difference is that data used for volumes and carbon abatement factor should reflect the project reality and not global averages.

Avoided emission at project level for a given year *y*, can be determined using the same equation indicated above

$$\text{Avoided Emissions}_{project,\,y} = \text{Measured Volumes}_y * \text{Measured Volumes}_y * \text{Measured Carbon Abatement Factor}_y$$

(8) Documentation and validation of the process

“Fully document the methodology and calculation process, including the assumptions and data sources. Ideally, the documentation would be sufficient for someone to independently calculate the avoided emissions and produce the same results. It is best practice to have the process independently validated. This provides for scrutiny of the assumptions, methodology and data sources; adds credibility to the process; and may identify any errors in the assumptions or calculations. This validation can be performed by either an external expert, an internal expert, or by a panel of reviewers" (Mission Innovation, 2020).

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4.4 - Reductions in Green Premium

Green Premium is defined as the final consumer price difference of choosing a climate friendly product over one that emits a greater amount of greenhouse gases.

$$\textit{Green Premium} = \textit{Final consumer price of climate friendly product} - \textit{Final consumer price of incumbent product}$$

The reductions in Green Premium are calculated as a % decline of an initial Green Premium and the Green Premium at time *t*, as per equation below.

$$\textit{Reduction in Green Premium} = 1 - \frac{\textit{Green Premium}_t}{\textit{Green Premium}_{t=0}}$$

Data needs

Data for establishing the levelized cost for both the alternative and incumbent technology will need to be sourced from academic or market studies, or directly from the industry.

Data for establishing final market prices will have to be sourced from market surveys and studies, that can often be sourced from specialized data providers.

Uncertainty

The Green Premium is a metric that reflects the dynamics of the consumer market. Although socially and environmentally relevant, Green Premium reductions are an imperfect impact measurement metric for the strategic goal of catalyzing technology deployment — the link between final market prices and catalytic investments is not an established one. The following challenges need to be considered when using reduction in Green Premium as an impact metric:

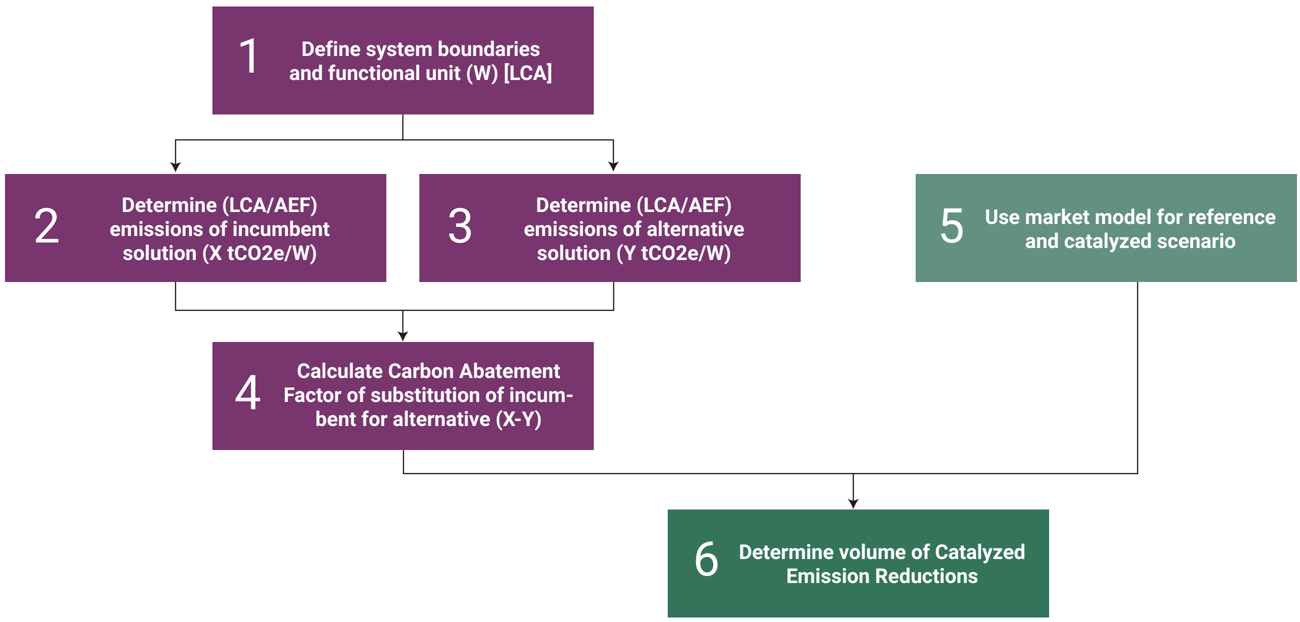
1. Green Premium reductions can occur not by decreases in the final market prices of the alternative technology but by increases in the market prices of the incumbent technology, likely to be policy induced. This price pressure on incumbents, coupled with increased social pressure, policy incentives and decreasing technology costs, can ultimately lead emerging climate technologies to become cost competitive. This dynamic will also be characterized by important time lags, which muddle the link between cause and effect. Given this complex dynamic, linking the impact of catalytic investments to Green Premium will be characterized by uncertainty, which should be acknowledged when reporting Green Premium data.
2. Non-concessional investments into ECT will be made and these will also drive the technology cost down. Additionally, and perhaps more important in the early stages of technology deployment, policy incentives, either through direct investment support, tax rebates, public purchase programmes or other policy means, are all ways of driving investment into ECT projects that will reduce technology costs and potentially also Green Premiums.
3. Although links between cumulative investment and technology cost reductions are well established in the literature, technology cost reductions do not necessarily lead to reductions in Green Premium. Additionally, estimating technology cost reductions is dependent on learning rates which have a number of challenges in their application for forecasting technology costs.

4.5 - Catalyzed emissions reductions

Ex-ante methodology

The Catalyzed Emissions Reductions (CatER), are the excess Emissions Reductions that result from the catalytic investments and the resulting deployment acceleration of emerging climate technologies. They can be calculated in a 6-step process which links to some of the previous methodologies, as per Figure A4.4 below.

