Workshop pre-read:

Perspectives on a Purchasing Programme for CRCF Permanent Carbon Removal

Workshop: 21 May 2025

Hugh McDonald[1], Jonathan Gardiner, John Tarpey, Benjamin Görlach (Ecologic Institute)

14 May, 2025

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1 Pre-read introduction

The following document serves as an informational pre-read for the workshop **Perspectives on a Purchasing Programme for CRCF Permanent Carbon Removal Credits,** taking place on 21 May 2025 in Brussels, hosted by DG CLIMA. The information in this pre-read synthesises the preliminary findings of an under-development study being prepared for DG CLIMA titled "An EU purchasing programme for permanent carbon removals: Assessment of policy options and recommendations for short-term policy design". This work is part of a project for the European Commission's DG CLIMA entitled Strategy for the Financing of Permanent Carbon Removals, running from Sept. 2024 – August 2025. Ramboll Management Consulting (Belgium) leads the project, in collaboration with Ecologic Institute, as well as input from Carbon Counts, Climate & Company, and CE Delft.

2 Context and report objectives

DG CLIMA is exploring options for an **EU purchasing programme for permanent carbon dioxide removals (CDR)** to address a critical gap in climate change mitigation. While emissions reductions remain the primary objective of EU climate policy, achieving climate neutrality and eventually net-negative emissions necessitates the **large-scale deployment of permanent carbon removals**. This requires the swift development and deployment of cost-effective and socially beneficial permanent carbon removal technologies.

A key challenge for upscaling permanent carbon removals is a lack of sufficient demand. The lack of demand stems from the nature of CDR, which, as a public good, generates little private value without policy intervention. While some private actors are purchasing limited amounts of permanent CDR in line with voluntary mitigation targets and corporate reporting, the limited current private business cases to purchase carbon removals highlights the significant role that public purchasing and public policy must play to generate demand. However, there are currently no EU-wide purchasing programmes for CDR and only limited concrete policy incentives to drive CDR demand. While some private actors and Member States are purchasing carbon removals, this is currently insufficient to drive scale up.

To address the lack of demand for permanent CDR, this pre-read and the workshop aim to explore the potential for an EU purchasing programme, with two focuses:

1. Identifying and assessing policy options for an EU purchasing programme
2. Proposing a detailed policy design for a purchasing programme in the short-term (2025-2030)

In this pre-read and workshop, we do not focus on supply of permanent CDR credits, and how this can be supported by policy. This is the focus of a parallel stream of work in the project (and was discussed in a previous workshop on the 28th of January 2025).[1]

This pre-read (and the associated report) builds on a literature review, expert interviews, and an assessment of fourteen relevant existing policies, to identify different policy options for a purchasing

[1] *Public funding for permanent carbon removal in the EU - European Commission*

programme and evaluate them in terms of effectiveness, efficiency, and coherence – that is, their potential to support the upscaling of permanent CDR.

3 Purchasing programme policy options and assessment

The overarching objectives of a purchasing programme for permanent CDR are to support the EU in meeting its climate objectives efficiently, safely, and fairly. We identify the following, more specific, objectives for purchasing programme design:

- Support CDR technology development
- Support CDR market development
- Purchase sufficient quantities of high-quality permanent CDR
- Ensure effective and cost-effective public CDR governance

We identify seven policy options for an EU purchasing programme, which offer a wide range of concrete, implementable options. To enable comparison, we present them as separate policy options but in reality, they could be combined, as discussed in section 3. They offer different strengths and weaknesses and are therefore suitable for different stages of policy development. We present them in approximate order of their potential temporal appropriateness—from short-term to long-term:

1. **EU-coordinated buyers' club**: An EU-coordinated buyers' club would be implemented by a public bank, with the funding for purchases of permanent CDR provided by private funders (e.g., companies with voluntary net zero targets or wanting to make contribution claims). Operating expenses would be covered by the EU Commission, who could also provide seed funding. The club would aggregate private demand and contract current and future purchases of CDR, using a mixture of pre-purchases (where suppliers receive funding up front), offtake agreements (where suppliers provide removals in the future and are paid upon delivering the credits), and ex-post purchases of delivered CRCF credits. In return for providing funding the private funders would be able to make claims using the CRCF credits purchased.
2. **EU Removals Fund**: The EU Removals Fund would be a publicly managed initiative within an existing EU institution (or contracted external authority). The fund has a mid-sized mandate to strategically procure diverse carbon removal units and shape the removals market—including for emerging technologies, building on precedents like the Innovation Fund and national schemes such as Denmark's NECCS fund.
3. **Centralised Procurement Agency**: A simple, centrally managed EU agency with a narrow mandate to aggregate and coordinate carbon removal purchases on behalf of the EU and its Member States (using auction-as-a-service approaches, similar to the EU Hydrogen Bank). This option enables economies of scale and lower transaction costs through pooled pay-as-you-go funding.
4. **Investment Vehicle**: A publicly endowed but highly independent investment fund—hosted within an EU financial institution—designed to leverage public capital with private

investment to build the removals market through a flexible mix of procurement, equity, and de-risking instruments.

5. **Independent foundation**: A privately managed, non-profit institution with a mid-sized mandate and high independence, designed to flexibly procure removals and develop the market using blended public–private funding, while operating outside the constraints of typical public sector rule. This model builds on the KliK Foundation example and could be particularly appropriate for implementing carbon removal obligations.
6. **Carbon Central Bank**: A separate and independent, publicly managed institution with a broad mandate to procure removals, shape the removals market, and manage any link between carbon removals and the broader carbon market (e.g. ETS integration). Such a novel and complex institution could offer advantages in terms of political independence, analogous to the European Central Bank, but would imply relatively high establishment costs and would only be justified by significant changes to broader EU climate governance.
7. **Rule-based mechanism**: A tightly constrained, low-autonomy mechanism operated by an EU agency to make carbon removals purchases based on predefined rules or market conditions, aiming to stabilise prices in the removals and/or ETS markets with minimal political interference (building on the example of the Market Stability Reserve).

Different policy options will be appropriate for different timescales, as the needs for a public purchasing programme are likely to shift overtime. This is closely linked to the technology and market readiness of carbon removal technologies, as well as EU capacities (i.e., timeline for implementing more sophisticated and politically challenging policies), and the wider EU climate policy decisions regarding the role for CDR, including use in any future compliance market or other removals obligations. Accordingly, the programme would need to be adaptable to future policy evolution.

We qualitatively assess the policy options against a set of assessment criteria, including effectiveness and efficiency. A summary of our assessment is presented in Table 1 Qualitative assessment of purchasing programme policy options**.** We use expert judgment and provide our assessment using a 5-point scale (--, -, 0, +, ++). All assessments are relative, that is, they compare across the different policy options to assess the specific indicator/question.

Table 1 Qualitative assessment of purchasing programme policy options, given current policy settings

Assessment criteria	Sub-criteria	Indicator/question	EU coordinated buyers' club	EU Removals fund	Centralised purchasing platform	Investment vehicle	Independent foundation	CCB	Rule-based
Effectiveness	CDR technology development and innovation support	Capacity to support the development of multiple technologies / removal types	++	++	0	++	++	+	--
		Ability to support large-scale facilities (>1 $MtCO_2$-e)	+	+	0	+	+	+	-
	CDR market development	Ability to crowd in private finance (beyond ETS/RTS);	+	0	0	+	+	0	-
		Capacity to develop market (e.g. co-ordination, standardisation, etc.)	+	+	0	+	+	++	--
	CDR Market demand: short/medium/ long term	Ability to generate permanent CDR market demand in short term	++	++	+	0	0	--	-
		Ability to generate permanent CDR market demand in medium-long term	+	+	0	0	+	+	0
	Public governance	Public oversight	+	++	++	0	-	+	0
Efficiency	Administrative costs	Low administrative costs for EU and affected parties (Member States)	0	-	0	-	-	--	+
	Administrative burden	Low compliance costs for business community, also SMEs	+	+	+	0	0	+	-
	Dynamic efficiency	Incentivises low-cost removals over time	++	++	+	+	++	++	--
Coherence	Avoids major policy changes	Require major adaptation of the regulatory framework	+	++	+	0	-	--	-

