ILMASTO-RAHASTO

EMISSIONS REDUCTION POTENTIAL CALCULATION BY THE CLIMATE FUND

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INTRODUCTION

The Finnish Climate Fund (Ilmastorahasto Oy) is a state-owned special-assignment company. Its operations focus on combating climate change, boosting low-carbon industry and promoting digitalisation. The Climate Fund finances significant environmental and digital projects in which the company's investment is crucial for the project's success or will enable it to be realised sooner or on a larger scale.

This document describes the Climate Fund's approach to emissions reduction potential[1] calculation, modelling and tracking in the company's investment activities. It also reports the emissions reduction potential of implemented investment decisions and provides an estimate of the emissions reduction potential of future decisions. The document and the approaches presented therein will be updated as necessary.

[1] Emissions reduction potential also includes carbon dioxide removal (CDR).

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RAHASTO

1. PREMISES FOR SEEKING EMISSIONS REDUCTIONS IN THE CLIMATE FUND'S OPERATIONS

The purpose of the **government resolution on the state ownership steering policy** is to create a framework for the goals of state ownership in wholly or partially state-owned companies. The Climate Fund is a wholly state-owned special-assignment company.

The most recent government resolution on ownership steering policy[1] states that state-owned companies should strive to be pioneers in the transition to a carbon-neutral circular economy, the utilisation of digitalisation and sustainability. The owner requires these companies to identify the climate and environmental impact of their operations, and state-owned companies must set ambitious and measurable targets for themselves in these respects.

The Climate Fund started its operations on 21 December 2020, and its **operational guidelines drawn up by the owner**[2] and published on the same date mention emissions reduction potential in several places. The reduction of emissions is discussed, for example, in connection with the background and goals of the company and is cited as one of its funding criteria.

> *"The Climate Fund (Ilmastorahasto Oy) is a special-assignment company. Its operations focus on combating climate change, boosting low-carbon industry and promoting digitalisation. The Climate Fund's mission is to decrease Finland's carbon footprint and strengthen its carbon handprint, as well as promote the development of new climate solutions and digital solutions, with the objective of decreasing greenhouse gas emissions, enhancing the use of natural resources and supporting biodiversity."*

The operational guidelines specify emissions reduction potential as one of the key criteria for assessing investment targets.

> *"The Climate Fund's primary investment targets are industrial scale-ups of, for example, new technology demonstration projects. Key assessment criteria include enabling the earlier realisation of a significant investment, the emissions reduction potential of the investment, the innovativeness of the solution, and the realisation of the investment on a larger scale than permitted by a market-based plan or bringing the investment to Finland. It must also be a key focus of investment operations that the investments can verifiably and significantly reduce emissions or the use of non-renewable natural resources compared to current solutions."*

In the operational guidelines, the owner has specified an assessment model and criteria that guide the Climate Fund's investment activities. This three-stage assessment model consists of financial and other preconditions, cross-

cutting impact goals and more detailed, investment-proposal-specific impact goals. Every investment target must meet the preconditions, and the Climate Fund makes the final choice of investment targets based on its impact goals. It should be noted that adherence with the 'Do no significant harm' principle, which is a precondition for Climate Fund investments, meets the requirement of taking environmental impact into account in the company's operations, laid down in the government resolution on ownership policy.

> *"When making investment decisions, the Climate Fund must assess the impact of the investments on climate change. … The criteria take into account appropriate short-term and long-term indicators with regard to combating climate change, by reference to international standards where applicable. A three-stage assessment model will be defined for the investments of the Climate Fund, consisting of financial and other preconditions, cross-cutting impact goals and more detailed, investment-proposal-specific impact goals. Every investment made by the Fund must meet these preconditions. The final comparison and choice between investment proposals that meet the preconditions is made based on the Fund's impact goals."*

The "Climate Fund impact model and criteria" document appended to the operational guidelines describes the calculation of emissions reduction potential and climate impact in more detail. Emissions reduction potential in Finland and globally is cited as the first general impact goals that guide the Fund's decision-making.

> *Climate Fund impact criteria:*
> *Definition: When the preconditions are met, investment targets will be primarily prioritised according to the impact criteria and investment-proposal specific analysis. The impact criteria are assessed in connection with every investment decision. Furthermore, an individual mechanism for monitoring and verifying the intended impact is created before each investment decision.*
>
> *Impact criteria:*
> *1. Emissions reduction potential in Finland and globally*

The Climate Fund's strategy[3] and investment policy[4] published in 2021 reiterate the owner's policy on the criteria on which the Fund's financing operations are based and on emissions reduction potential calculation as a general impact criterion for every investment decision, set down in the operational guidelines.

2. CONCEPTS

Baseline and project scenarios and emissions reduction

Emissions reduction calculations frequently conceive the emissions reduction achieved by a project as the difference between emissions generated in the baseline and project scenarios (***Figure 1***).

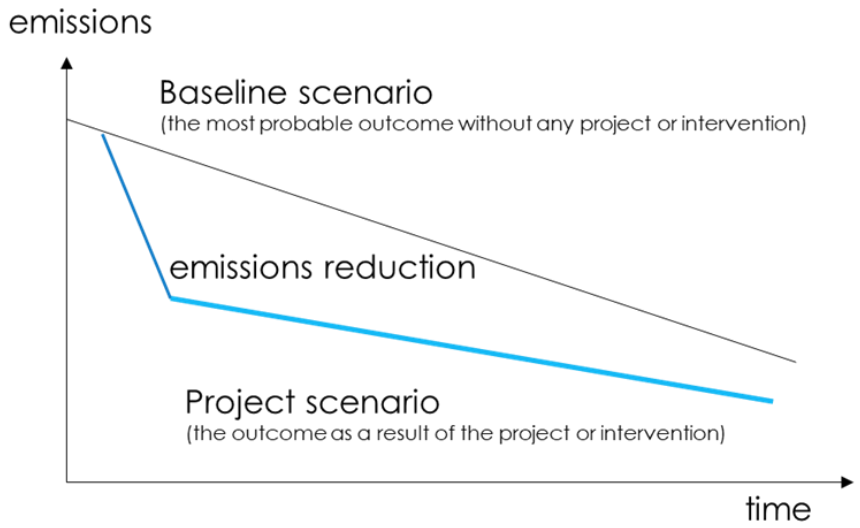

***Figure 1*. The emissions reduction is defined as the difference between the emissions generated in the baseline and project scenarios.**

The baseline scenario refers to the realised emissions in the absence of an emissions-reducing project or an intervention created by such a project. Frequently used terms with practically the same meaning include the *business-as-usual (BAU) scenario* or, in the case of policy measures, the *with existing measures (WEM)* scenario. It is important to note that the emissions will typically not remain at the same level over time even in the baseline scenario, but factors like technological development will reduce emissions even in such scenarios.