Figure A4.4: Process for the calculation of Catalyzed Emissions Reductions



Steps one (1) to four (4) are derived and consistent with the Emissions Reduction Potential/Avoided Emissions methodology, while step 5, is taken directly from the reference uptake scenario. You combine step (4) and (5) to calculate the CatER (step 6) by using the following formula:

$$CatER_N = \sum_{n=y}^{2050} \frac{Cat\ ER_n}{(1+i)^{n-y}} = \sum_{y}^{2050} \frac{CAF_n * Catalyzed\ Activity_n}{(1+i)^{n-y}}$$

and

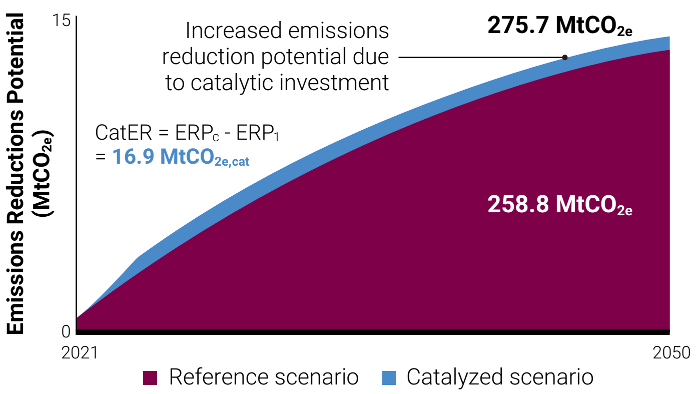
$$Catalyzed\ Activity_n = Activity\ volume_{Catalyzed\ diffusion\ scenario} - Activity\ volume_{Reference\ diffusion\ scenario}$$

Where:

$CatER_N$: Catalyzed Emissions Reduction during N years
$CatER_n$: Catalyzed Emissions Reduction in year n
CAF_n: Carbon abatement factor in year n
Activity volume: Is the volume or amount of the functional unit produced in the Catalyzed or reference scenario in year n
i: is the discount factor for avoided emissions

A carbon discounting factor of 3% per year is applied to acknowledge the relatively greater impact of earlier emissions reductions vs. emissions reductions that occur later.

Figure A4.5: Graphical representation of the concept of Catalyzed Emissions Reductions



Ex-post methodology

The ex-post calculation of CatER poses some challenges, namely the fact that, at asset level, it is not possible to determine the overall market acceleration effect. This is why the estimation of CatER at asset levels requires first the ex-post monitoring of some system level facts, namely:

1. That the acceleration of the deployment of the given technology can be observed at the technology or market level;
2. That an acceleration of the reference uptake scenario occurred;
3. That the conditions for the investment to be catalytic, were indeed satisfied.

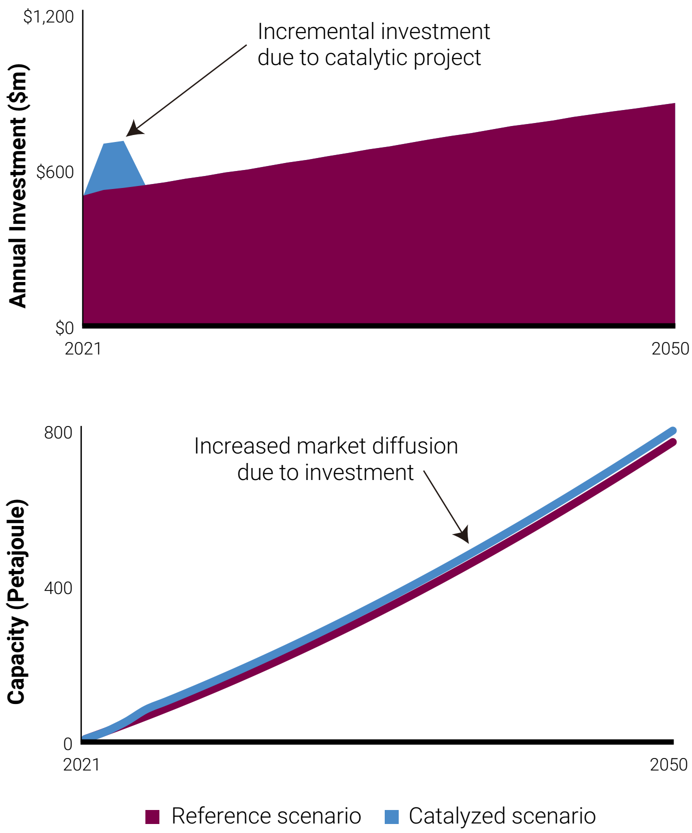
If these 3 conditions are satisfied, then the Avoided Emissions estimated for the asset can be considered "catalytic" in nature. Next, we explain further each of these conditions.

The acceleration of the deployment of the given technology can be observed at the technology or market level

This condition is linked to the fundamental theory of change of the investments. It is thus necessary that some evidence can be found of such behavior.

The current proposal is that this is done based on the theory presented in the Green Premium section and which we partially reproduce below.

Figure A4.6 Acceleration effect of catalytic investments in emerging climate technologies



Data on investment flows and technology adoption history should be collected to show evidence of "investment peaks" (for period of 2-3 years) as well as signs of an acceleration effect (Figure A4.6). Collecting this data, might require special studies and/or research through a lengthy amount of time (5 or more years). Nevertheless, it is considered that such evidence should be collected and will, in general, improve the learning about low-carbon technology uptake.

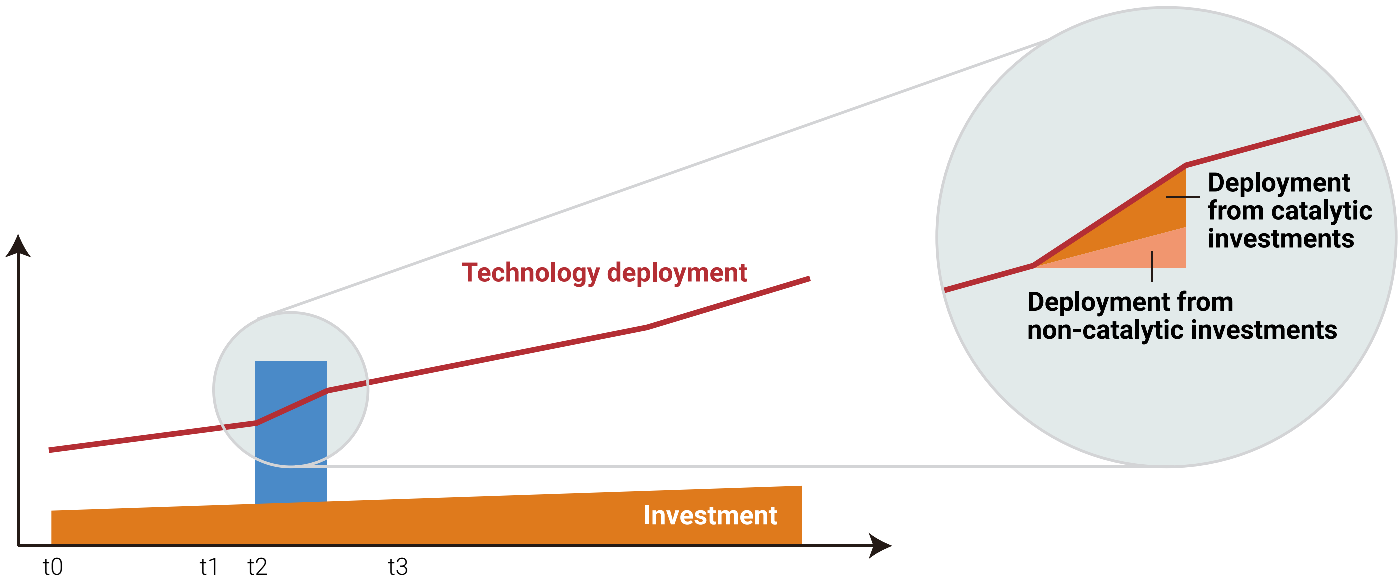
The acceleration of the reference uptake scenario occurred

Both the technology reference uptake scenario, as well as the investment reference scenario, are defined ex-ante. As such, it is very unlikely that they can be observed in the real economy. However, the effect of the accelerated/catalytic investments during a certain amount of period should be able to be visible as a jump in the real economy of the deployment curve for that technology.