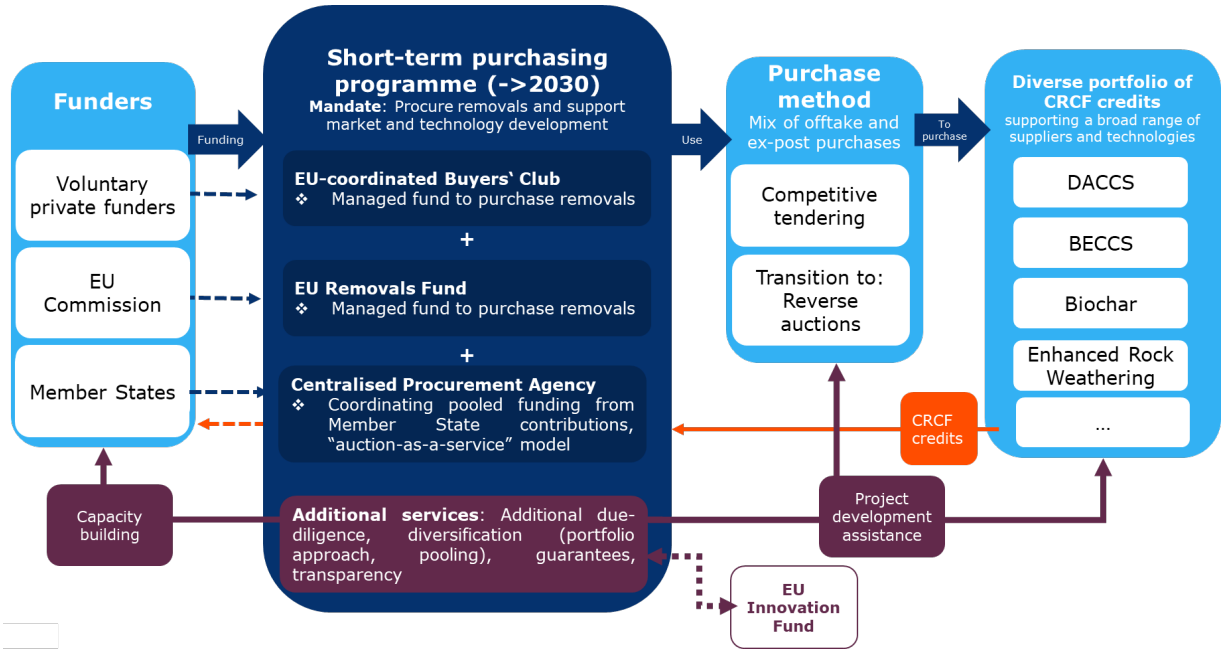
4 Policy design for a purchasing programme in the short-term (2025-2030)

The workshop and remainder of this pre-read focus on developing specific recommendations for the design of an EU purchasing programme for the short-term (2025-2030).

Considering the policy options proposed in section 2 and our assessment of their relative strengths and weaknesses, **for the short-term (2025-2030) we propose a purchasing programme based upon the EU Removals Fund combined with the EU Coordinated Buyers Club and Centralised Procurement Agency**. The combination of these policy options is the preferred short-term policy option as they offer the quickest and most effective means to generate demand incentives and support technology development. The EU Removals Fund has the advantage of offering a familiar institutional form and strong public oversight and adaptability, making it swift to implement and signalling public commitment to the development and management of permanent carbon removals. This could be extended and implemented in combination with elements of the EU Coordinated Buyers Club and the Centralised Procurement Agency, to facilitate increased, and coordinated, private sector and Member State funding for the purchasing programme.

In the following section, we identify key design elements for an EU purchasing programme including expected scale and target portfolio, purchase method and instruments, institutional structure, and funding, with particular focus on crowding in private and Member State contributions, among other issues. We present design options along with their associated opportunities and risks, offer recommendations, and consider implications for the long-term evolution of the policy. **Figure 1** presents a visual summary of the draft proposed policy design.