The project scenario, on the other hand, refers to the outcome achieved by the project or intervention (much like the *with additional measures (WAM) scenario* in the context of policy measures). The emissions reduction achieved as a result of the project is the difference between the emissions generated in the baseline and project scenarios. The emissions generated in the project scenario can be monitored with the progress of the project. Baseline emissions will remain a hypothetical outcome insofar as the project has an impact on them. In other respects, the baseline can also be monitored and updated during the project. For example, the baseline for a renewable energy project can consist of the emissions that would be incurred from generating a corresponding amount of electricity in other power plants supplying the grid.

This baseline, or the grid emission factor, can in theory then be updated according to changes in the production structure feeding the grid.

A baseline is essential to the assessment of a project's emissions reduction potential, and it can often be complex to define. We will elaborate on this below. At this stage, we can assume that the most probably outcome without the implementation of the project is the relevant baseline at the project level.

Additionality

In connection with emissions reduction calculations, the term 'additionality' is used to describe a situation where an intervention has an impact (i.e. the project scenario) on emissions that differs from the most probably outcome, or baseline, that would have been realised without the intervention. At the project level, an emissions reduction achieved by a project financed by a public financial institution could probably be termed additional with respect to the public funding if it would not have been realised without the funding. If the financed project would be the most likely outcome even without the intervention, it would be part of the baseline and the intervention would not achieve an additional reduction in emissions. In many cases, it is necessary to extend the examination of the baseline and additionality beyond the level of the individual project: 1) would some other projects have achieved the same reduction in emissions if this particular project had not been implemented or 2) will the project decrease the need for others to make corresponding reductions in emissions? Such questions may arise if the project is covered by the emissions trading mechanism, produces renewable fuel for the distribution obligation or taps into a limited pool of raw materials in order to reduce emissions.

Emission factors

The greenhouse gases emitted into the atmosphere are usually not measured directly in connection with emissions reduction calculations. Rather, they are calculated with emission factors describing the emission impact of various functions. The emission factor for oil combustion could be used as a simple example. It represents the estimated emissions generated by the combustion of a unit of oil based on certain assumed properties of the oil and combustion process, namely the carbon content of the oil and the oxidation factor of the combustion process. There are differences in the accuracy of emission factors (for example, the emission factor for oil combustion is presumably more accurate than that of electricity consumption, which seeks to model the emissions generated by all production facilities supplying the grid per unit of electricity consumed).

Emission factors are published by many sources and when using them, it should be kept in mind that they have been developed for different purposes. For example, national emissions inventories use either the emission factors published by the IPCC or more detailed local emission factors. One purpose of the national inventories is to model the emissions according to where the aerial emissions were generated (for reasons such as counting the emissions into the inventories of the correct country). Life cycle emission factors, which seek to describe the emissions of various products over their entire life cycles on the basis of the average emissions caused by the various stages in the manufacture and use of the product (e.g. the emission factors of cotton fibre production or cotton fabric), are a significantly different instrument. Life cycle emission factors do not typically provide information on where the emissions were generated, and it is also clear that the life cycle emission factors of end products with complex production processes include a huge amount of assumptions and averages (e.g. regarding the equipment used in various processes, their energy sources and the transport distances of products). Life cycle emission factors can be very useful for assessing emissions impact but can also over-simplify reality and thus mislead in some cases. Average life cycle emission factors for various products and functions are available in the literature and are also being published in various libraries, such as the EcoInvent database.

Emissions reduction calculation methods

There are several calculation methods designed for the assessment of emissions and emissions reductions, such as the GHG Protocol for Project Accounting, EIB carbon footprint methodology and UN Clean Development Mechanism (CDM) methodologies. The CDM, for example, includes tools developed for demonstrating additionality and roughly 250 detailed calculation methods for setting the baseline and calculating and monitoring additional emissions reductions for various project types. Supporting sustainable development in developing countries has also been one of the key premises of the CDM. However, the CDM is now being wound up and replaced by a new offsetting mechanism under the Paris Agreement. A number of independent offsetting standards have also been developed on the basis of the CDM. These standards serve the voluntary market and, increasingly, obligation-based applications as well (e.g. emissions trading systems and emission taxes). The active development of new methodologies largely takes place within the framework of these standards, now also supplemented by the Paris Agreement.

It should be noted that the CDM and other emission offsetting mechanisms are designed for the creation and trading of offsettable emission reduction units, which sets special requirements on the accuracy of the calculation methods and the conservativeness of the emissions reduction estimates. This is necessary because each created carbon credit gives the right to offset emissions of corresponding magnitude generated elsewhere. The assessment of the emissions reduction achieved by projects in other contexts is usually not subject to quite as exacting integrity requirements, which means that methods with lower transaction costs can also be appropriate. If, on the other hand, the objective would be assessing the contribution of a project toward the achievement of a national emissions reduction goal, it would be especially significant how the impact of the project would be reflected in national emissions inventory calculation.

The most common emission or emissions reduction calculation guidelines could be grouped by their purpose, for example as follows:

CATEGORY	EXAMPLES
National emissions inventory calculation	IPCC Guidelines
Emissions monitoring methods for emission trading systems	EU ETS Monitoring and Reporting Regulation
Emission offsetting mechanisms under the UN	Clean Development Mechanism Article 6.4 Mechanism (in development)
Independent emission offsetting standards	Gold Standard for Global Goals, Verified Carbon Standard
Project-level emissions reduction calculation	GHG Protocol for Project Accounting
Corporate emission calculation	GHG Protocol Corporate Standard, ISO 14064
Product carbon footprint calculation	GHG Protocol Product Life Cycle Accounting and Reporting Standard ISO 14067
Guidelines suited to general use by international financial institutions	International Financial Institution Framework for a Harmonised Approach to Greenhouse Gas Accounting EIB Project Carbon Footprint Methodologies
Funding-programme-specific project assessment methods	EU Innovation Fund Green Climate Fund
Life cycle emission factors	EcoInvent Database

Emissions reduction potential

The term 'emissions reduction potential' is often used in connection with greenhouse gas emissions to indicate, for example, the extent to which emissions can be reduced in a certain sector or with a specific technology. Potential is typically divided into technological and commercial potential, with

the former describing the overall emissions reduction potential and the latter the potential that can be realised in a commercially viable manner.