The conditions for the investment to be catalytic satisfied

This is the third condition and the only one that is not a system-wide (or economy-wide) condition, but one that applies to each investment. The principle here is that, if condition 1) and 2) can be observed than it should be possible to reasonably attribute to catalytic investments the acceleration of investment and deployment for that specific technology and thus consider their avoided emissions as being catalyzed emission reductions. Please note that, not all investment into a catalytic project might have been "catalytic investment" as per our definition. In fact, the "catalytic investment" notion is tied to concessional funding. If catalytic investment is leveraging non-catalytic investment in a catalytic project, that leverage is in principle, a positive feature in terms of increasing investment flows into a technology (Figure A4.7).

Figure A4.7: Catalytic and non-catalytic investments in the catalyzed scenario



4.6 - Direct Paris-aligned finance

Paris-aligned finance is finance that, in accordance with Article 2.1c of the Paris Agreement, makes financial flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

Direct Paris-aligned finance shall be calculated on an annual basis, based on the amounts of investment that goes into technologies deployment that is consistent with reaching the goals of the Paris agreement. Overall, financing emerging climate technologies such as the ones listed by the IEA in their "Innovation needs in the Sustainable Development Scenario" (IEA, 2020) shall be considered as Paris-aligned finance. These technologies can be checked against taxonomies such as the EU taxonomy for sustainable activities or others (for example those listed in Rydge, 2020), if required for legal purposes. The World Bank published a World Bank Guide on "Developing a National Green Taxonomy" in 2020, and other taxonomies might be expected in the near future. With time, the ECT Framework might develop its own taxonomy and identify alignment and gaps with major current taxonomies, to facilitate this metric calculation.

The types of finance shall be categorized in accordance with the capital types considered in the ECT Framework, namely those in Table A4.2.

Table A4.2: Concessional capital types and their application

Types of concessional capital	Application examples
Grants	Providing revenue subsidies (contract for differences); buying down CapEx costs
Direct offtake agreement	Directly procuring fuel, energy CO_2 at a set price that enables bankability
Concessional return debt	Subsidized debt to reduce CapEx financing costs and lower overall project weighted average cost of capital
Concessional return equity	Subsidized equity to reduce CapEx financing costs and lower overall project weighted average cost of capital

The metric itself, is quite simple and consists of the amount and type of finance that have been invested by the fund during the reporting year, as well as cumulative investment to date, per key technology solution — see Table A4.3 for an example.

Table A4.3: Reporting of Direct Paris-aligned finance as per ECT Framework requirements

Interventions	Reporting year (Million USD)					Historical to date (Million USD)				
	SAF	GH	DAC	LDS	Total	SAF	GH	DAC	LDS	Total
Grants	150	50	70	30	**300**	100	50	100	50	**300**
Direct offtake agreement	10	15	15	10	**50**	5	20	15	10	**50**
Debt	60	70	30	40	**200**	200	300	250	250	**1000**
Equity	100	130	50	20	**300**	250	500	350	250	**1350**
Total	**850**					**2700**				

References

IEA (2020) Clean Energy Innovation. IEA, Paris. Available at: https://www.iea.org/reports/clean-energy-innovation

Rydge, J. (2020) Aligning finance with the Paris Agreement: An overview of concepts, approaches, progress and necessary action. Policy Insight. Available at: https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2020/12/Aligning-finance-with-the-Paris-Agreement-3.pdf

World Bank (2020) " Developing a National Green Taxonomy, A World Bank Guide. World Bank Group. Available at: https://documents1.worldbank.org/curated/en/953011593410423487/pdf/Developing-a-National-Green-Taxonomy-A-World-Bank-Guide.pdf

https://www.iea.org/reports/net-zero-by-2050

https://www.iea.org/reports/energy-technology-perspectives-2020

https://www.epa.gov.sites/default/files/2016-12/documents/social_cost_of_carbon_fact_sheet.pdf

4.7 - Catalyzed Paris-aligned finance

As per the Direct Paris-aligned finance metric the catalyzed Paris-aligned finance, shall consider that, overall, financing emerging climate technologies such as the ones listed by the IEA in their "Innovation needs in the Sustainable Development Scenario" (IEA, 2020) as Paris-aligned finance. Likewise, the types of finance shall be categorized in accordance with the capital types considered in the ECT Framework.

The metric, however, does not consider solely contributions of the fund, but the totality of the finance required to the deployment of the asset. These amounts are also to be reported by the amount and type of finance that have been invested in investees during the reporting year, as well as cumulative investment to date, per key technology solution — see Table A4.4 for an example.

Table A4.4: Reporting of contributions of Catalyzed Paris-aligned finance as per ECT Framework requirements

Interventions	Reporting year (Million USD)					Historical to date (Million USD)				
	SAF	GH	DAC	LDS	Total	SAF	GH	DAC	LDS	Total
Mobilized by fund										
Grants	150	50	70	30	**300**	100	50	100	50	**300**
Direct offtake agreement	10	15	15	10	**50**	5	20	15	10	**50**
Debt	60	70	30	40	**200**	200	300	250	250	**1000**
Equity	100	130	50	20	**300**	250	500	350	250	**1350**
Total mobilized	**850**					**2700**				
Catalyzed by fund										
Grants	1050	350	490	210	**2100**	700	350	700	350	**2100**
Direct offtake agreement	70	105	105	70	**350**	35	140	105	70	**350**
Debt	420	490	210	280	**1400**	1400	2100	1750	1750	**7000**
Equity	700	910	350	140	**2100**	1750	3500	2450	1750	**9450**
Total mobilized	**5950**					**18900**				

