Innovation Booster
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Evolving the Swiss CDR Ecosystem

Understanding Today's Challenges to Shape Tomorrow's Solutions

Innovation Booster Carbon Removal

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Executive Summary

Carbon Dioxide Removal (CDR) is a critical pillar in achieving global net-zero targets, especially in addressing hard-to-abate emissions and removing historical emissions already in the atmosphere. Switzerland is home to a growing number of CDR actors, from research institutions and startups to established businesses, yet visibility across the ecosystem remains limited, and challenges persist in scaling innovation.

This white paper, developed as part of the Innovation Booster Carbon Removal (CDR Booster), was initiated to help close this gap. Drawing from a survey of 74 stakeholders and a series of interviews, the report offers a snapshot of current CDR activities in Switzerland, identifies key challenges, and showcases examples of promising collaboration and innovation.

The findings reflect Switzerland's strong research and startup base, with most CDR activities originating in academia or through entrepreneurial initiatives.

However, challenges such as limited funding across the innovation pipeline, uncertain markets and regulatory frameworks, and lacking awareness remain key recurring gaps to overcome.

Despite these challenges, the Swiss CDR ecosystem demonstrates strong momentum. Case studies illustrate how real-world collaboration between academia, startups, and established businesses is helping test and scale new approaches. Various initiatives are fostering community-building, knowledge-sharing, and the formation of cross-sector partnerships.

This white paper aims not only to reflect the current state of CDR in Switzerland, but also to serve as a tool to shape future offerings of the CDR Booster and to inform public authorities, funders, and ecosystem builders on how to accelerate innovation in CDR in Switzerland.

CARBON REMOVAL BOOSTER

The Innovation Booster Carbon Removal, powered by Innosuisse, supports the early-stage testing of radical ideas that contribute to the development and scaling of the CDR ecosystem. It does so by fostering joint innovation, strengthening the ecosystem, and providing both financial and methodological support for collaborative projects.

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sus.lab is a "think-and-do-tank" of intrinsically motivated people with diverse backgrounds in engineering, science, management consulting, and entrepreneurship. Our mission is to drive the transition towards a net-zero and circular economy in collaboration with industry, policy makers, and academia.

Introduction

Carbon Dioxide Removal (CDR) is essential to achieving global climate targets and reaching net-zero emissions, as residual emissions from hard-to-abate sectors will make gigaton-scale CDR deployment unavoidable [1]. However, current capacity falls far short of what is needed [2].

Closing this gap will require accelerated innovation across a diverse portfolio of novel CDR solutions[1]. Innovation will be key to scaling technologies, reducing costs, and building market and infrastructure readiness [2,3,4]. To support this, governments must strengthen regulatory frameworks, raise public awareness, and expand funding and incentives across all stages of development to accelerate investment and adoption [5]. Nevertheless, the public sector cannot drive this transformation alone. As in other areas of climate technology advancements, cross-sectoral collaboration between governments, the private sector, and academia is a critical enabler of innovation [6]. Programs like the DemoUpCARMA[2] pilot project have shown the value of bringing together actors from government, industry, and research. A similar dynamic can be observed in the CDR Booster, where interdisciplinary teams - combining partners from research and industry - work together to develop and test early-stage ideas, ensuring that solutions are grounded in real-world needs and implementation contexts.

Switzerland has positioned itself as a leader in CDR development, building on its strong innovation ecosystem, financial resources, and progressive regulatory environment [7,8,9]. Early technological innovations in Switzerland have led to the development of some of the first commercial solutions of novel CDR globally. Beyond technological advancements, Swiss actors are also emerging as active buyers in the global CDR space, with large corporations having participated in prepurchases over 215kt of CDR as of April 2025 [10].

Finally, Switzerland offers a variety of platforms and initiatives for organizations in cleantech and specifically in CDR to connect and collaborate, such as CleantechAlps, Swisscleantech, the Swiss Carbon Removal Platform, or the CDR Booster. In addition to these initiatives, Switzerland's small size and strong research-industry network create ideal conditions for cross-sectoral collaboration, a crucial factor for developments in CDR.

This white paper was developed to address a key gap in Switzerland's emerging CDR landscape - a lack of visibility into who is active, what is being done, and where collaboration or support is most needed. This gap was consistently observed by the CDR Booster over its first year, during which it hosted multiple open innovation workshops with over 120 participants and supported 18 innovation teams.

To better understand the current state of the ecosystem, a survey with 74 participants from various sectors was conducted (**Figure 1**). The goal was to gain insights into both ongoing CDR activities, and the needs and challenges faced by these actors. This was followed up with in-depth interviews with selected ecosystem actors to explore case studies of challenges, innovation, and collaboration in more detail. Together, these findings offer a snapshot of where the Swiss CDR ecosystem stands today and provide a foundation to shape what comes next. The results should be used to provide valuable input for public authorities and decision-makers seeking to better understand and support CDR development in Switzerland, and to help guide the future design and offerings of the CDR Booster.

[1] *Novel CDR as defined by the State of CDR includes biochar, mineral products, enhanced rock weathering, biomass burial, bio-oil storage, bioenergy with carbon capture and storage, direct air carbon capture and storage, ocean fertilization, ocean alkalinity enhancement, biomass sinking or direct ocean carbon capture and storage.*

[2] *Demonstration and Upscaling of CARbon dioxide MAnagement solutions for a net-zero Switzerland.*

The Path to Swiss Carbon Removal

1998

Switzerland signs the **Kyoto Protocol**, committing to reduce greenhouse gas (GHG) emissions [11]

2002

ETH students found **myclimate**, a nonprofit climate protection organization, enabling climate protection through economic mechanisms [13]

2017

Switzerland ratifies the **Paris Agreement,** thereby committing to halve its GHG emissions from 1990 levels by 2030, in part through emissions reductions abroad. In addition, Switzerland announces it will reach **net zero GHG emissions by 2050** [15]

Climeworks launches the world's first commercial Direct Air Capture (DAC) plant in Hinwil, Switzerland [16]

2022

IPCC states that "The deployment of **carbon dioxide removals to counterbalance hard-to-abate residual emissions is unavoidable** if net zero […] emissions are to be achieved." [24]

Publication of **"Potentials and costs of CO_2 removal in Switzerland"**, analyzing the technical potential and costs of various CDR methods in Switzerland [25]

National working group for CDR ("AG CCS/NET"), initiated by the Swiss Federal Office of Energy (SFOE), coordinating expertise and stakeholder dialogue on CDR in Switzerland [26]