In addition to the baseline and emission factor, the emissions reduction potential of a new technology typically depends on its estimated performance (e.g. the power factor of geothermal heat pumps) and scalability (e.g. the future demand for and use of such pumps). The estimated scalability in particular often involves significant uncertainties.

For example, the emissions reduction potential of a plant investment based on an individual commercial technology with no major demonstration value can usually be estimated fairly accurately since the potential is limited to the emissions reduction potential of that specific plant.

The other extreme of emissions reduction potential assessments could involve a project demonstrating a new emissions-reducing technology in an emissions-heavy industry. There are significant uncertainties related to the assessment of the entire potential of such projects in the technology demonstration or scale-up financing stages. The project and its possible cascade effects can have major emissions reduction potential, but its realisation involves significant uncertainties.

Ex ante estimation of emissions reduction

The ex ante estimation of emissions reduction refers to the estimated (on the basis of certain assumptions) emissions reduction of a project (or intervention). An ex ante estimation is typically conducted with the same method used for emissions reduction monitoring after the project has been implemented (e.g. CDM and GHG Project Protocol).

Realised emissions reduction follow-up – monitoring, reporting and verification (MRV)

When a project is implemented, the emissions reduction achieved by it can be tracked by monitoring the emissions generated in the project scenario and comparing them to development under the baseline scenario. If necessary, emissions monitoring can be implemented at a highly detailed level in the project scenario since the object of monitoring is a real situation with measurable parameters. In EU emissions trading or the Clean Development Mechanism, for example, realised emissions are tracked with calibrated measurement devices specified in the monitoring methodologies and the monitoring reports are verified by accredited inspectors. The reliability and accuracy of emissions monitoring, reporting and verification is extremely

important in connection with the emissions trading and emissions offsetting mechanisms in order to guarantee market integrity. In many other contexts, emissions reduction monitoring is mostly only of informational value and other, administratively lighter, approaches can be more appropriate. However, and especially if the emissions reduction to be achieved involves, for example, a monetary incentive, it would probably be important to agree on the monitoring method in advance and to have the results verified by a third party.

Project boundaries and greenhouse gas emissions taken into account

In connection with emissions reduction calculations, the term 'project boundaries' is used to describe both the physical entities whose emissions reductions are taken into account in the emissions reduction calculation and the greenhouse gases included in the calculation. For example, in order to simplify the assessment, CDM methodologies exclude emissions of other gases than carbon dioxide and methane in several project types in which such emissions are insignificant.

The thresholds for taking emissions into account can be set by project type (such as in the CDM methodologies) or at a more general level, like in the EIB's carbon footprint methodology (see table below):

Thresholds for taking emissions effects into account in the EIB's carbon footprint methodology:		
Scope 1	Direct emissions physically emitted from sources that are operated by the project.	Taken into account
Scope 2	Indirect emissions associated with energy consumed by the project.	Taken into account
Scope 3	Other indirect emissions caused by the project.	Not taken into account

Baseline dependency on perspective

As stated above, the emissions baseline from which emissions reductions are calculated plays a key role in the assessment of the emissions reduction achieved by a project. The guiding principle of project-level emissions calculation instructions is typically that the baseline would be the most probable outcome under existing policy instruments and legislation (e.g. the CDM and EIB Methodology). In general, setting a baseline is not simple and can depend on the context and outlook, as illustrated by the example below:

- Let us consider a scenario in which a state has committed to reducing its emissions to a certain level. When the state is planning an intervention

for meeting its obligation, the relevant baseline from the state's perspective would probably be the projected development of emissions if the state would not take any additional measures to meet its obligation (i.e. the 'with existing measures' scenario). With its additional measures, the state achieves an outcome (the project scenario or with additional measures scenario) in which the emissions are reduced in comparison to a relevant point of reference as the result of policy measures.

- At the level of global climate policy, however, these emissions reductions already became a part of the baseline scenario when the state committed to its emissions reduction goal.
- As stated above, the guiding principle of project-level emissions calculation instructions is typically that the baseline would be the most probable outcome under existing policy instruments and legislation.
- If the project-level baseline was simply considered as the most probable outcome, we would have to address the probabilities and schedules of international and national climate policy as well as the achievement of corporate targets when setting the baseline. As an extreme example for the sake of illustration, we could postulate that, if the objectives of the Paris Climate Agreement would be achieved with absolute certainty, the most probable outcome would be very low emissions in many industries and few measures would reduce emissions compared to that scenario. On the other hand, the objectives of the Paris Agreement are precisely the objectives that emissions-reduction projects seek to achieve, which should be taken into account in setting the baseline.

In the next section, we will discuss aspects of emissions-reduction project baselines and additionality more extensively in the framework of international climate policy and its policy instruments.

Climate policy framework

Objectives of the Paris Agreement and their allocation at the national level

The Paris Climate Agreement was signed in 2015 and had been ratified by 191 countries accounting for 97% of global GHG emissions by April 2021. The agreement applies to the post-2020 period and is in force indefinitely. The EU and its Member States have ratified the agreement. **The *objective* of the Paris**

Agreement is to limit global warming to well below 2°C and pursue efforts to limit it to 1.5°C above pre-industrial levels.[2]

The Paris Agreement obligates states parties to draw up ***Nationally Determined Contributions (NDC)*** with which they declare their emissions-reduction and adaptation goals and report on their planned climate actions. By October 2021, more than 165 countries had reported their *NDCs* under the Paris Agreement. These alone are not sufficient to achieve the *goals* of the Paris Agreement, but the agreement requires regular increases to the NDCs. If the measures declared by October 2021 will be fully implemented, global warming would be limited to an estimated 2.4°C. In addition to the NDCs, 130 countries have announced that they are aiming for net-zero emissions by 2050 and China by 2060. If these efforts will be successful, global warming would probably be limited to approximately 2°C from pre-industrial levels.[2, 3] Figure 2 illustrates the national allocation of NDCs under the Paris Agreement.