ANNEX 5 – ATTRIBUTION METHODOLOGY

Attribution to grants

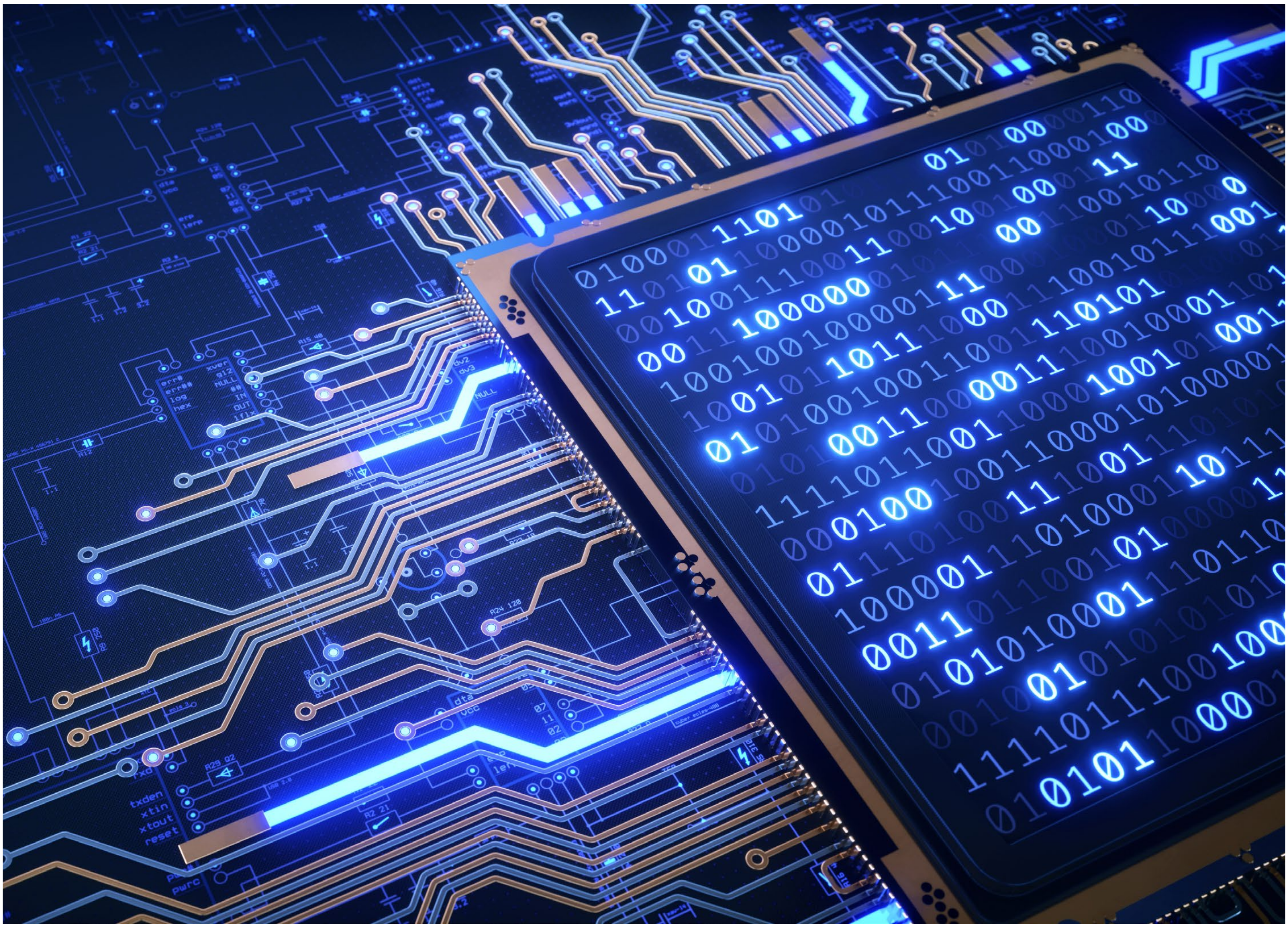
As grants represent non-repayable funding, the full amount of the finance disbursed through upfront grants is to be deemed as fully concessional, representing a grant element of 100% (factor of 1). Considering that this methodology defines attribution when an investment decision is made on the individual project-level, potential follow-up grant funding later in the investment cycle is excluded.

Attribution to debt instruments

To define the grant element of a concessional debt investment into a project, the difference between the net present values of future cash flows associated with a 'market based' loan and the offered concessional loan needs to be established. There are several aspects of a loan that impact its level of concessionality:

- The level of the interest charged on the loan (cost of debt)
- The duration of the loan (maturity)
- The period during which the loan does not have to be serviced (grace period)

The below outlines a stepwise approach to determining the grant element of loans offered through the ECT Framework, the resulting weighting which can be applied the attribution of CatERs generated through the Framework.



Proposed methodology to attribute CatERs to providers of debt:

Step 1: Determine the benchmark cost of debt

The cost of debt is the return that a lender provides to its creditor. This required rate of return is the minimum level of expected return that a debt investor requires in order to invest in a project over a specified period, given the asset's riskiness. It represents the opportunity cost for investing in the asset, and a threshold value for being fairly compensated for the risk of the asset.

In the proposed attribution approach, the level of concessionality of the offered debt financing is determined by comparing the offered terms of finance against a benchmark rate that can be deemed 'representative' of that investment's inherent risk profile. The first step is, therefore, the determination of an appropriate benchmark applicable to debt investments in early-stage ventures.

This methodology proposes the use of the Capital Asset Pricing Model (CAPM), a well-known financial model that describes the relationship between systematic risk and expected return for assets[32]. While typically applied to value required returns on equity investments, it may also be applied to evaluate discount rates for debt instruments.

The general premise of the CAPM is that the expected return on an investment equates to a risk-free rate of return combined with an additional expected return (risk premium) that reflects the sensitivity of the funded asset in relation to that of a broader market. In the context of the type of investments supported by the ECT Framework, the risk premium part of the equation can be further dissected into two elements: first, a risk premium on a corporate debt of equal credit worthiness as the referenced risk-free rate, and; second, an additional debt risk premium associated with high-risk, early-stage investments. This yields the following formula:

Benchmark cost of debt = *Risk-free rate + Generic debt risk premium + Project debt risk premium*

Below the sub-steps for calculating these three metrics is presented:

i. Risk-free rate

The risk-free rate of return is the interest rate an investor can expect to earn on an investment that carries zero risk. In practice, in the financial markets the risk-free rate is commonly considered to be equal to the interest paid on the treasuries or bonds of the United States government, which are regarded as the safest form of investment an investor can make. Government bonds are preferred to even the highest rated corporate bonds as they typically have a lower (near zero) default risk. Industry practice also tends to favor the use of longer-term government bond rate in the premium estimates, with the benchmark rate reflecting the duration of the asset being valued. For the target early-stage investments supported under the ECT Framework, a duration of 10 years is proposed. Therefore:

Risk-free rate = *Yield on a 10-year US government bond*

Being:

Benchmark risk-free rate = 1.46%[33]

32 The capital asset pricing model was first proposed by the economist William Sharpe in 1970. See W. Sharpe (1970) Portfolio Theory and Capital Markets. ISBN 978-0071353205

33 Bloomberg (2021) Rates and Bonds June. Available here.

ii. Generic debt risk premium

The next step is to determine the generic debt risk premium, which represents the investment return a loan to a business is expected to yield in excess of the risk-free rate of return over the applied duration. To calculate this first part of the debt risk premium, it is proposed to use the required return on the broad debt market (representing the average-systemic-risk debt security), meaning a corporate bond with a risk rating similar to the referenced risk-free asset. Therefore:

> ***Generic debt risk premium*** *= Yield on a 10-year corporate bond with a credit rating equal to the credit rating of the risk-free asset, less the risk-free rate*
>
> Being:
>
> *Benchmark generic debt risk premium = 1.26%*[34,35]

iii. Project debt risk premium

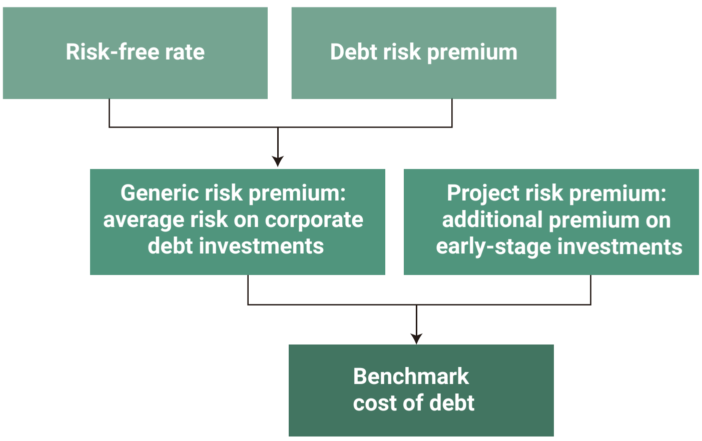
Finally, given the specific focus of the ECT Framework on unlocking investments in emerging climate solutions, the debt risk premium part of this general equation should be further expanded to include a project risk premium that reflects the inherently riskier profile of the targeted investment opportunities (when compared to triple A-rated corporate bonds).

Rather than choosing a fixed benchmark value for this final metric, this approach proposes to use the weighted average cost of debt capital offered to a project supported under the ECT Framework as input for calculating the project debt risk premium. The first advantage of this approach is that it enables the attribution methodology to reflect the project-specific risk priced by debt providers, rather than proposing a flat, fixed benchmark rate across different types of technologies. The second advantage of this approach is that it also makes the premium definition more objective, as it is challenging to derive accurate proxies on market-level risk premiums applied to debt investments in early-stage investments.

Therefore:

> ***Project debt risk premium*** *= Weighted average cost of debt capital provided to the project less the generic debt risk premium and the risk-free premium*
>
> Being:
>
> *Benchmark project debt risk premium = % tbd on project-level*

Figure A5.1: Approach to determining the benchmark cost of debt for investments supported under the ECT Framework



Step 2: Calculate the grant element of an offered debt investment

Once the benchmark cost of debt is established, it is possible to calculate the grant element of the offered debt by comparing the net present value of the loan priced at the benchmark cost of debt with the net present value resulting from an investment discounted at the concessional terms of debt finance. The grant element, thereby, is defined as the difference between the present value of the debt servicing proceeds applying the benchmark cost of debt, and the present value of the debt servicing proceeds using the offered cost of debt. Key assumptions include full disbursement of principal in year 0; no fees other than interest payments; and repayment of principal structured in equal payments throughout the duration of a loan.

34 Calculated as the difference between the stated yield for a triple-A corporate bond in the US and the referenced risk-free rate of return.

35 Moody's (2021) Moody's Seasoned Aaa Corporate Bond Yield. Available here.

The approach to calculating the grant element share of debt financing can be expressed through the following formula:

Parameter	Symbol	Value (Example)
Payments per annum	*A*	*1*
Offered cost of debt (%)	*R*	*2.50*
Maturity (years)	*M*	*10*
Grace period (years)	*G*	*5*
Interval period (years)	*INT*	*4*
Benchmark cost of debt (%)	*I (=D)*[36]	*5.21* *(Calculated as per step 1)*

(1) $D = (1 + I)^{1/A} - 1$ $\qquad D = 5.21\%$

(2) $INT = G - \frac{1}{A}$ $\qquad INT = 5 - \frac{1}{1}$

(3) $1 - \frac{(R/A)}{D}$ $\qquad 1 - \left(\frac{2.50\%}{5.21\%}\right)$

(4) $\frac{1}{(1 + D)^{A*INT}}$ $\qquad \frac{1}{(1 + 5.21\%)^{(1*4)}}$

(5) $\frac{1}{(1 + D)^{A*M}}$ $\qquad \frac{1}{(1 + 5.21\%)^{10}}$

(6) $(4) - (5)$ $\qquad \frac{1}{(1 + 5.21\%)^{(5-1)}} - \frac{1}{(1 + 5.21\%)^{10}}$

(7) $D * (A * M - A * INT)$ $\qquad 5.21\% * (10 - (5 - 1))$

(8)
$$GE_{equivalent\ debt} = 1 - \frac{(R/A)}{D} * \left(1 - \frac{\frac{1}{(1 + D)^{A*INT}} - \frac{1}{(1 + D)^{A*M}}}{D * (A * M - A * INT)}\right)$$

$$GE_{equivalent\ debt} = 1 - \left(\frac{2.50\%}{5.21\%}\right) * \left(1 - \frac{\frac{1}{(1 + 5.21\%)^{(5-1)}} - \frac{1}{(1 + 5.21\%)^{10}}}{5.21\% * (10 - (5 - 1))}\right)$$

36 As the proposed approach assumes only one debt service payment per annum, in effect I = D. Formula (1) was retained, however, in case the ECT Framework would like to account for different payment periods for debt.

Attribution to equity investments

To define the grant element of a concessional equity investment into a project, a comparison between the present value of future cash flows realized under a 'market based' equity investment and the present value of cash flows derived using the offered cost of equity needs to be carried out. The below outlines a stepwise approach to determining the level of concessionality of equity, the resulting weighting which can be applied the attribution of CERs generated through the Framework.

Proposed methodology to attribute CatERs to providers of equity

Step 1: Determine the benchmark cost of equity

As with debt, the level of concessionality of the offered equity financing can be determined by comparing the offered terms of finance against a benchmark rate that can be deemed 'representative' of that investment's inherent risk profile. The first step is, therefore, the determination of an appropriate benchmark applicable to equity investments.

Once again, the CAPM is applied to calculate the required return on equity investment for projects supported under the ECT Framework. As with the debt equation, the required rate of return is determined by adding to the risk-free rate an additional risk premium that reflects the risk profile of the typical early-stage investments funded under the ECT Framework. The equity risk premium part of the equation is therefore composed of two elements: first, a risk premium on equity investments in general, and; second, an additional risk premium associated with high-risk, early-stage investments. This yields the following formula:

Benchmark cost of equity *= Risk-free rate + Generic equity risk premium + Project equity risk premium*

Below are the sub-steps of calculating these three metrics:

i. Risk-free rate

As with debt, for the target early-stage investments supported under the ECT Framework, a 10 year US government bond yield is proposed as the proxy for the risk-free rate of return. Therefore:

Risk-free rate *= Yield on a 10-year government bond in the US*

Being:

Benchmark risk-free rate = 1.46%[37]

ii. Generic equity risk premium

The next step is the determination of the first equity risk premium, which relates to the generic additional rate of return that an equity investment is expected to yield in excess of the risk-free rate of return. To calculate this generic equity risk premium, the required return on the broad equity market in the US can be used to define a historical expected rate of return[38]. Therefore:

Generic equity risk premium
= Historical equity risk premium observed in the US stock market over the past 10 years

Being:

= 5.53%[39]

37 Bloomberg (2021) Rates and Bonds June. Available here.

38 Investors active in other geographies should have the possibility to account for equity risk premia that reflect local markets, and the suggested historical US stock market premium may be substituted by local data. One source for this can be the NYU Stern School of Business database on Country Default Spreads and Risk Premiums, accessible here.