Founding of **Next Gen CDR facility**, bringing together multiple participating buyers, including SwissRe and UBS, to support projects that provide CDR at scale [27]

Founding of **Carbon Removal Partners**, a Zurich-based VC specializing on CDR investments [28]

2024

Switzerland and Thailand complete the **transfer of Article 6.2 carbon credits**, marking the first ever deal for emissions reductions under the Paris Agreement [29]

Launch of the **"Innovation Booster Carbon Removal"**, the first open innovation program in Switzerland focused on CDR, funding and supporting innovative ideas over four years [30]

Neustark achieves **milestone of removing 1'000 tons of CO_2**, as one of the few novel CDR providers using a non-biochar-based approach [31]

2000

CO_2 Act is enacted, mandating the reduction of Swiss CO_2 emissions to 10 percent below 1990 levels by 2010 [12]

2009

Climeworks is founded, as a spin-off from ETH Zurich, focusing on a technology to remove CO_2 directly from the atmosphere [14]

2019

Publication of **"The Role of Atmospheric Carbon Dioxide Removal in Swiss Climate Policy"**, by the Federal Office for the Environment (FOEN) to explore the current state of CDR in Switzerland and provide recommendations for Swiss climate policy [17]

2021

Swiss citizens **reject the revised CO_2 Act** [18]

Climeworks and Swiss Re enter into long-term partnership, signing the world's **first 10-year CDR purchase agreement** worth USD 10 million [19]

Kick-off of **project DemoUpCARMA**, to demonstrate the implementation and upscaling of two pathways for generating CDR in Switzerland and Iceland [20]

Stiftung Risiko-Dialog founds the **Swiss Carbon Removal Platform**, to help shape the CDR space in Switzerland in a sustainable and participatory way [21]

Kick-off of Innosuisse Flagship **project DeCIRRA**, identifying key players in Swiss CDR and assessing the acceptance and benefits of policy instruments to support CDR [22]

Carbon Removal ClimAccelerator is launched, a **CDR-specific accelerator program.** Initiated at ETH Zurich and TU Delft, it evolves into the privately operated accelerator **remove** in 2023, and supports over 120 CDR startups in Europe by 2024 [23]

2025

Klima- und Innovationsgesetz (KIG) enters into force, setting targets for the reduction of GHG emissions and use of CDR while providing financial support to companies for the use of innovative, climate-friendly technologies and processes, including CDR [32]

Portraits of Swiss CDR Actors

The following case studies offer a glimpse into the various actors shaping the Swiss CDR landscape: From a nature-based non-profit and established industry player to university spin-offs and deep-tech ventures founded by career changers, these organizations span the broad CDR ecosystem. Each profile provides a brief overview with further insights on their challenges, enablers and future needs featured throughout the white paper.

Divea is a startup that spun out of EPFL, where its membrane technology for carbon capture was initially developed by a research group around 2016 and later refined as part of a student-led research project. In 2024, Divea was officially incorporated, securing initial funding to commercialize its solution. The startup is focused on CO_2 capture directly at the source using Graphene membranes and is running its first pilot at an industry site of Gaznat. Divea's collaboration with Gaznat goes beyond this first industrial demonstrator. The gas supplier also funds several chairs at EPFL, supporting research projects and competence development around CO_2 capture, storage, and use for the production of synthetic gas specifically in Western Switzerland [33]. Divea has scheduled further demonstrator projects for 2025, in partnership with key actors in the aluminum and waste sectors.

KohlenKraft is a startup founded in 2023 by master's students at ZHAW. Initially focused on applying biochar in agriculture, the team discovered that while large companies were purchasing biochar-based CDR credits, the actual product was rarely used or sold. This insight led them to explore alternative uses for biochar beyond agriculture. KohlenKraft began developing climate-positive materials for the construction industry, specifically focusing on biochar-based plaster. Since then, the startup has expanded its offering with the launch of "KlimaKumpel," a line of carbon-negative gifts such as flowerpots and plant sets, produced using its own CO_2-based additive. Through close collaboration with the CDR community, they are gathering early customer and peer feedback.

Open Climate Solutions (OCS) is a non-profit organization founded in 2022, focused on developing regenerative CDR solutions that not only reduce CO_2, but also enhance biodiversity and support local ecosystems. OCS is currently working on an aquaculture-based approach involving regenerative seaweed farming, which contributes to CDR, sustainable food systems, and marine regeneration. In addition to producing biostimulants and biochar from ongoing projects in Scotland, OCS is also processing waste algae from the Lake of Zurich into similar products. OCS takes an open innovation approach to its work to help others learn and launch their own regenerative practices more quickly.

Recoal was founded in 2023 with the purpose of removing CO_2 through the conversion of moist waste biomass into carbonisates at high pressure and temperature. The produced carbonisates are subsequently stored underground in geological sites, such as abandoned quarries or other extraction sites for mineral resources. Recoal has worked closely with research institutes and industry partners such as ETH Zurich, ZHAW, TU Delft, and Helbling for feasibility studies. Recently, Recoal collaborated with FHNW on an Innosuisse innovation cheque and secured funding from the Migros Pionierfonds to bring their technology to market maturity.

The **Swiss Carbon Removal Platform** was founded in 2021 as an initiative of Stiftung Risiko-Dialog to provide a space where all actors involved in CDR can openly exchange ideas and information, following its vision of "scaling up CDR, sustainably, together." The initiative traces its origins to 2016, when a project brought together scientists and experts in climate engineering. Ongoing discussions and a formative report [34] at the time underscored the need for stakeholder exchange and networking—highlighting how collaboration could benefit both the participants and the complex, cross-sectoral issue itself. The platform provides stakeholders with continuity that goes beyond the usual research projects, offering the opportunity for actors to connect beyond individual projects and specific topics.

The **Services Industriels de Genève (SIG)**[3] is a public utility serving the Canton of Geneva, providing essential services such as water, gas, electricity, thermal energy and wastewater treatment. It also manages waste recycling and supports the development of smart districts, along with implementing energy and environmental efficiency programs. As part of its efforts to reduce climate impact, SIG initiated a project to address residual methane and CO_2 emissions from its biogas production. Media coverage of neustark's activities at the time prompted SIG to explore a potential collaboration with the CDR startup to process and durably store the captured CO_2. As of April 2025, SIG and neustark have removed more than 400 tons of CO_2 at the pilot site at the Aïre sewage plant.