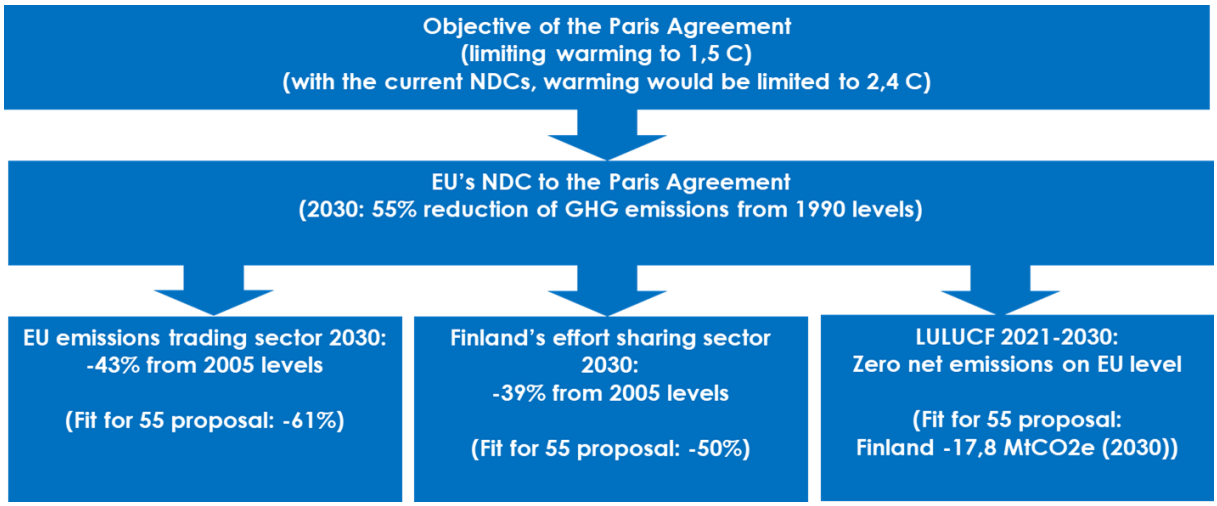

Figure 2. National allocation of NDCs under the Paris Agreement.

The EU's NDC to the Paris Climate Agreement is the reduction of GHG emissions by at least 55% from 1990 levels by 2030. Furthermore, the EU aims for Europe to be the first carbon-neutral continent by 2050.[4]

The EU has set the target for the ***emissions trading sector*** at a 43% decrease on 2005 levels by 2030. ***According to the proposal issued by the Commission in July 2021 (the Fit for 55 package), the new target for the emissions trading***

[2] Lounasheimo, Cederlöf and Mäntylä. Annual Climate Report 2021. Ministry of the Environment. https://julkaisut.valtioneuvosto.fi/handle/10024/163322

[3] The situation in October 2021:
https://unfccc.int/sites/default/files/resource/cma2021_08r01_E.pdf
[4] https://ym.fi/en/eu-climate-policy

sector would be a reduction of 61% by 2030. The Commission also proposes *strengthening the current provisions and extending the scope of emissions trading*.[4] The intention is to extend emissions trading to cover transport and the heating systems of buildings.

Finland's country-specific ***emissions reduction target for the effort sharing sector*** is a 39% decrease on 2005 levels by 2030. ***According to the Commission proposal of July 2021, Finland should reduce its emissions by 50%*** from 2005 levels by 2030.[4] Finland has additionally set its own long-term objective to be carbon-neutral in 2035 and carbon-negative soon after that.[5]

To achieve the EU objectives, it is possible for countries to utilise certain flexibilities such as transferring a small amount of emission reduction units from the emissions trading sector to the effort sharing sector. It is also possible to save the annual surplus of emission reduction units for use in subsequent years or to acquire emission reduction units from other Member States.[4]

The carbon sinks and emissions coming from land use, land use change and forest management are also taken into account in the EU climate objectives. **The LULUCF sector (Land Use, Land Use Change and Forestry) must not be an overall source of emissions during the period 2021–2030.** The calculation rules are defined in the LULUCF Regulation, for which the Commission also submitted a new proposal in July 2021.[4]

Finland reports its national emissions inventory annually to the EU and UN. In addition, it reports on its policy measures for reducing GHG emissions and submits two scenarios on the future development of its emissions and energy balance every two years. Of these scenarios, the With Existing Measures (WEM) scenario includes implemented policy measures and the With Additional Measures (WAM) scenario also takes into account planned policy measures. The scenarios reported are based on the scenarios prepared for the national energy and climate strategy. [6] [7]

Considerations regarding the additionality of emissions reductions in the context of climate policy

We will examine themes related to the emissions baseline and additionality of emissions reductions from the perspectives of climate policy and its policy instruments, with reference to the Figure below (Figure 3).

[5] Objective set by the Government Programme, Government proposal for amendments to the Climate Act, published on 3 March 2022
[6] https://tem.fi/en/developing-scenarios-for-eu-reports
[7] https://tem.fi/eulle-toimitettavat-suunnitelmat-ja-raportit