39 Based on the average 10-year public equity premium in the US (2020 – 2011 S&P500 data) as per: NYU Stern (2021) Historical Implied Equity Risk Premiums for the US. Available here.

iii. Project equity risk premium

Finally, given the specific focus of the ECT Framework on unlocking investments in emerging climate solutions, the equity risk premium part of this general equation needs to be further expanded to include a project risk premium that reflects the inherently riskier profile of the targeted investment opportunities.

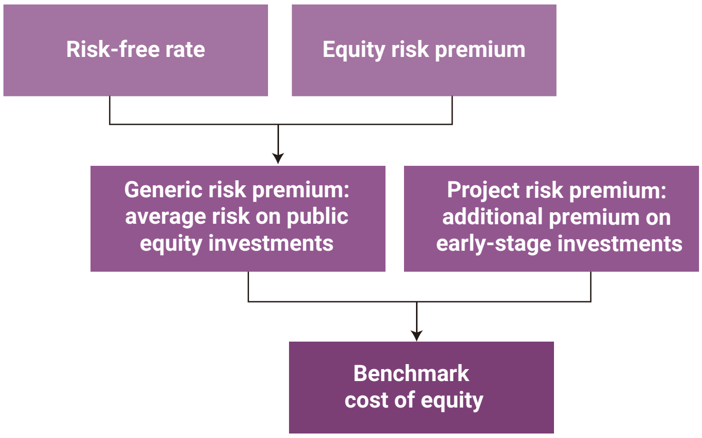
This approach proposes to use the weighted average cost of capital offered to the projects supported under the ECT Framework as input for calculating the project risk premium for equity investments. Therefore:

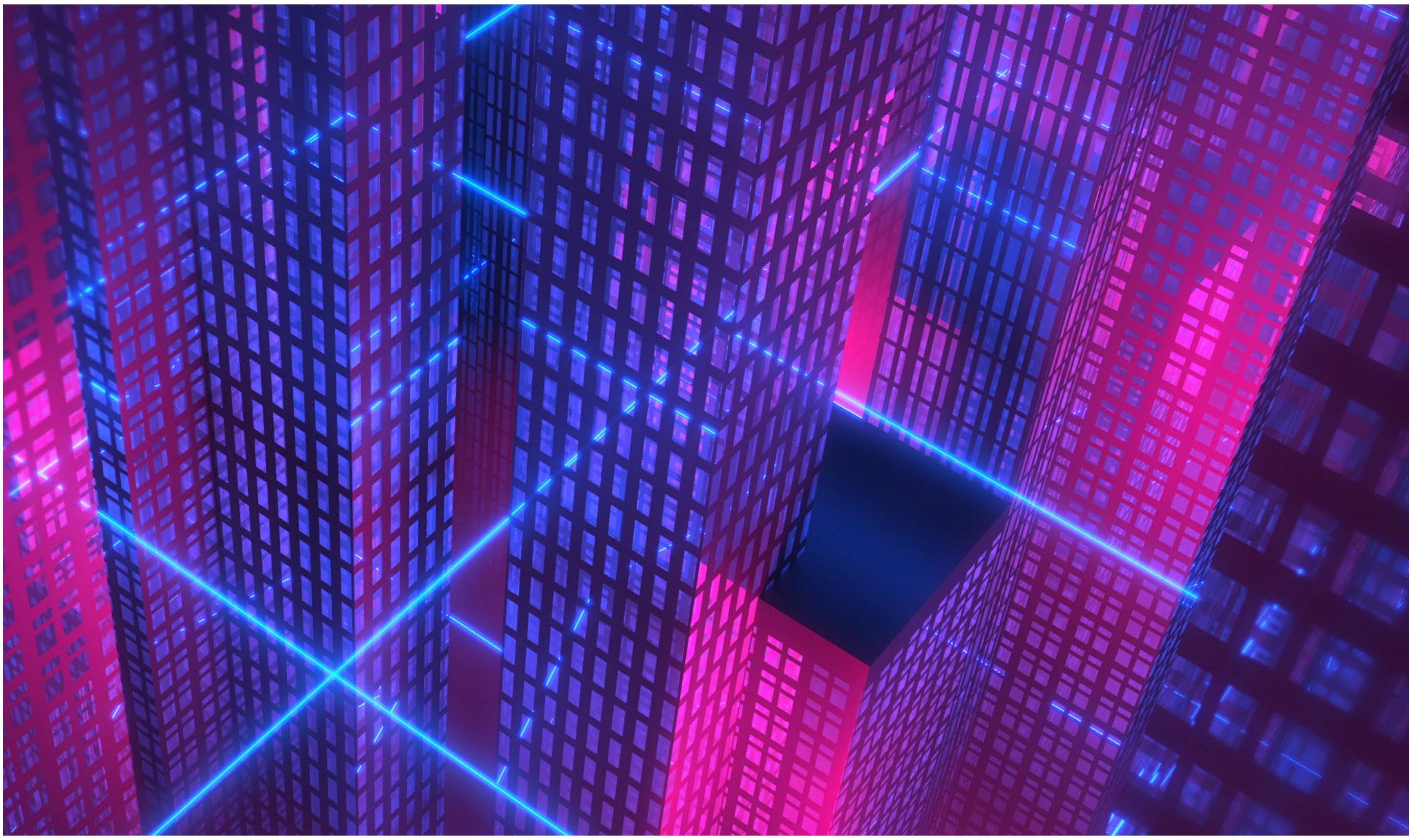
Project equity risk premium = *Weighted average cost of equity capital provided to the project* <u>*less*</u> *the generic equity risk premium* <u>*and*</u> *the risk-free premium*

Being:

Benchmark project equity risk premium
= <u>*% tbd on project-level*</u>

Figure A5.2: Approach to determining the benchmark cost of equity for early-stage investments supported under the ECT Framework





Step 2: Calculate the grant element of an offered equity investment

To derive a valuation of projects supported under the ECT Framework, investors will discount future cash flows using a certain discount rate; the higher the discount rate, the lower the present value of the future cash flows. This means that a lower discount rate leads to a higher present value, and thus a higher valuation. The difference between the valuation derived from applying the higher rate (the benchmark cost of equity) and the concessional equity offered by investors can be quantified in monetary terms, allowing for the calculation of the grant element of the committed equity.