[3] *Headquartered in Vernier (GE), SIG is an autonomous public-law institution with legal personality and subject to the supervision of the State Council.*

Swiss Carbon Removal Landscape

The following graphics present results from the survey, conducted in early 2025. Seventy-four individuals from 58 organizations across Switzerland participated, illustrating the wide distribution of CDR activities and expertise throughout the country. To ensure clarity, responses from different teams or departments within the same organization (e.g., research groups at ETH Zurich) were grouped under a single umbrella organization. While the results reflect the perspectives of those who responded and may not capture the full ecosystem, they offer valuable insights into current trends, key stakeholders, and emerging needs within the Swiss CDR landscape.

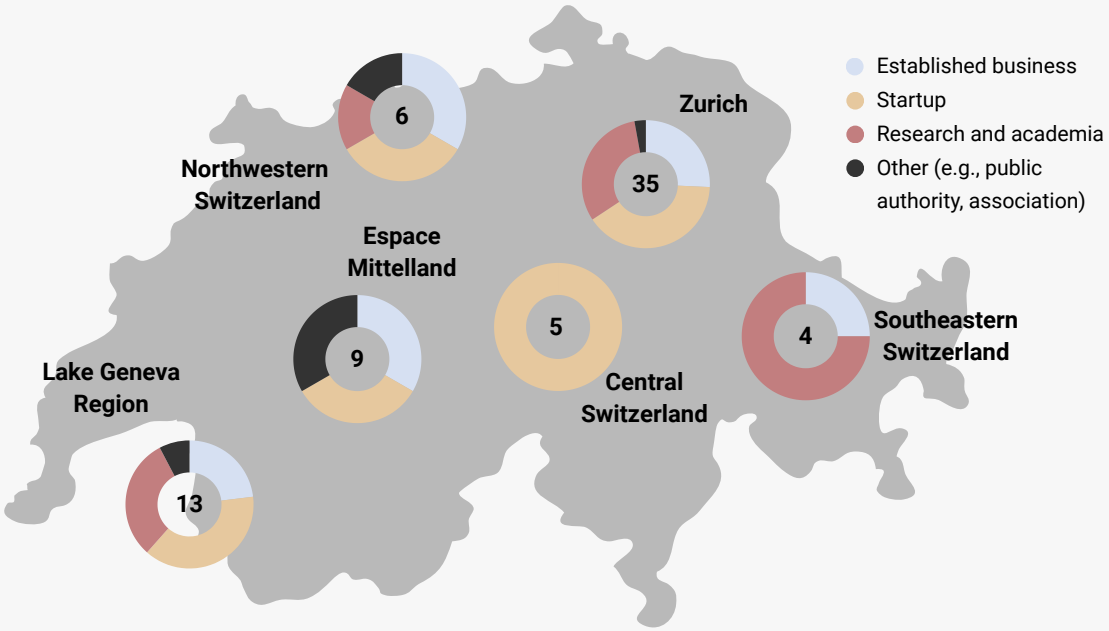

Figure 1: *Survey participants are distributed throughout Switzerland. Clusters can be seen around the canton of Zurich and the Lake Geneva area with 35 and 13 participants respectively, reflecting the influence of the international tech hubs of Zurich and Geneva as well as research institutions such as ETH Zurich and EPFL, along with their startup scenes (**Figure 6**) [35]. Further actors are linked to universities of applied sciences, public authorities on national, cantonal or municipal level, a few associations and multiple established businesses and startups throughout the country.*

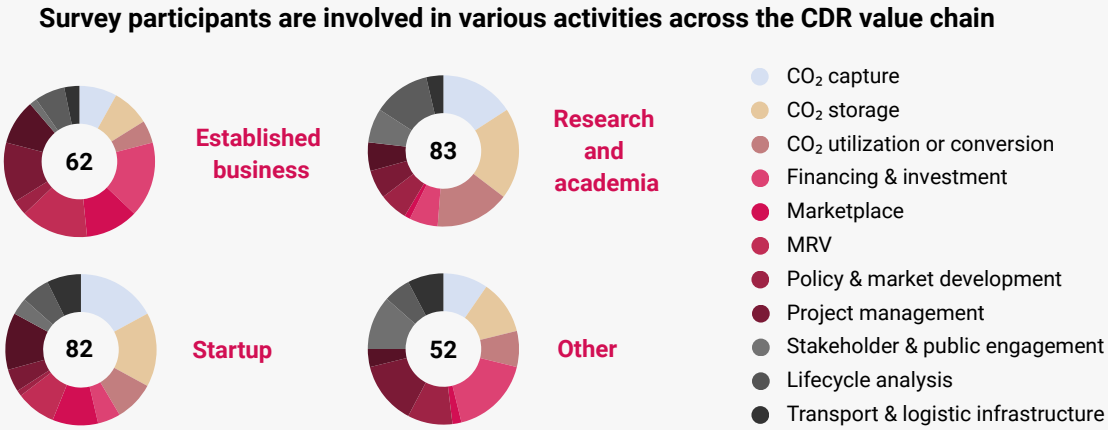

Figure 2: *Established businesses (n=18), mentioning 62 activities, operate mostly in financing and investment, Measurement, Reporting, and Verification (MRV), and policy and market development. Startups (n=30) state 82 activities, showing more engagement in activities around CO_2 capture, storage and project management. Meanwhile, research and academia (n=19) devote significant attention to CO_2 storage, CO_2 utilization and conversion, while also being more active in systems integration and lifecycle analysis. Other actors (n=7), such as public authorities and associations, mention 52 activities that cover important aspects such as financing, policy development or stakeholder collaboration.*

Among all survey participants, nearly two-thirds are CDR suppliers - as illustrated in **Figure 3**. The remaining participants are enablers - focused on non-implementation aspects such as research, policy, or consulting. As shown in **Figure 4**, CDR suppliers involved in the development, testing, or implementation of CDR activities can be further categorized by their respective Technology Readiness Level (TRL). Suppliers cover a broad range of CDR methods (**Figure 5**) and often originate from academic discovery or entrepreneurial initiatives (**Figure 6**) .