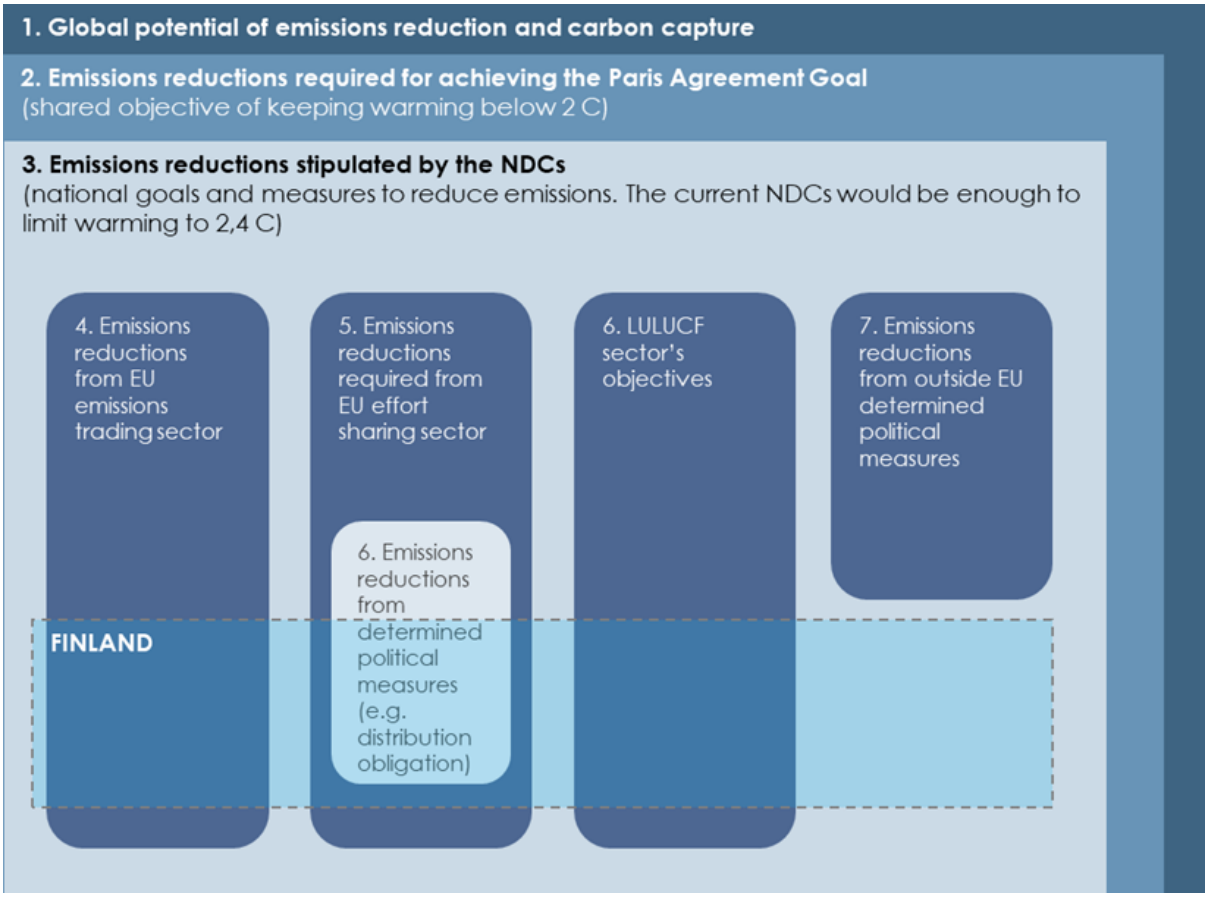

Figure 3. Outline of the various levels of climate policy.

The largest square in the Figure includes global emissions from all sources, greenhouse gases that can be captured from the atmosphere and stored, thus increasing the number of sinks. Some of this GHG emissions reduction potential will be used when working towards the goal of the Paris Agreement. The emissions reductions required for achieving the goal are distributed among the NDCs of different countries. The emissions reductions stipulated by the NDCs are then distributed further by national guidance mechanisms, down to the level of individual actors.

Goals of the Paris Agreement and avoiding double counting

Many countries have already outlined the NDC-related national measures with which they intend to achieve their emissions reductions and removals. For example, the EU has announced binding targets regarding the EU emissions

trading system, effort sharing sector and LULUCF sector as its principal measures [8].

If an intervention is made to reduce emissions in a sector subject to the targets and the emissions reduction achieved is used to offset other emissions (e.g. international market cooperation and voluntary emission offsetting under Article 6 of the Paris Agreement), it is important to ensure that there is no double counting of emissions reductions.

For example, the realisation of the EU's NDCs is monitored with national emissions inventory counting and reporting [9]. If a flexibility mechanism or offsetting project would reduce emissions subject to EU NDCs (which includes all sectors) and give the right to cause corresponding emissions in another country or sector, this would result in *double counting*: the same reduction in emissions would help both the EU and the party using the project's emissions reductions to meet its targets (or offset its emissions) as illustrated below (Figure 4).

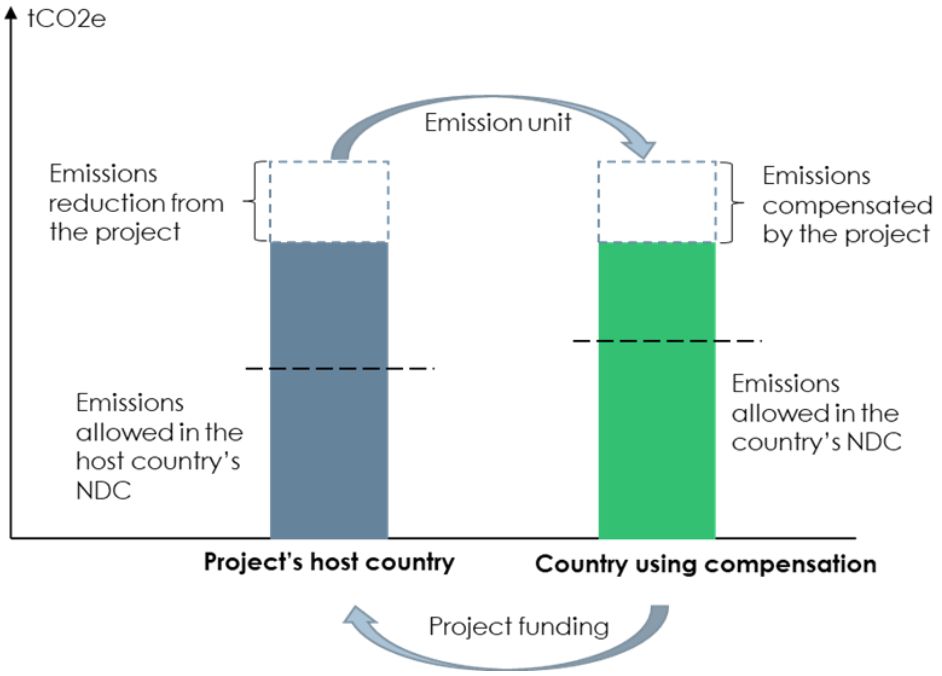

Figure 4. The double counting of emissions reductions means counting the same reduction twice.

In order to avoid double counting, the project's host country must, in its NDC monitoring, take into account the impact of emissions reductions authorised for other uses than the host country's NDC (in practice, increase its national

8 https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/European%20Union%20First/EU_NDC_Submission_December%202020.pdf

emissions balance by a an amount corresponding to the authorised emissions reductions). The framework for this arrangement was agreed in the 2021 Glasgow Climate Change Conference, avoiding the double counting of emissions reductions that the host country has authorised for NDC use under Article 6, for international mitigation purposes (e.g. the climate obligations of international air traffic) or for other purposes (e.g. voluntary offsetting).

The EU does not currently permit Article 6 to be used for meeting EU obligations, but this does not prevent Member States from using Article 6 to achieve or exceed their own targets going beyond the EU targets. The Government Programme specifies that flexibilities will be examined as part of the assessment of the carbon neutrality target in 2025[10]. The potential of Article 6 should be considered in the Climate Fund's investments as well. Emissions reductions have commercial value on various markets – including the voluntary market.