Figure 1 Policy blueprint: Recommended short-term EU purchasing programme for permanent CDR (draft)



Purchasing programme mandate

The **mandate** describes the purchasing programme's functions, objectives, the tools or resources it can deploy to achieve them, and what discretion it can apply in the execution of its tasks. This has important implications for purchasing programme policy design, with the mandate determining the appropriate shape and scale of purchasing programme. The optimal mandate will shift over time, as technologies and markets mature, and policy develops.

Mandates can range from narrow to broad, where broader mandates incorporate and extend narrower mandates:

- **Narrow mandate**: At the core, the essential function of the body is to purchase removals (i.e. permanent CRCF certified units) that can then be used by the (public or private) buyer.
- **Mid-sized mandate**: Beyond this, the body may also serve to develop the market for removals units and foster the scaling of removals as a business model – by providing the infrastructure for such a market, and/or by creating demand.
- **Broad mandate**: In the broadest interpretation, a purchasing programme may serve to actively manage the market for removals, and possibly even their integration with existing carbon markets.

Purchasing programme mandate - draft recommendation: A short-term purchasing programme should have a **mid-sized mandate**, going beyond simply procuring removals credits to also support the development of the removals market. Taking a portfolio approach, this implies strategic purchase of a range of removals credits to promote technology and market development (rather than just the cheapest credits) to support dynamic efficiency, but also the use of pooling and guarantees to reduce risks for buyers.

Purchasing programme portfolio and investment needs

The **portfolio** refers to the target purchase mix of removals from different permanent carbon removal methods. The portfolio should balance different objectives of a purchase programme, including technology and market development and social objectives, while minimising costs. When developing a purchasing portfolio, these objectives can be weighted and balanced in various ways.

If the key objective is purchasing permanent CDR to maximise the short-term quantity of deliveries of the **lowest cost** removals, the portfolio is likely to be heavily weighted towards a small subset of CDR approaches. This approach is cost-effective and scalable in the short term but offers limited long-term upscaling potential or support for technology development. Alternatively, if the focus is more on developing CDR technologies and markets, and maximising scaling potential, the portfolio could be broader—for instance, **evenly divided in terms of the money spent or tonnes delivered** per technology group. Another option is to focus on **specific technologies**, for example, DACCS, BECCS, and mineralisation technologies with mid-level TRLs. Many other potential objectives exist, reflecting that in addition to the range of technology readiness levels between the technologies, there are important difference with respect to cost, mitigation potential, co-benefits, and negative side-effects. While the purchasing programme will rely on the Carbon Removal and Carbon Farming Certification Framework Regulation for quality control, portfolio selection allows other policy priorities to be taken into account, including land and energy impacts, or administrative simplicity.

Investment needs: An important determinant of the ability of a short-term purchasing programme policy to deliver on its objectives is the scale of the policy—particularly its budget and quantity of removals purchased. This depends on the total amount of removals that are needed, the total investment necessary to purchase those removals, and the share of that investment that is to be met by the public purchasing policy. In addition to its implications for the public budget, the scale of the purchasing programme has implications for policy design. Larger budgets come with greater responsibilities, requiring additional governance. They also offer economies of scale that can support more sophisticated purchasing programme institutions, with greater capacities.

To estimate the investment needs, we take as a starting point the EU's 2030 ambition of permanently removing and storing 5 $MtCO_2$-e annually by 2030, mentioned in the EU Commission's Sustainable Carbon Cycles Communication. Based on the average cost estimates from the assessed portfolios, we estimate that the total investment requirement to meet the 5 $MtCO_2$-e per year by 2030 would be approximately €2.5 to €6.2 billion[2]. The upper bound of €6.2 billion corresponds to the "High Permanence" portfolio composed exclusively of DACCS, BECCS, and Mineralisation.

Portfolio – draft recommendation: Given uncertainties in technology development paths, we recommend starting with a broad portfolio, targeting many technologies. As technology and market development becomes clearer over time, this should transition towards prioritising cost-effectiveness, whilst still considering other societal objectives including energy use, land impacts, and social outcomes.