Nearly two-thirds of survey participants are CDR suppliers, while a smaller share acts as enablers

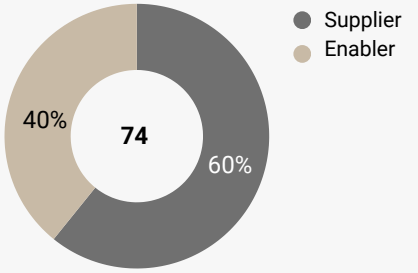

Figure 3: *Distribution of survey participants by role in the CDR ecosystem, distinguishing between suppliers (involved in development, testing, or implementation of CDR activities, n=44) and enablers (focused on research, policy, consulting, or other non-implementation aspects of CDR, n=30).*

Over 40% of CDR suppliers operate at higher TRL, indicating proximity to market deployment

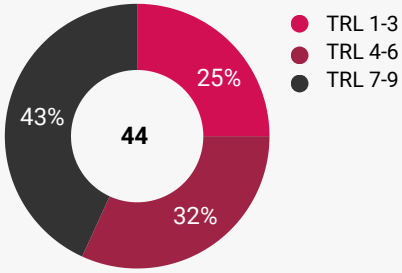

Figure 4: *Distribution of TRL associated with activities of suppliers. TRL 1-3 (n=11) covers the research stage, TRL 4-6 (n=14) describes technologies in development, moving from lab validation to demonstration in the relevant environment, whereas technologies at TRL 7-9 (n=19) have reached the deployment stage.*

Participants are engaged in a diverse mix of CDR methods*, often simultaneously

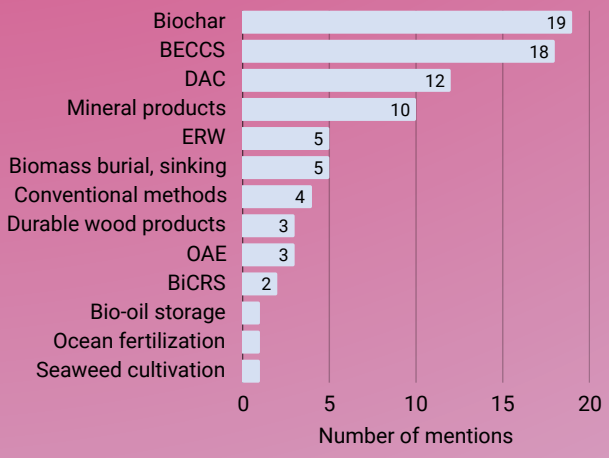

Figure 5: *Distribution of CDR methods in which participants are actively involved. Most are focused on technologically advanced methods such as biochar and BECCS. More than 60% of participants are active in more than one method, indicating cross-method synergies and growing momentum in the field.*

**BECCS = bioenergy with carbon capture and storage*
DAC = direct air capture,
ERW = enhanced rock weathering
OAE = ocean alkalinity enhancement
BiCRS = biomass carbon removal and storage

CDR initiatives most commonly originate from academic discovery or entrepreneurial initiative

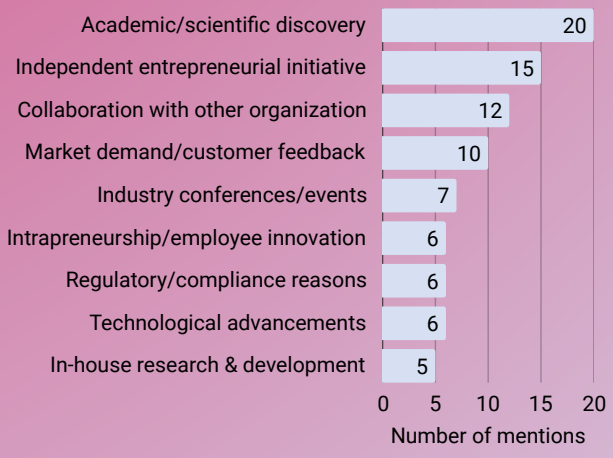

Figure 6: *Distribution of responses to the question regarding the origin of participants' CDR initiatives. The two most often mentioned - academic discovery and entrepreneurial initiative - reflect Switzerland's strong foundation in research and early-stage innovation. Frequent mentions of collaboration with other organizations and market demand underline the importance of both cooperation and economic viability in shaping CDR activities.*

Challenges and Required Support to Accelerate Swiss CDR Activities

As part of capturing the current state of the Swiss CDR ecosystem, this chapter explores the key challenges and needs identified by survey participants. Understanding these is essential for shaping targeted support mechanisms that can accelerate the development and deployment of CDR technologies in Switzerland. The survey responses point to key challenges that, to varying degrees, are perceived to hinder progress across the ecosystem: funding constraints, market and regulatory uncertainty, as well as low awareness or acceptance. Further insights on these as well as other recurring challenges are explored in the case studies and complemented by quotes from the interviewees.

Funding emerges as a key challenge across TRL

When asked about their key challenges and needs, survey participants most frequently mention funding constraints, especially at low to mid TRL (**Figure 7**). Although funding difficulties are not unique to CDR [35], they highlight the importance of increasing funding throughout the development process if CDR is to scale up to meet climate goals.

"Obviously, there is a lack of funding, but we do not want to rely on external sources. We want to generate revenue through product sales to drive the development of our core technology."

Charles Gerike-Roberts – Founder & CEO (KohlenKraft)

The case of OCS shows how teams can struggle to secure the resources needed to maintain core operations, particularly in early phases of development. Many startups aim to generate revenue through products or services beyond CDR, using these to help fund their CDR activities and reduce reliance on external funding.

"Enabling faster progress through investments and private funding is essential for the commercialization of our technology."

Karl Khalil – Co-Founder & CEO (Divea)

However, this approach is often less viable for technology-heavy, capital-intensive solutions, where the high upfront costs make cross-financing insufficient or even impossible [36]. This is illustrated in the example of SIG, where financial challenges also affect an established business, particularly when planning large scale CDR projects. Broader discussions are ongoing around how such projects can be funded [37]. Options range from private investment and public-private partnerships to fully public funding, as in the example of Zurich's sewage sludge utilization plant [38].

"Swiss investors tend to be cautious – but taking six months to decide on an investment can easily kill a startup."