It should also be noted that the double counting described above can only occur if the emissions reductions achieved by an intervention are used to offset other emissions (a *carbon neutrality claim*[11]). Other types of interventions are probably explicitly intended to help the target country meet its targets. The mere fact that the target country and several project parties announce their participation in an emissions-reducing project, for example, does not constitute double counting in the sense described above. But it could make the context clearer if it was communicated that other actors too have contributed to the realisation of the emissions reduction, and that the emissions reduction will specifically help the target country to meet its targets and will not add emissions reductions beyond these targets. Actors that make a measurable and verifiable contribution to a country's emissions reduction targets can make *contribution claims*[11].

Emission-reducing measures under the EU emissions trading system

In its current scope, the EU emissions trading system (EU ETS) covers the emissions of large industrial facilities, energy production[12] and air traffic inside the EU. The emissions generated by the emissions trading sector correspond to approximately 40% of the EU's GHG emissions and slightly under half of Finland's GHG emissions.[13]

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[10] https://valtioneuvosto.fi/en/marin/government-programme/carbon-neutral-finland-that-protects-biodiversity

[11] https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/163347/YM_2021_26.pdf?sequence=4&isAllowed=y

[12] As a rule, the system covers energy production facilities with a heat output of over 20 MW, but the system also includes smaller district heating plants in Finland.

[13] https://tem.fi/en/emissions-trading

EU emissions trading represents a cap-and-trade emissions trading system, in which a number of emission allowances corresponding to the emission cap is partly given and partly auctioned to operators, who can then buy and sell the allowances. The total number of emissions allowances limits emissions to the cap, and a significant fine is levied for unauthorised emissions. The idea is that operators who are able to reduce their emissions at a reasonable price do so and sell the released allowances to those for whom reducing emissions is more expensive – or do not purchase allowances from the auction in the first place. The market mechanism should thus direct operators to undertake the required emissions-reduction measures in order of attractiveness. In several years, emissions in the EU ETS have remained below the number of emission allowances allocated and auctioned to the market for reasons such as weaker-than-anticipated economic development, resulting in the accumulation of surplus emission allowances on the market. However, the situation is about to be rectified as the Market Stability Reserve (MSR) removes emission allowances from the market and the number of emission allowances allocated to the market decreases annually as we approach the 2030 cap. This can already be seen in the prices of emission allowances, which have increased sharply of late.

As a rule, additional interventions for reducing emissions covered by the EU ETS will not reduce emissions below the cap set by the number of emission allowances. If an intervention results in an emission-reduction measure that would not be implemented otherwise, this will correspondingly decrease the number of other measures implemented. The additional information can lower the price of emission allowances but could also change the market-based order of attractiveness of reduction measures and thus lead to market inefficiencies. On the other hand, the EU ETS market stability reserve regulates the number of emission allowances on the market and, from 2023, will permanently annul the emission allowances removed from the market that exceed the previous year's auction volume. If an additional intervention would increase the number of available emission allowances and thereby affect the total number of emission allowances, it would also have an emission-reducing effect under the EU ETS.

An intervention can also, for example, seek to eliminate barriers to entry for new technologies that operators within the scope of the EU ETS can use to reduce their emissions and avoid having to purchase emission allowances. For example, the EU Innovation Fund, financed with the proceeds of emission allowance auctions, focuses on promoting emission-reducing innovations in heavy industry and the energy sector. As the EU strives to achieve carbon-neutrality by 2050, it can be assumed that the EU ETS cap will be lowered

further, further increasing the importance of reducing emissions to operators in the sector and the competitiveness of the Union's industry.

Emissions-reduction measures in the effort sharing sector

The effort sharing sector refers to the sector not covered by the EU ETS and comprising construction, building-specific heating, housing, agriculture, transport and waste management, as well as industrial F-gas emissions. As stated above, Finland's current emissions reduction target for the effort sharing sector is 39% from the level of 2005 by 2030. This means that annual emissions will need to be reduced by approximately 13 Mt from the 2020 level. The 50% reduction provided for in the Commission's Fit for 55 proposal would mean an annual emissions reduction of approximately 17 Mt from the level of 2020. Internal flexibilities within the EU enable temporal flexibility to deal with annual fluctuations and let Member States buy allocations from those Member States that will meet their own targets in the effort sharing sector.

In Finland's effort sharing sector, an emissions reduction achieved by an additional intervention is, in a sense, already included in the baseline of international climate policy, because Finland would in any case be obliged to reduce its emissions in the effort sharing sector. However, such measures will help Finland meet its obligations in the effort sharing sector and decrease the need for other policy measures.

But this situation will be different if a national guidance mechanism, such as the distribution obligation, has already been set up to achieve the emissions reduction. In this case, an intervention would not achieve a reduction in emissions, or at any rate not an additional reduction, because it would not decrease the need for other policy measures since the obligation has already been distributed among the operators. However, an intervention can help Finnish operators fulfil their obligations and lower the costs of cascade effects for the operators (e.g. reducing traffic emissions within the scope of the distribution obligation). On the other hand, it could also change the market-based order of attractiveness of reduction measures and thus cause market inefficiencies, as in the case of emissions trading.

The LULUCF sector

The LULUCF (land use, land use change and forestry) sector refers to the sinks and emissions in these fields. As stated above, the EU has set the climate target that this sector must not be an overall source of emissions during the period 2021–2030.

3. EMISSIONS REDUCTION ASSESSMENT CRITERIA AT THE CLIMATE FUND

Assessment of the emissions impact of individual investments

Modelling principles

According to its operational guidelines, the Climate Fund must assess the impact of the investments on climate change when making investment decisions. The Climate Fund's first impact criterion is the emissions reduction potential in Finland and globally. There are a variety of relevant frameworks and criteria that can be taken into consideration in the preparation of the Climate Fund's investment decisions where applicable, such as the EU classification system for sustainable finance, or EU Taxonomy, the UN Sustainable Development Goals, the terms and conditions of the EIB's lending policy, as well as the sustainable recovery criteria drawn up by the working group instituted by the Ministry of the Environment.
The Climate Fund assesses the emissions reduction potential and monitors the emissions reductions of investment targets with appropriate approaches developed specifically for each project in cooperation with external experts. Where applicable, these approaches seek to draw on existing methods, such as the GHG Protocol standard, the EIB method, CDM methodologies[14] and, in future, Article 6.4 Mechanism methodologies, as well as use the emission factors best suited for each application.

Greenhouse gas emissions taken into consideration

As a rule, an emissions assessment must cover all seven greenhouse gases set down in the Kyoto Protocol: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), HFC compounds, PFC compounds, sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3). These are converted into carbon dioxide equivalents using the global warming potential (GWP) conversion factors provided in the latest IPCC assessment report (at the time of writing, AR5). However, the Climate Fund seeks to follow the materiality principle in conducting the examination and exclude factors with insignificant emissions impact. These choices can be based on existing methods or the assessment of the external expert making the calculation.