Purchase method

The **purchase method** entails selecting what to purchase, in what quantities, and at what prices, and how and when payments are made. Different purchase methods have different abilities to incentivise low costs, to differentiate between carbon removal types, projects, or companies, and different administrative complexity and cost. Accordingly, purchase method has implications for the effectiveness and efficiency of the purchasing programme and its ability to drive technology and market development. Purchasing programmes can carry out their purchases using several different approaches. We consider five options:

1. **Competitive project-based tendering** involves individual projects competing for funding, in exchange for providing units to the government at agreed date(s) in the future.
2. **Prizes:** the purchaser awards cash prizes to several 'winners' in exchange for providing removals
3. **Reverse auction**: tendering procedure where the removals contracts are awarded to the cheapest qualifying bids until the budget is exhausted.
4. **Flat rate price**: The purchaser commits to purchasing any number of removals that can be delivered at a given, pre-determined price.
5. **Carbon Contracts for Difference (CCfDs)**: the purchaser commits to purchase removals at an agreed minimum price (strike price) in the future, if the market price at that point in time is below the minimum price.

[2] *To estimate the investment needs, we draw on the methodology carried out in Carbon Gap's pilot purchase programme policy brief (Battersby et al. 2024). We take as a starting point the EU's 2030 aspirational goal of permanently removing and storing 5 MtCO2-e annually by 2030 and calculate the costs of different portfolios of technologies using data on costs per technology from Ramboll (forthcoming).*

6. **Equity investment and public ownership**: The purchaser provides funding in exchange for partial ownership or shares in a project or company.

Each of these approaches can be adapted to meet the different needs of different CDR technologies, while different purchase methods imply different timings for payments.

A key design question for the purchasing of CRCF-certified removals is the timing of purchases. Three distinct options are available:

- **Pre-purchase agreement**: The purchasing programme pays a CDR supplier upfront in exchange for a commitment from the CDR supplier to deliver carbon removal certificates in the future.
- **Offtake agreement**: The purchasing programme makes a contractual agreement with a CDR supplier, agreeing to buy a specific amount of future CDR credits at a specific price at a specific time in the future, with the payment made on delivery.
- **Ex-post payments**: The purchasing programme purchases CRCF credits once the removals have occurred and have been certified.

Purchase method – draft recommendation: In the short term, offtake agreements should be used to purchase removals through **competitive tendering,** which can consider multiple criteria and therefore best make strategic purchases and can also be swiftly implemented. Recognising the different needs of different technologies, different funding rounds should be run for different technologies. Offtake agreements should be employed to provide support before CRCF credit deliveries from lower TRL technologies (e.g. DACCS, BECCS). In the future, as the volume of CRCF credits generated by all technologies increases, the purchase method should shift to ex-post purchases through reverse auctions. In the medium term this could be facilitated through Carbon Contracts for Difference, with subsidies allocated through a reverse auction. While this will increase cost-effectiveness of the purchasing programme, it relies on a clear reference price for carbon removals, which, in turn, will depend on some form of compliance market integration.

Additional services

In addition to purchasing carbon removals itself, a purchasing programme can support additional demand from other actors by providing additional services such as expert support and de-risking mechanisms. These additional services can be a cost-effective way for the EU to support technology and market development. **Buyers of carbon removals, both public and private, face risks that may limit their willingness to purchase carbon removals–the purchasing programme can help manage these risks to boost demand.** These risks include quality risks, delivery risks, and policy risks, among others. Different additional services will be effective to minimise or manage each of these risks. We identify four categories or additional services that the purchasing programme could offer:

- **Diversification:** The purchasing programme would purchase a diverse portfolio of removals from different removals technologies, vintages, and providers. This portfolio approach spreads risk, reducing exposure to individual failures. It would also smooth the price for buyers, who could buy into the fund at an average price of the portfolio.
- **Due-diligence:** The purchase programme could perform additional due diligence to identify high impact, priority carbon removals projects. This would encourage private buyers into the

purchasing programme, who would be confident that they are purchasing the highest quality and impact carbon removals, without having to carry out the assessments themselves. The purchasing programme could work with the Innovation Fund, drawing on Innovation Fund assessments and assessment approaches, and also allowing for combined funding from public sources (through Innovation Fund) and CRCF unit demand (via purchasing programme), building on Stockholm Exergi example. The purchasing programme should also support market development through transparency, e.g. through public reporting of purchases and prices.