Bojan Martin – Co-Founder (Open Climate Solutions)

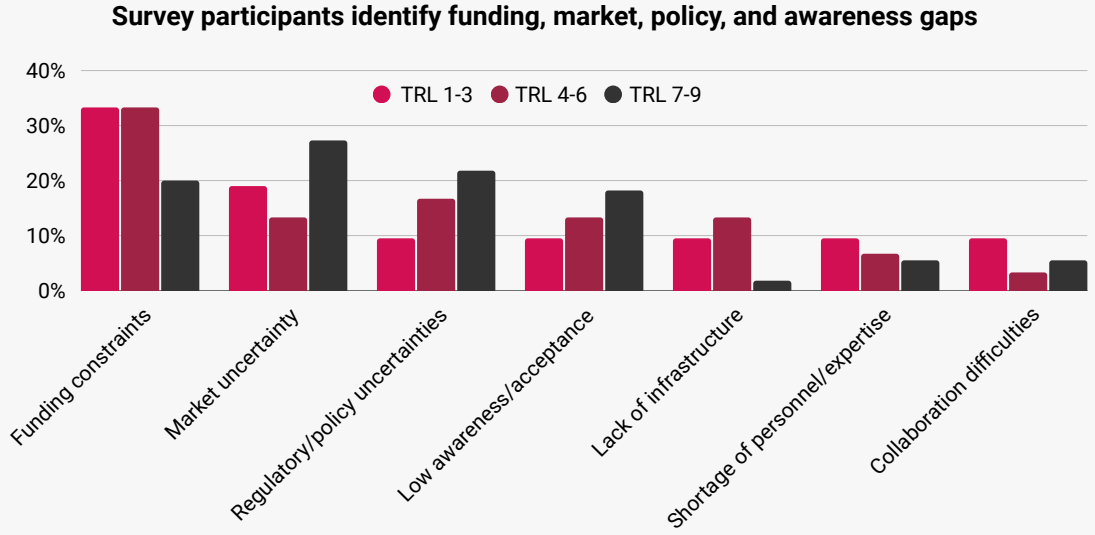

Figure 7: *Distribution of mentioned challenges for scaling CDR activities, grouped by TRL. The values indicate the relative frequency (%) of each challenge among the total challenges mentioned within each TRL segment.*

A lack of readily available funding remains

A central pain point for **Open Climate Solutions** has been access to stable funding. Until recently, OCS was critically underfunded, operating solely on grants and donations as a non-profit, with no salaries for team members. While recent support, including the CDR Booster, has helped cover essential activities, significant gaps remain – particularly when it comes to securing sustainable financing for core operations. OCS reports that, generally, there is a clear funding gap in Switzerland throughout the CDR value chain, and across all stages of technological development. Financing for deep-tech and capital-intensive solutions like CDR remains difficult to access. Although capital exists, it is often highly selective, and traditional due diligence processes are not always well suited to early-stage climate ventures.

Funding gaps slow large-scale CO_2 capture

Services Industriels de Genève highlights the need for additional funding mechanisms, such as those provided by the Klima- und Innovationsgesetz or cantonal programs, to support projects and reduce financial risks. It points to two key developments that would help move the sector forward: First, the emergence of large-scale, reliable demand and offtake for captured CO_2; and second, the availability of financial incentives and funding options for all the actors involved to de-risk investment. Such support is seen as essential for enabling major projects like those planned by SIG at the Aïre sewage plant and in the industrial area of Bois de Bay, which together have the potential to capture around 7'000 tons of CO_2 per year.

Uncertainty hinders progress

Following funding issues, market as well as regulatory uncertainties were identified as further critical challenges to deploy CDR technologies. This is of little surprise, as generally the core "products" of CDR activities are CDR credits. As of today, most purchases and transactions of such credits happen in the voluntary carbon market (VCM) [2,39]. The VCM is based on voluntary efforts and private initiatives, operating largely outside formal regulations. Since there is currently no clear outlook on how the carbon market will evolve and guidance from regulators is limited [40], stakeholders working on CDR face several challenges.

These include uncertainty about future demand, difficulty identifying potential customers and their willingness to pay, and a lack of clarity on which standards to follow to ensure compliance with possible future regulations. In addition, actors in Switzerland can face a complex landscape as regulations around CDR activities might differ across cantons.

"The market for CO_2 remains narrow, and if there is insufficient demand for biogenic CO_2, we will end up sitting on it."

Alexandre Laforêt – Projects & Operations Engineer (SIG)

Uncertainties call for diversified value streams

Open Climate Solutions is aware of the current uncertainty surrounding CDR markets and regulations and has intentionally chosen not to make its business model reliant on the fluctuating price or long-term viability of carbon credits. Instead, the organization sought to design CDR as a co-benefit, rather than as the primary revenue stream. The main value lies in the biostimulant it produces, which supports regenerative agriculture and climate resilience. In OCS's view, CDR markets will only scale if we are able to reduce the market uncertainty. A key element of this is to move from voluntary to compliance markets that provide the conditions to reduce that uncertainty.

Need for regulatory flexibility and openness

Recoal emphasizes the importance of regulatory flexibility and technological openness to foster innovation and enable emerging CDR methods to succeed. They highlight the value of regulatory sandboxes[4], such as those offered by the Swiss Federal Office of Energy [41], as essential tools for testing and validating new approaches. Given the current uncertainty and evolving nature of CDR regulations, Recoal is actively exploring storage options both within Switzerland and across the EU to ensure their solutions can scale under different future policy scenarios.

[4] A regulatory sandbox is a tool that allows organizations to test and experiment with new innovative products, services, or business models under the regulator's supervision. It incentivizes innovators to test their technologies in a controlled setting while helping the regulators better understand them.

While market uncertainty affects actors at all stages of development, it becomes particularly acute as CDR technologies move towards higher TRL, and market interaction becomes more relevant (**Figure 7**), following similar findings that were explored in other reports [36,42].

Likewise, regulatory and policy uncertainty become increasingly relevant with technological maturity, as technologies move from research to market deployment and real-life environments, where regulations can have implications for day-to-day operations. This underlines the need for supportive policy frameworks and market incentives to facilitate broad implementation of CDR and prevent innovative solutions from failing to move towards execution because of adverse regulations.

The strategy shared by Open Climate Solutions of exploring alternative revenue streams to mitigate uncertainties is one that is followed by an increasing number of CDR actors [36,42]. Others, such as Divea, choose to focus on deliberate customer selection to secure long-term relationships.

> **"Focus on sectors where your solution solves a real problem to create genuine value."**
>
> *Karl Khalil – Co-Founder & CEO (Divea)*

Low awareness and acceptance become more relevant at higher TRL

Similar to regulatory uncertainties, public acceptance and awareness are more relevant to survey participants at higher TRL, which can be expected as their technology moves from the lab to implementation in "the real world" (**Figure 7**). This highlights the need for targeted communication and awareness-building efforts to ensure that emerging CDR solutions are not only technically viable but also publicly accepted. Previous research and experiences from the DemoUpCARMA project, for example, show that the public is mostly unfamiliar with CDR and public acceptance largely depends on stakeholder communication [43,44].