[14] For certain (especially newer / more innovative) project types, the methodology used can be based on methods developed (or under development) by independent standards. In 2000–2020, the CDM has focused on relevant project types, and development is no longer carried out within the methodology.

Project boundaries

At minimum, the emissions impact assessment must include the project's direct material emissions impact (e.g. primary effects in the GHG Protocol standard or Scope 1 and 2 emissions in the EIB method). It must also identify the most significant types of indirect emissions impact (e.g. secondary effects in the GHG Protocol standard or Scope 3 emissions in the EIB method). These must be taken into account in the calculation with regard to the emissions caused by the project if they are material with regard to the sector or project. These choices can be made on the basis of existing methods or the discretion of the external expert making the calculation.

Periods examined

The calculation must determine the emissions impact for at least 10 years (the Climate Fund's investment horizon), but shorter-term (e.g. 5 years) or longer-term effects can also be presented.

Defining the baseline

The emissions reduction achieved by the investment target is recorded as the difference between the baseline and the project scenario. The baseline is defined as the most likely market-based outcome under existing and confirmed forthcoming policy instruments and legislation if the project will not be implemented. Other aspects can be examined as well, such as how the project baseline and emissions reductions relate to the With Existing Measures (WEM) and With Additional Measures (WAM) scenarios set out in the Climate Strategy, and to what extent the project will help achieve the emissions reductions that existing and confirmed forthcoming policy measures seek to achieve. The baseline is determined based on a project-specific assessment by an external expert. Existing methods may be used in its definition where applicable, or it can be based on the assessment of the external expert who made the calculation. This assessment must state the grounds for the choice of baseline and describe the assumptions and uncertainties related to it. The guidelines on defining the baseline and taking emissions reductions into account are updated as required.

Defining the project scenario; emissions reduction potential and the assessment of realised emissions reductions

The project scenario is based on, among other things, the investment target's business plan and an assessment of the performance and scalability of its technology. The assessments conducted by the investment targets themselves

are evaluated by both the Climate Fund and external experts as part of the Climate Fund's due diligence process.

The assessment of the investment target's emissions reduction potential includes assessing the scalability of the technology, for example based on the investment target's business plan. The preliminary assessment of emissions reductions looks at the most likely amount and schedule of the emissions reductions generated by the project on the basis of the information available at the time of assessment. As a rule, this assessment is updated biannually based on the monitoring data reported by the investment target. The monitoring of realised emissions reductions is discussed in section 4 below.

Choice / definition of emission factors

The Climate Fund uses the most accurate emission factors suitable for the project. Possible sources include the IPCC's emission factors, more detailed local emission factors and the applicable life cycle emission factors. The choice of emission factors can be based on existing methods or the assessment of the external expert making the calculation.

Defining the emissions reduction and assessing additionality

The project is considered to reduce emissions equal to the difference between the project scenario and baseline. When assessing the added value provided by State funding, which is one precondition in the Climate Fund's funding criteria, the Climate Fund primarily considers how its funding will promote the realisation of the project.

4. ASSESSMENT, MONITORING AND REPORTING OF EMISSIONS REDUCTIONS IN THE CLIMATE FUND'S INVESTMENT PROCESS

An impact model of GHG emission reductions is drawn up for every investment target in the Climate Fund's investment process, used to assess the emissions reductions before the implementation of the project and monitored after the implementation of the project. The model is drawn up by the Climate Fund or an external expert according to the principles presented in chapter 3 above (Figure 5).

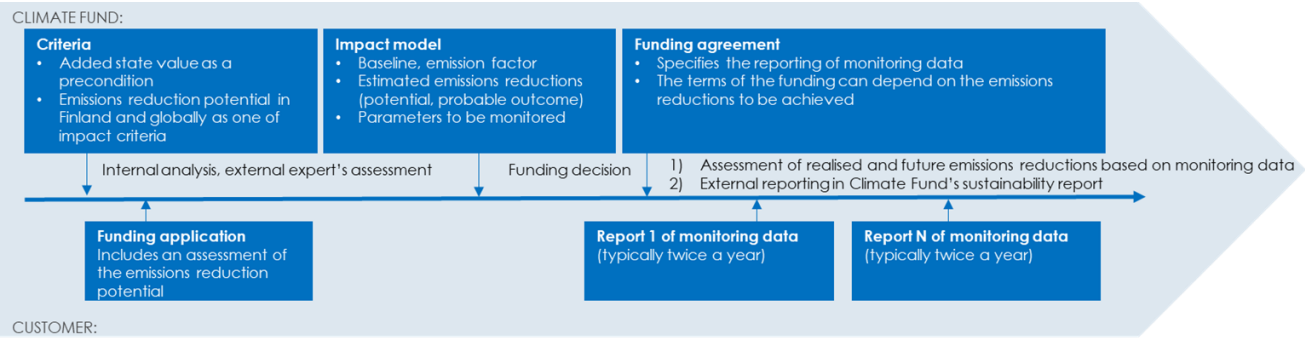

Figure 5. Emissions reduction monitoring in the Climate Fund's investment process.

The impact models, parameters to be monitored and reporting intervals are specified in the funding agreement. The terms of the funding can also depend on the emissions reduction achieved. Investment targets typically report their monitoring data biannually. Assessments of both realised and future emissions reductions are then updated based on the monitoring data. The updated assessments are reported annually in the Climate Fund's sustainability report.

5. EMISSIONS REDUCTION POTENTIAL CALCULATIONS FOR THE CLIMATE FUND'S INVESTMENT TARGETS

The Climate Fund's investment targets can have emissions reduction potential in Finland and abroad, and their potential is divided between sectors within and without the scope of the EU Emissions Trading System (Figure 6).

Case	Annual potential after 10y (MtCO2e)	Estimated total theoretical potential in 10y (MtCO2e/10y)	Finland	Global emphasis	Effort sharing sector	EU ETS	LULUCF	Additional investment need	Climate Fund's funding (MEUR)	EU Taxonomy-alignment*	Case type
Solar Foods	13,3	22,3	(X)	X	X		(X)	High	10,0		Facility investment
Elstor	0,1	0,5	X		(X)	X			4,0	(X)	Scaling up the deployment
Magsort	1,6	7,5	(X)	X		X			4,5		Scaling up the deployment
Betolar	Not reported	150,0	(X)	X		X			7,0		Digital solution
Aurelia Turbines	0,6	1,5		X	(X)	X			5,0	(X)	Scaling up the deployment
P2X Solutions	1,1	2,7	X	(X)	X	(X)		High	10,0	X	Facility investment
Joensuu Biocoal	0,1	1,1	(X)	X		X			5,0		Facility investment

(X) = partly

* Taxonomy-alignment refers to an assessment whether the company's operations are included in the EU taxonomy's list of sustainable activities. However, each investment target must have met the precondition of alignment with the EU Taxonomy's "Do no significant harm" principle during the due diligence assessment.