- **Project and buyer support**: The purchasing programme could support market and technology development through additional services. On the project side, the purchasing programme could offer project support, e.g. building on EIB **project development assistance** support under the Innovation Fund. The purchasing programme could also offer **capacity building** to buyers.[3]

- **Guarantees:** The purchasing programme could directly take on buyers' risk by guaranteeing their purchases of CRCF credits. This could take the form of **quality guarantees** (e.g. a commitment to replacing CRCF credits that fail, for whatever reason). They could also offer **delivery guarantees** for pre-purchase and offtake agreements, promising to source replacement CRCF credits in accordance with agreement terms if they are not delivered. This could be in the form of insurance, where buyers pay a fee to the purchasing programme in return for the delivery guarantee, or could be a flat-rate guarantee provided at the cost of the purchasing programme, for example through the creation of a buffer fund. The guarantees would be available to funders of the purchasing programme but could also be extended to buyers outside the programme

The purchasing programme must rely on other policies to further address buyer risks. Most pressing is policy risk, with buyers unsure about the longer-term role foreseen for carbon removals within EU climate policy, which generates high uncertainty over their value.

Additional services – draft recommendations: Additional services offer cost-effective tools to reduce buyer risk and crowd-in private buyers and should be employed, building on existing approaches employed in the Innovation Fund.

Funding

In the context of a permanent carbon removal programme, **funding** refers to the financial resources available to cover the costs of the programme and meet its objectives, including procuring removals, additional incentives or services, and operating costs. Funding can come from a variety of sources (e.g. EU, Member States, or private), and can take multiple forms (e.g. long-term commitments, short-term funds, or resources under the institutions' own control). From the perspective of designing an effective purchasing programme, these sources differ in terms of security of funding, speed, sufficiency of funds, burden for the public budget, and alignment with the 'polluter pays' principle.

Funding – draft recommendation: To maximise swift impact, funds should be encouraged from all sources. Initial funding should come from the EU budget; these could be re-targeted from existing funding streams, to enable swift establishment of the purchasing programme.

[3] *Buyers would also see other benefits of selling to the purchasing programme, including high degree of trust associated with the purchasing programme's high credit rating, ability to offer pre-funding, and to make large purchases.*

This should be complemented by voluntary private funding of the purchasing programme in the form of an EU-coordinated buyers' club. Funding should also come from Member State contributions, augmenting EU budget contributions, facilitated by the purchasing programme offering an auction-as-a-service model. Over time, the provision of funding could shift as the role of carbon removals in EU climate policy becomes clearer. Private funding should continue to be encouraged, including through clear signposting of a transition towards a future of mandatory private financing (whether through ETS integration or carbon removal obligations) (see box below).

Crowding in private financing

In light of limited EU budgets and the 'polluter pays' principle, a key focus for any policy option should be minimising public costs for permanent carbon removal and ensuring that those responsible for generating pollution bear the associated costs. In addition to reducing financial burden and implementing the polluter pays principle, private funding of a purchasing programme can also increase the total amount of funding for permanent removals, increasing the effective impact of public funding. Funding from private sources can be sourced either voluntarily or mandatorily. In this section, we discuss options for both of these avenues and identify key considerations.[4]

Private contributions – Voluntary:
Funding could come in the form of voluntary contributions from the private sector. These could be voluntary, matching procurement levels made by the procuring authority. They could also be facilitated through the structure of the auction-as-a-service model, with private companies contributing funds in return for the procuring authority to purchase removals on their behalf. Some models for voluntary private funding and existing examples include:

- **Private funding for public purchasing programmes**: The EU-coordinated Buyers Club model offers a trustworthy and expert one-stop-shop for CDR buyers, who receive claims on CRCF credits in return for providing private funding to the purchasing programme. Examples of private contributions to a public purchasing programme include the 2007 EIB-KfW Carbon Programme, which purchased CDM credits on behalf of private and public buyers.
- **Partnership**: A partnership model occurs when a private company, rather than directly providing funding to a purchasing programme, instead partners with the programme, investing its own funds in a complementary manner. In the EU context, the EU Breakthrough Energy Catalyst Partnership brings together EU funds and loans to partner with funding from a private foundation.
- **Private funding as part of a contract for difference**: The H2Global Mechanism, under the EU Hydrogen Bank, offers an example of how contracts for difference can crowd in private funding. The H2Global mechanism acts as an intermediary. They sell hydrogen to buyers (private funding), whose insufficient private payment

[4] *Our focus is on issues relevant for the design of a purchasing programme policy. Broader strategic issues, such as the equitable share of cost or the implications of different options for the EU climate architecture are out of scope of this paper; they will be considered in subsequent work.*

is topped up with a contract for difference (i.e. a subsidy) provided by public funders (public funding), enabling H2Global to purchase hydrogen from providers.

- **Private investment in a public fund**: Private-sector actors could invest in a publicly managed fund, which could purchase CDR removals credits today, to sell in the future (to private buyers). Private investors could invest today in hopes of returns when credits sold (or have access to future credit sales). There are numerous examples of private investments in publicly managed funds, including e.g. the EU Commissions and EIB's GEEREF fund, which invests in private equity funds working with renewable energy and energy efficiency in emerging markets.

Private contributions – Mandatory

Private sector contributions could also be mandatory. These could take the form of a removal obligation, with private companies obliged to provide funding for permanent removal purchases. Removal obligations could take multiple forms, for example linking to current emissions (e.g. ETS obligations, fuel importing requirements, CBAM integration, etc.) or historical emissions. They could come in the form of initial endowments or long-term commitments, or annual or occasional funding. Mandatory contributions will be a very important driver in demand in the medium-long term. Mandatory sources of private funding offer significant advantages across various criteria, including funding security, funding sufficiency, public financial burden and alignment with the polluter pays principle. In the short-term, these mandatory sources of private financing are unrealistic sources of finance for a purchasing programme, due to the significant changes they imply for EU climate policy and the significant establishment times they imply, but in the longer-term (post-2030), they offer attractive potential options for funding a purchasing programme.

Other design considerations

A number of other design decisions must be considered to ensure the purchasing programme can deliver on its objectives. We consider three additional issues:

- **Effective and just public governance** will be essential to ensure the purchasing programme supports socially beneficial CDR upscaling. It demands consideration of the principles of procedural, distributive, and reparative justice.
- **Ownership of carbon removal claims** has implications for public and private funder incentives, and the system as a whole. In the short term, partly transferring the claim to the removal outcome to the public funder but allowing additional sale of claims to voluntary buyers creates incentives for multiple buyers. To avoid integrity risks posed by double-counting, this should shift to proportional attribution of claims.
- **The EU purchasing programme will need to be compliant with EU rules on public procurement and state aid.** Differentiated approaches to different technologies should be permissible but additional legislation to provide certainty may be appropriate to speed up approval procedures.
- **Opportunities for combining public funding:** The purchasing programme should be designed in collaboration with other, related EU-funding streams to increase attractiveness to sellers and increase administrative efficiency. For example, the programme should link with the Innovation Fund, utilising its evaluation methods, experts, and results.

Longer-term evolution of the purchasing programme

Two aspects will be crucial for the longer-term evolution of an EU purchasing programme:

- **CDR technology and market development** is uncertain; how it develops has implications for how the purchasing programme design should evolve.
- The medium- and long-term development of an EU purchasing programme will be most sharply influenced by **broader developments in EU carbon removal and climate policy** (e.g., decisions regarding ETS integration of removals, removals obligation, the long-term vision for carbon removals in the EU, and developments beyond EU policy).

Short-term policy design must also respond and adapt as these decisions are met, to support an efficient and effective transition.

Ecologic Institute
ecologic.eu