To calculate the grant element of equity investments, the net present value of the cash flows discount using the benchmark rate cost of equity is therefore to be compared with the net present value of the cash flows discounted by the offered cost of equity. The approach to calculating the grant element share of equity financing can be expressed as follows:

Parameter	Symbol	Value (Example)
Offered cost of equity (%)	$R_{applied}$	5.00
Yearly payment (US$)	PM	17,691
Present value of equity investment (US$)	PV	100,000
Number of years (year)	T	10
Benchmark cost of equity (%)	$R_{default}$	12.00 (Calculated as per step 1)

Microsoft Excel's PMT function can be applied in order to calculate periodic payments given certain minimum return requirements. In the applied example, the function determines the yearly compensation in US$ that equity investors need to qualify for[40] to achieve the required return on their equity. In mathematical terms, this is equivalent to the below:

(1)
$$P_M = \frac{P_V * R_{default}}{[1 - (1 + R_{default})^{-T}]}$$

$$US\$17{,}691 = \frac{100{,}000 * 12\%}{[1 - (1 + 12\%)^{-10}]}$$

To calculate (A), $R_{default}$ needs to be defined by following the steps presented in step 1 above, with $R_{default}$ being equal to the risk-free rate plus the generic equity risk premium combined with the project equity risk premium. As the project equity premium is to be determined by using the weighted average of the provided equity investments as an input ($R_{applied}$), $R_{default}$ will different per individual project supported through the ECT Framework.

The grant element of offered equity investments is subsequently calculated as a ratio evaluating the difference between the net present value of the cash flows using $R_{default}$ as the discount rate, versus the net present value of the cash flows using $R_{applied}$ as the discount rate.

Therefore:

(2)
$$Grant\ element_{Equity} = \frac{[NPV(R_{default}) - NPV(R_{applied})]}{P_V}$$

$$Grant\ element_{Equity} = \frac{[0 - 34{,}863]}{100{,}000}$$

40 It should be noted that these represent theoretical payments, as return on equity is determined by dividing net income by total equity, which does not imply that all profits are actually transferred to equity holders in the form of dividends.

Attribution to direct offtake agreements

This attribution methodology has so far presented an approach to attribute impacts generated under the ECT Framework to financing instruments that are delivered upfront. While grants, debt and equity investments are critical in delivering the necessary start-up finance to new projects, they do not provide any performance-linked guarantees that deliver future cash flow certainty. Uncertainty about the future revenue generation potential of start-ups is a critical barrier to raising upfront finance, and as such incorporation of instruments that allow the de-risking of future cash flows is a welcomed feature of the ECT Framework.

Direct offtake agreements – guaranteed purchase orders by buyers of a certain minimum volume of a produced good – can deliver such security and help investees raise debt or equity capital at more favorable terms. They do so by allowing investees to address demand risk by ensuring target product will sell enough to allow the project to reach a certain level of profitability, sending a strong signal to interested investors.

Given that providers of such offtake agreements do not participate in the upfront financing of the project, the attribution approach applied to grants, debt, and equity investments needs to be adapted to present an entry point for these forms of indirect financial support into the ECT Framework. The general approach behind defining a grant element of a financing instrument can however be replicated to guide the process for defining attribution to direct offtake agreements.

Proposed methodology to attribute CatERs to providers of direct offtake agreements

To establish the grant element of an offtake agreement, the net present value of the premium payments that apply to the offered agreement is to be calculated. To do so, the total value of the offered offtake agreement needs to be established first, by multiplying the total volume of the purchased good by the price at which the good will be sourced. Next, an agreement will need to be reached on what share of this total value should qualify as premium payments over the agreed duration of the agreement. The net present value of the resulting 'Green Premiums' can then be used to quantifying the grant element of the offtake agreement offered to the project supported under the ECT Framework.

The resulting attribution needs to be deducted from the original attribution allocated to the initial funders of a project, given that direct offtake agreements do not provide any direct upfront capital. It is proposed that a pro-rate approach is applied affecting all upfront providers of capital.

Box 1: Limitations of the proposed approach

It is challenging at this stage of the ECT Framework development to confirm that the proposed attribution approach to direct offtake agreements is adequate given the lack of data concerning the potential size of Green Premiums, the volumes of product that could be delivered from projects, and the upfront financing needed to deliver specific volumes of product over time. It is therefore suggested to consider the treatment of direct offtake agreements in further detail when more technology-specific input data is available to cross-check the proposed approach.

ANNEX 6 – EXAMPLES OF REPORTING IMPACTS OF ECT INVESTMENTS BY ASSET MANAGERS

In this Annex we present an example (and fictitious) report by an Asset Manager's (AM X) investing in ECT and using the ECT Framework. We also present an example of what a company (Company Z) investing in the company AM X could report in the future (the report is placed in 2028, exactly for that purpose). These two examples are used merely to illustrate some of the reporting requirements and the use of the metrics proposed. The example reports are built from a collation of best practice reports, dully adapted.

AM X Annual Report

Forward-looking statements

This report contains forward-looking statements respecting AM X's financial position, operational results, businesses and impacts on the environment. These statements and forecasts involve risk and uncertainty, as they relate to events and depend on circumstances that occur in the future. There are various factors that could cause actual results to materially differ from those expressed or implied by these forward-looking statements. To better understand forward-looking statements, we seek to provide users of information full transparency, by referring to the data, assumptions, methods, standards and frameworks used to derive forward-looking statements. These will be updated once more information is collected.

About this report

This report is prepared in accordance with the International <IR> Framework of the International Integrated Reporting Council (IIRC) and provides our stakeholders with a concise and transparent assessment of our ability as a business to do good and create sustainable value. It is produced and published annually and provides Material information relating to our strategy, business model, operating context, material risks, stakeholder interests, performance, prospects and governance, covering the year 1 January 2020 to 31 December 2020. The report is about financial and extra-financial reporting, Including non-financial performance which has a significant influence on our ability to create value.

Executive summary

(...)

It is becoming ever more acknowledged that meeting the goals of the Paris-agreement is essential for the economy and that the financial sector has a strong leadership role to play in achieving them. The finance industry must increase transparency on their exposure to climate change, making carbon emissions measurement a vital part to assess related risks. Measuring the carbon footprint is essential, but it is focused mainly on a backwards-looking risk assessment approach to portfolio management. We have been doing it for the past 5 years and we will keep doing it.

But at AM X we have always proud ourselves to be ahead of the market, pro-actively creating the high-growth opportunities of tomorrow. Today, more than ever, these opportunities present not only future potential financial returns, but they are also an essential part of our wait out of the climate crisis-our best and only insurance policy against climate disruption. Therefore we have created the AM X Emerging Sustainable Tech fund, which invests in tomorrow's solutions managed, as always, for the best financial and climate impact returns. We work towards solution-oriented capital allocation through the careful measurement and understanding of the GHG emissions of the entire value chain, and the future systemic impact of our investees — in this way we assess our potential contribution to achieve climate change mitigation.

(...)

Our Impact

Through our AM X Emerging Sustainable Tech fund we have been investing in growing our portfolio of projects.

Table X shows the most significant data on AM X investments to date.