Figure 6. Assessment of the total potential of investment targets and the allocation of potential to different sectors.

For example, the emissions reduction potential of technologies aiming to reduce the emissions of heavy industry, such as those of Betolar and Magsort, is mainly allocated to the EU ETS sector. The emissions reductions sought by projects focusing on industrial-scale energy solutions, such as those of Elstor, Joensuu Biocoal and Aurelia Turbines, would mostly also be allocated to the

EU ETS sector. On the other hand, Solar Foods, aiming at reducing emissions in food production, and the P2X hydrogen production project that seeks to reduce traffic emissions are allocated to sectors not subject to emissions trading i.e. the effort sharing sector.

The emissions reduction potential of non-recurring plant investments, such as Joensuu Biocoal and P2X, is mainly allocated to Finland, while the potentials of technologies with major scaling potential, such as those of Solar Foods and Betolar, as well as the suppliers of more mature technologies, like Aurelia Turbines, are global and mostly allocated abroad.

When looking at the total potential assessments, it should be noted that the Climate Fund's investment would only be a small part of the financing needed for achieving the total potential. The realisation of the emissions reduction potential of the Climate Fund's investment targets is also completely dependent on the realisation of the investment targets' business plans. Because the business plans involve uncertainties, it is highly unlikely that the plans of all targets will be realised fully. Table 7 describes the emissions reduction potential in relation to the calculated realisation rate of the plan.

		Realisation percentage									
Case	Estimated total potential (MtCO2e/10y)	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Solar Foods	22,3	2,2	4,5	6,7	8,9	11,2	13,4	15,6	17,8	20,1	22,3
Elstor	0,5	0,1	0,1	0,2	0,2	0,3	0,3	0,4	0,4	0,5	0,5
Magsort	7,5	0,8	1,5	2,3	3,0	3,8	4,5	5,3	6,0	6,8	7,5
Betolar	150,0	15,0	30,0	45,0	60,0	75,0	90,0	105,0	120,0	135,0	150,0
Aurelia Turbines	1,5	0,2	0,3	0,5	0,6	0,8	0,9	1,1	1,2	1,4	1,5
P2X Solutions	2,7	0,3	0,5	0,8	1,1	1,4	1,6	1,9	2,2	2,4	2,7
Taaleri JBC	1,1	0,1	0,2	0,3	0,4	0,6	0,7	0,8	0,9	1,0	1,1
	Sum	19	37	56	74	93	111	130	148	167	186

Figure 7. Emissions reductions achieved by Climate Fund investment targets at different realisation rates.

Considering the profile of the Climate Fund's investment targets as mostly early- or growth-stage companies, the projected realised emissions reductions at the portfolio level could be placed in the region of under 50 Mt CO2-eq. over the next ten years. This would correspond to an average realisation rate of under 30% in relation to the full calculated potential.

By definition, the Climate Fund's investment targets are projects that would not be realised with commercial financing alone, so the realisation of their plans

can be considered to include a high degree of uncertainty. Furthermore, much of the total potential is provided by disruptive technologies, which can reduce emissions very much if they succeed. Their significant scaling potential must nevertheless be assessed quite conservatively in the early stages of technology development.

In the scenario, the average annual emissions reduction would be less than 5 Mt CO2-eq. The emissions reduction assessments expect the technologies to scale over time, so emissions reductions would centre around the end of the ten-year period. The emissions reduction potential of such technologies is mainly allocated abroad and in the EU ETS sector. If successful, however, domestic projects can make meaningful contributions to both the EU ETS and effort sharing sectors.

Perspectives related to the emissions reduction potential of the Climate Fund's future operations.

The Climate Fund has made investment decisions for around €45 million by February 2022. As mentioned above, the realised emissions reduction potential of this portfolio could currently be estimated at under 50 Mt CO2-eq over the next ten years. In future, the Climate Fund aims to make approximately €80 million in investment decisions annually. The following Figure presents the distribution of the Climate Fund's current dealflow by project type (Figure 8).

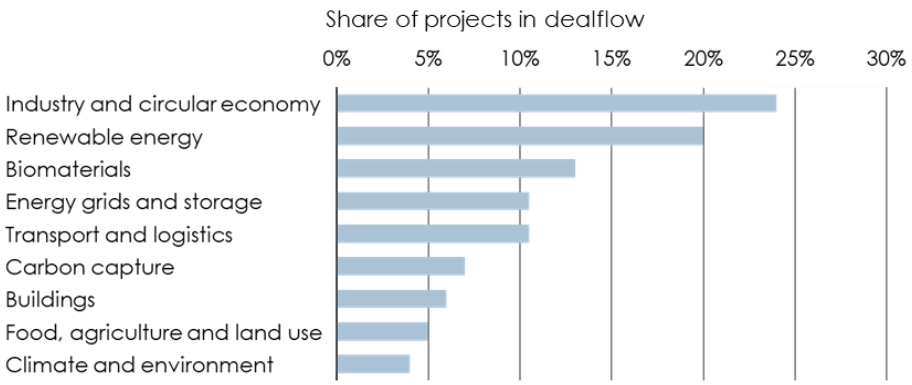

Figure 8. Climate Fund dealflow distribution by project type (including the currently active 115 projects).

The majority of the emissions reduction potential of the investment decisions already made is generated by two technologies with significant global scaling potential. The current dealflow does not contain many technologies or digital solutions with major scaling potential, so the monetary potential estimates of investment decision made within the current dealflow are expected to be smaller than the average for investment decision already made.

The emissions reduction potential related to implemented investment decisions is centred abroad and on the EU ETS sector. The potential of the Fund's current dealflow is similarly oriented, which is only natural as the sectors covered by the emissions trading system – heavy industry and the energy sector – typically have more targets for industrial-scale emissions reduction solutions. Projects aiming for international potential naturally also have the greatest emissions reduction potential. However, the dealflow also includes a significant number of projects focused on the effort sharing sector and Finland.

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