> **"We see it as one of our key responsibilities to provide science-based information on CDR, enabling knowledge sharing and informed dialogue across society, industry, and policymaking."**
>
> *Samuel Eberenz – Co-Lead*
> *(Swiss Carbon Removal Platform)*

Case studies suggest that proactive outreach, relatable messaging, and tangible examples can help build awareness and bring CDR into the public conversation.

Lack of public and political visibility

Recoal notes that CDR still lacks a strong public and political lobby, making it crucial for actors in the field to actively engage across the ecosystem. They see it as part of their responsibility, as well as that of all other stakeholders, to speak up, invest time, and participate in open dialogue. Without proactive engagement, they believe, the needs and perspectives of CDR actors will not be adequately reflected in the evolving regulatory, financial, and public landscape. For Recoal, building connections and contributing to conversations is essential to help shape a supportive environment where innovative CDR solutions can succeed.

Making CDR tangible and relatable

Early into their CDR Booster project, **KohlenKraft** realized that what was most important at this stage, was to demonstrate that CDR is possible in a relatable way. They observed that while many people care about sustainability, few are willing to significantly change their lifestyles. This led them to explore how to engage that mindset and communicate the reality of CO_2 storage in a tangible form. The result was the creation of the "KlimaKumpel" cup – a product that physically stores CO_2 and helps spread the message in a simple, accessible way. One of the major challenges they highlight is reaching audiences beyond the CDR community, particularly those who are not actively thinking about sustainability – where making net-zero feel realistic and within reach is specifically important.

Other challenges, such as access to infrastructure, shortage of skilled personnel, or sufficient collaboration opportunities might be less relevant to actors overall, but they should not be neglected.

A lack of infrastructure is perceived for mid-TRL

Owing to the nascency of the CDR market, actors also face various challenges regarding the complexity of the CDR value chain and its required infrastructure. While activities at TRL 1-3 often benefit from a research environment, with access to academic labs and facilities (**Figure 6**), this might change as technologies move to first prototypes and pilots, where access to and testing in an operational and industrial environment can become more relevant to technological development. However, such a transition often comes at a cost that not all actors can bear.

"We are transitioning out of EPFL – support from the Canton of Valais has made it possible to set up a new industrial facility, a crucial step toward commercialization."
Karl Khalil – Co-Founder & CEO (Divea)

Shortage of qualified personnel not an issue (yet?)

Similarly to what has been shown in other reports [36,42], a lack of skilled people is not considered a major issue by survey participants at this point. Established actors either have the capacity to attract qualified personnel or meet their needs through internal training and development. For many early-stage actors, growing their headcount is not a priority yet, likely due in part to limited funding. However, this could change over time if startups and established businesses scale up their operations.

"Our pilot plant allowed for on-site learning and further training for our engineers and technicians."
Alexandre Laforêt – Projects & Operations Engineer (SIG)

Collaboration is key

While survey results indicate that networking or collaboration does not cause concern, over 20% of participants across all TRLs state that collaboration, specifically with industry, would be beneficial to deploy their technologies. **Figure 8** shows the organizations and consortia most mentioned as collaboration partners among survey participants. Key organizations include research institutions such as ETH Zurich, EPFL, ZHAW, and EMPA, as well as government bodies like FOEN, ecosystem platforms such as the Swiss Carbon Removal Platform, and joint initiatives like DeCIRRA and DemoUpCARMA. With partners across academia and industry, these joint initiatives can be a valuable source of collaboration across sectors.

"We would like to see more engagement with large companies. We want to understand their pain points and challenges and bring them into the CDR conversation."
Charles Gerike-Roberts – Founder & CEO (KohlenKraft)

Survey responses highlight that collaboration takes many forms, ranging from joint research projects to business model development and consulting. Research institutions typically partner with other academic groups, while startups and established businesses are more likely to engage in cross-sector collaboration, especially in the context of pilot projects and early market validation.

Research institutes and joint initiatives are mentioned often as partners and collaboration opportunities

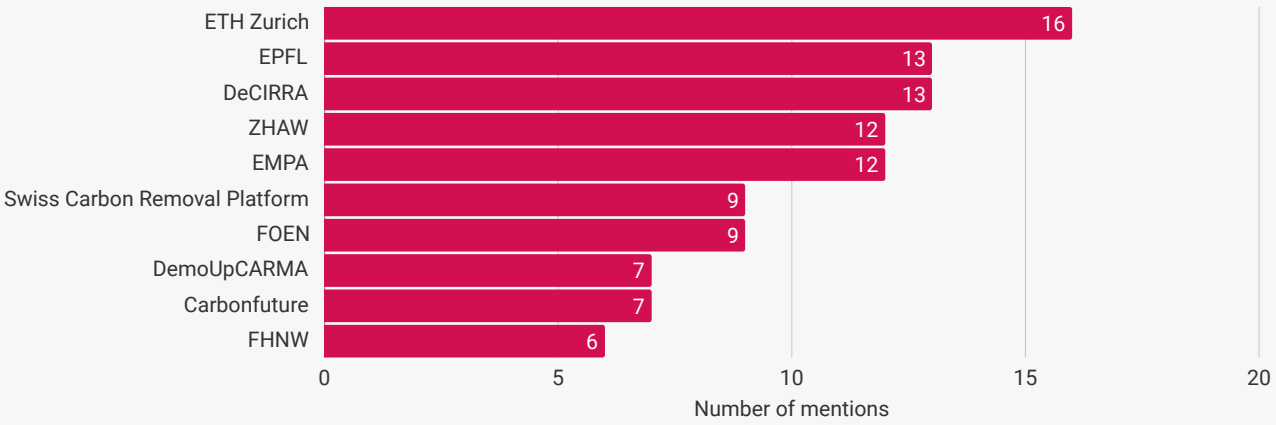

Figure 8: *Most mentioned organizations or consortia that survey participants collaborate with. ETH Zurich's prominence, alongside EPFL, ZHAW, and EMPA, highlights the central role of Swiss research institutes in shaping CDR collaborations. The inclusion of DeCIRRA signals the growing importance of multi-stakeholder consortia in advancing the ecosystem.*

"We hope to see a distribution network that facilitates connections and collaboration between producers and off-takers of CO_2."