Technology areas	Nr. projects		Direct Paris-aligned Finance (M USD)		Historical to date (Million USD)		
	to date	this year	to date	this year	NA	EU	RoW
Clean fuels	20	3	2000	300	30	40	30
Bio-solutions	15	2	1500	200	50	50	-
Sustainable chemistry	5	2	1000	300	25	75	-
Building technology	13	2	1300	120	10	50	40
Metals	3	1	600	300	40	-	60
CO_2 infrastructure	8	2	800	200	60	40	-

Technology areas	Type of Capital provided (2020) (%)				Catalyzed Paris- aligned Finance (MUSD) (2020)
	Loans	Equity	Grants	DOA	
Clean fuels	25	30	30	15	1500
Bio-solutions	20	40	20	20	1000
Sustainable chemistry	20	40	25	15	1300
Building technology	25	60	10	5	800
Metals	20	50	20	10	900
CO_2 infrastructure	25	20	40	15	1500

Thanks to our trusted approach to blended finance, maximizing sustainable impacts and financial returns, we have been able to grow grant money to desired levels of 20 to 30% of the capital provided, with a good mixture of concessional and non-concessional loans and equity. This mix has allowed to catalyze a substantial higher amount of non-concessional capital into real climate solutions, further enhancing our impact.

Our best estimate is for our 1.42 billion USD of Direct Paris-aligned finance made during 2020, to have an Emission Reduction Potential of 600 million tCO2e and a total of Catalyzed Emission Reductions of 100 million tCO2e until 205041. These numbers have significant uncertainty, and the result of our assessment is that they have a medium confidence level (about 5 out of 10 chance of being correct)[42].

In Table Y we report our list of impact indicators as per IRIS+ catalogue.

IRIS+ Ref.Nr.	Indicator	Value (2020)
PI2764	Total greenhouse gas (GHG) emissions avoided and reduced (tCO_2e)	145 $MtCO_2$
PI9878	Greenhouse Gas Emissions Sequestered (tCO_2)	1.3 $MtCO_2$
PI3687	Jobs Created at Directly Supported/Financed Enterprises: Total (Nr.)	132

GHG Emissions

As usual, we continue to monitor the negative climate impacts of our investees in accordance with PCAF, proportionally to our financial participation. The 2020 carbon footprint of our ECT investments during 2020 amounts to total approximately 0.6 million tonnes and further information can be found in Table Z.

Technology areas	Direct GHG emissions ($ktCO_2e$)			Direct GHG emissions ($ktCO_2e$)		
	NA	EU	RoW	NA	EU	RoW
Clean fuels	80	100	90	90	120	100
Bio-solutions	12	11	-	5	6	-
Sustainable chemistry	23	56	-	13	34	-
Building technology	2	5	4	5	23	16
Metals	34	-	45	4	-	5
CO_2 infrastructure	64	36	-	45	21	-

Company Z Annual Report

Summary Forward

This report contains forward-looking statements respecting AM X's financial position, operational results, businesses and impacts on the environment. These statements and forecasts involve risk and uncertainty, as they relate to events and depend on circumstances that occur in the future. There are various factors that could cause actual results to materially differ from those expressed or implied by these forward-looking statements. To better understand forward-looking statements, we seek to provide users of information full transparency, by referring to the data, assumptions, methods, standards and frameworks used to derive forward-looking statements. These will be updated once more information is collected.

2021 Strategy

The strategy we have defined to ourselves in 2021, was tough but necessary. To half our 2020 emissions by 2031 required the phasing out of all coal power by 2025, and the shutdown of all gas power by 2031 or the retrofitting of CCS facilities. Our hydro assets required tough adaptation measurements and making them fit to address urgent human and food supply needs, and changing weather patterns, led to necessary investments in Nature-Based Solutions in our catchment areas. All these led to a sizeable investment effort to shut-down, retrofit and adapt our assets — and a need to reinvent ourselves.

Admittedly, we came late to renewables, but we did not want to come late to the next wave of energy technologies. That is why in 2021 we decided to gain critical exposure through small investments, as for example, our partnership with impact investor AM X. Through radical collaborations we have built a portfolio in hydrogen, energy storage, CCS, DAC and biofuels. We are now the leading infrastructure provider, building and operator of assets for any of these four critical technologies in southern Europe.

We continue to make performance assessment a key tool for our success and attach our executive remuneration to the achievement of our clear decarbonization goals.

GHG Emissions

We closely monitor our GHG emissions since 2010 and since then we have been making our GHG inventory more complete and comprehensive. Table X shows the evolution of our GHG emissions and we are on target to meet our 2031 goal of reducing emissions while continuing to deliver shareholder value.

GHG Emissions	$MtCO_2e$						
	2010	2015	2020	2025	2026	2027	2028
Direct	23	24	23	17	*17*	*15*	*12*
Indirect							
Electricity, heat and cooling purchased and consumed	1.5	1.6	1.2	1	0.9	0.7	0.6
Transportation	-	0.5	0.4	0.3	0.3	0.25	0.2
Goods	-	1.2	1	0.9	0.9	1.3	1.3
Services	-	0.4	0.35	0.3	0.3	0.3	0.3
Use and end-of-life products made and sold	-	7	7	6	5	4	3
Investments	-	-	-	0.15	0.16	0.2	0.3
TOTAL	**24.5**	**34.7**	**33.0**	**25.7**	**24.6**	**21.8**	**17.7**

Radical collaboration

Since 2021 we have embarked on a quest for radical collaboration with organizations across society that aimed to deliver what we seek to deliver: the radical new energy infrastructure for a zero-carbon economy. We have entered into multiple partnerships providing finance, knowledge transfer and technical, legal and management capabilities. Our agreements have encompassed investment funds, clients and creators of technology. We have worked through consortiums to bring new technology to commercialization stage.

As an example, through our participation in the AM X Emerging Sustainable Tech fund we have helped accelerate — with others — technologies which we later on helped to scale. In total our finance in the form of grants, concessional loans and equity and forward-procurement contracts, have led to an estimated 2 million Catalyzed Emission Reductions, over 40 million tonnes of avoided emissions since 2020 and an average reduction of the price of clean products of 30% in relation to their fossil competitors (Green Premium)43. In total, throughout the past 8 years, we have mobilized more than 1.5 billion € in Paris-aligned finance for Emerging Climate Technologies.

Most important, the levelized-cost of some of the technologies we have invested in are now becoming cost competitive with their fossil counterparts (See Annex Y for reference). With our planned deployment and engineering scale-up plans we are in an excellent position to continue to support other businesses and benefit from the expected incoming growth of these markets in the 2030's.

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About CDP

CDP is a global non-profit that runs the world's environmental disclosure system for companies, cities, states and regions. Founded in 2000 and working with more than 590 investors with over $110 trillion in assets, CDP pioneered using capital markets and corporate procurement to motivate companies to disclose their environmental impacts, and to reduce greenhouse gas emissions, safeguard water resources and protect forests. Over 14,000 organizations around the world disclosed data through CDP in 2021, including more than 13,000 companies worth over 64% of global market capitalization, and over 1,100 cities, states and regions. Fully TCFD aligned, CDP holds the largest environmental database in the world, and CDP scores are widely used to drive investment and procurement decisions towards a zero carbon, sustainable and resilient economy. CDP is a founding member of the Science Based Targets initiative, We Mean Business Coalition, The Investor Agenda and the Net Zero Asset Managers initiative.

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