Alexandre Laforêt – Projects & Operations Engineer (SIG)

These results, as well as insights from the case studies highlight the importance of multi-actor collaboration to advance the CDR ecosystem, as well as to develop one's own activities. This can include collaboration on practical applications such as pilot testing under industry conditions or access to shared infrastructure and on-site learning.

"It is really important that knowledge, techniques, and methods developed in academia do not stay locked up. We need an easy and effective bridge to bring these innovations into the real world."

Bojan Martin – Co-Founder (Open Climate Solutions)

Broader forms of collaboration are just as important: leveraging strong ties to academia and ecosystem platforms for knowledge exchange or maintaining an extensive network to cover the varying needs as CDR development progresses.

"Real progress happens through conversation and mixing of people from different sectors. It is essential to bring together all ecosystem players to talk, exchange, and build solutions together."

Charles Gerike-Roberts – Founder & CEO (KohlenKraft)

Building dialogue across the CDR landscape

The **Swiss Carbon Removal Platform** provides a space for all actors interested or active in CDR to openly exchange ideas and knowledge. It plays a key role in facilitating connections, delivering content-related input, supporting socio-political discourse, and offering science-based information to the public. A central pillar of the platform's activities is its event portfolio, including networking apéros, webinars, and two dedicated working groups: "R&D Innovation & Pilots" and "CDR Policy" for its over 70 member organizations. The platform sees significant opportunity to involve more private sector actors, especially from the financial and industrial sectors. While their respective associations are often present, the platform encourages greater direct involvement from businesses that are essential for driving large-scale projects and shaping the dialogue around financing and implementation.

Complex value chains require collaboration

Recoal describes the challenge they are addressing as highly complex, with a product that spans the entire CDR value chain and involves actors with diverse interests and needs. While the team had already built a strong network prior to founding the company, they emphasize that real progress is only possible through active engagement with the broader community and stakeholders. This means sharing their perspectives, seeking support, and knowing whom to approach at different stages of their journey. Recoal highlights the value of the Swiss CDR community, particularly the role of the Swiss Carbon Removal Platform, in fostering exchange, offering input, and connecting them with the right partners. They note that the constructive atmosphere and collaborative spirit within the ecosystem serve as a source of motivation, even when facing inevitable challenges.

Pilot site bridges lab and industry needs

Divea reports that its first demonstrator has been up and running at Gaznat's industrial site since late 2024. In addition to providing financial support for the pilot, Gaznat has offered space at its site, allowing Divea to test its membrane technology under real-life industrial conditions. This has been crucial in demonstrating that the membranes are not just functional in the lab, but also robust and effective in operational environments. While laboratory testing remains important, the pilot enables validation with actual industrial gas streams, including impurities that are not present in controlled lab settings. Divea emphasizes that the site offers an ideal combination of laboratory flexibility and industrial relevance, allowing for frequent iteration and rapid learning, yielding valuable insights for scaling the technology.

Validating CDR technology through low-risk pilot

Services Industriels de Genève expressed interest in collaborating with neustark due to their status as a Swiss-based company offering an innovative and attractive carbon sequestration technology. The partnership created multiple opportunities: neustark provided a low-cost and compact liquefier solution for SIG's pilot project, allowing for low-risk technology validation. The pilot also served as a valuable hands-on learning platform, enabling on-site training for SIG's engineers and technicians. Additionally, neustark's ability to process industry-grade CO_2 directly eliminated the need for further refinement, helping SIG avoid complex and costly purification processes.

Conclusion & Outlook

Considering the challenges stated in the survey and case studies, there still is potential for progress in the Swiss CDR ecosystem, especially in creating more funding opportunities, stable market demand, and guidance on regulatory developments. This is confirmed by many survey participants and interviewees, who believe that there is room for further engagement around CDR in Switzerland (**Figure 9**). Particularly, they point to enhanced policy and market-based incentives, increased funding and investments, as well as rapid development of relevant infrastructure and facilities as measures for advancing the ecosystem (**Figure 10**). To make this happen, engagement at various levels is needed – across individuals, across organizations, across the country, and beyond its borders.

"We value the mix of people in the Swiss CDR ecosystem – from industry veterans to total newcomers. It is an exciting space to be in – and it feels like we are finally moving past the 'cowboy era.' There is huge potential, and we hope more people from different backgrounds jump in and help shape what comes next."

Charles Gerike-Roberts – Founder & CEO (KohlenKraft)

"While the community is very active and engaged, we feel that the ecosystem is still nascent and fragile. Initiatives such as the CDR Booster will certainly help with bringing people together, there is still a lot of room for further engagements and activities."

Samuel Eberenz – Co-Lead (Swiss Carbon Removal Platform)

A majority of survey participants see the need to further develop the Swiss CDR ecosystem

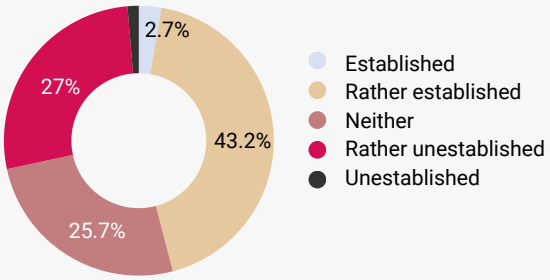

Figure 9: *Survey participants view on the status of the Swiss CDR ecosystem.*

Policy and market-based incentives as leading forces for CDR development

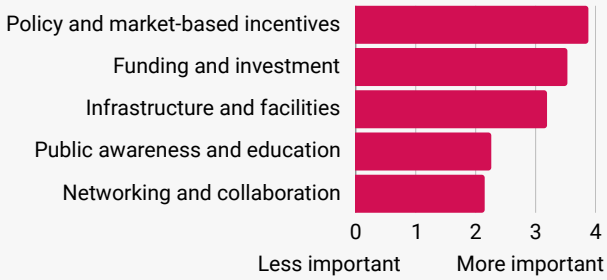

Figure 10: *Average perceived importance of priority areas for strengthening CDR development in Switzerland.*

Given current estimates of CDR growing into a substantial market [45], there are many opportunities for actors to participate in:

Governments should continue to engage in dialogues with both startups and established businesses to better understand what support is needed to advance CDR. Clear guidance on planned regulations and a flexible, innovation-friendly policy framework will be key to enabling new solutions to emerge and scale.

Financial institutions, including banks and insurers, could take a more active role in providing capital and de-risking mechanisms, helping to close the funding gap, especially for capital-intensive and early-stage technologies.

Established industries can support innovation by offering infrastructure, expertise, and real-world testing environments, to help bridge the gap between lab-scale research and market deployment.

Scientists have a critical role to play in communicating beyond academia, informing the public and policymakers and laying the groundwork for an informed and science-based dialogue on the risks and benefits of different CDR methods.

At the same time, startups and early-stage actors are called upon to speak up and help shape the conversation. Their perspective is essential to making other stakeholders aware of the support and conditions needed to advance their work.

The insights highlighted in the survey are reflected in participants' planned next steps (**Figure 11**). The most frequently mentioned are "forming or expanding partnerships", "commercial deployment", "strengthening research and development", as well as "scaling up pilot projects and demonstration plants". These goals point to a maturing ecosystem that is preparing to move from early experimentation to broader implementation.

Expanding partnerships is the top priority in participants' planned activities for the coming years

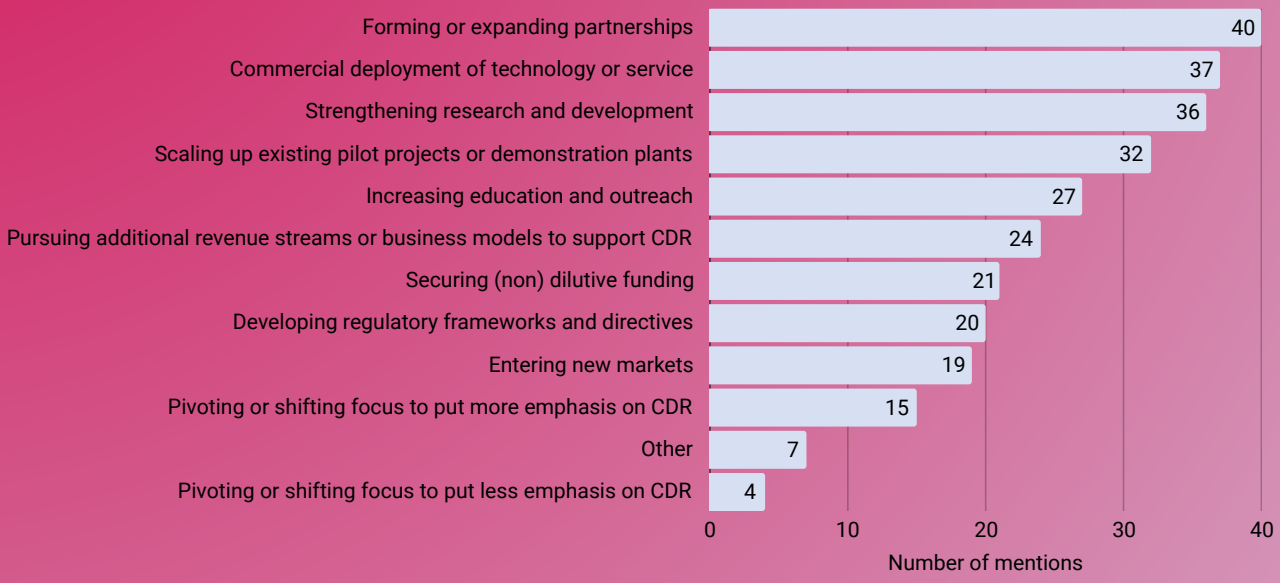

Figure 11: *Planned activities and measures for the upcoming five years as stated by the survey participants.*

Switzerland's CDR community remains relatively small and familiar, with an openness that encourages transparency and collaboration. At this early stage, both the ecosystem and its individual actors continue to benefit from cooperation. As the field moves into a more established and possibly more anonymous space, it will be crucial to maintain this culture of openness and shared learning to ensure progress at the required pace.

"We really appreciate the community that has emerged in Switzerland. It has allowed us to exchange, ask for help and input, and connect to the right partners to bring us forward. There is an amazing positive energy which helps us stay motivated to progress even when we are facing challenges and obstacles."

Pirmin Aregger – Co-Founder (Recoal)

The coming years will be decisive for accelerating CDR in Switzerland and globally. To support this, the CDR Booster will continue to foster collaboration and facilitate early-stage innovation through its open calls, ideation workshops, and funding for pilot projects.

These activities aim to address part of the needs raised by ecosystem actors, especially around testing ideas, building partnerships, and advancing early-stage solutions. However, to truly close the gaps identified in this white paper, other actors across the ecosystem will also need to step up: from enabling infrastructure and flexible funding mechanisms to open knowledge exchange and long-term policy direction.

"There is still work to do in breaking down silos where people protect their ideas rather than sharing. We can go further, faster together if we truly collaborate – we simply don't have the time to lose."

Bojan Martin – Co-Founder (Open Climate Solutions)

Scaling CDR will not happen through isolated efforts. It will require coordination, openness, and a willingness from all sides to contribute. Whether by enabling small but meaningful advances or helping push promising solutions to the next level, the time to act is now.

"It is all about small steps – we are not promising the world, but it is one little step at a time."

Charles Gerike-Roberts – Founder & CEO (KohlenKraft)

Method

This white paper was developed as part of the Innovation Booster Carbon Removal. To gain a better understanding of the current landscape, a survey targeting Swiss CDR actors across various sectors was conducted, focusing on their CDR activities, perceived gaps and challenges, existing collaborations, and future needs. The survey received 74 responses. While the results reflect the perspectives of those who responded and may not capture the full ecosystem, they offer valuable insights into current trends, key stakeholders, and emerging needs within the Swiss CDR landscape. Additionally, six in-depth interviews were conducted with selected ecosystem actors to explore case studies of said challenges, innovative solutions, and strategies for collaboration in more detail.

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Agroscope
Airfix Carbon
Aquaforge
Arrhenius
Bakz4ever
Bigfoot
Carbon Removal Partners
Carbon Standard International
Carbon Valleys
Carbonfuture
Circea
CleantechAlps
Clima Now
conspark
Coopérative Carbone Paris & Métropole
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EBP Schweiz
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Permutation
PostFinance
Pyronet
Recoal
Rytec
Services Industriels de Genève
SkyCell
SolidWatts
South Pole
Swiss Climate
Timber Finance
University of Fribourg
VBSA
WasteOlas
WattAnyWhere
WSL
ZHAW

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