Report
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Our Synthesis: a Photo

Extreme weather events have become a daily reality. This year alone, the news has reported severe winters with prolonged snowstorms, torrential rains, numerous and intense tornadoes, devastating fires, heat waves with unbearable temperatures, unprecedented thaws and warming oceans. In any season or latitude, unprecedented records have been reached, reinforcing the view that the Earth's climate is indeed changing. As we know, the increasing frequency and intensity of these phenomena result from the non-linear nature of the climate system. Therefore, as long as emissions are not curbed and the planet's temperature continues to rise, the perceived effects will unfortunately accelerate.

In Dynamo Reports 112 and 113, we pointed out that this issue has different repercussions for companies. On the one hand, it imposes a need for investment and adaptation costs for some, and on the other, it enhances opportunities and boosts revenues for others. The incentives for the race towards decarbonization are beginning to take root. Consumers increasingly express their choices according to the sustainability values conveyed by brands. Investors are starting to factor different corporate strategies and commitments towards a low-carbon economy into their risk/return equations. Governments here and around the world are rushing to establish their institutional frameworks[1]. Changes in behavior, market forces and regulatory initiatives are aligning to induce and select the climate/environmental filter as a competitive criterion in the corporate environment.

Here at Dynamo, we are continuing our efforts to advance our knowledge of these issues, which are likely to prove increasingly relevant to the performance of our portfolio. And so, in mid-April, we had the opportunity to attend a conference in San Francisco on carbon capture. Given the interest, topicality and relevance of the subject, the idea of this Report is to share with our readers the main notes from the trip and some of the resulting reflections.

First, a few more conceptual points to set the context. As we described in more detail earlier (Dynamo Report 112), scientific understanding is becoming increasingly widespread that a warming of the planet beyond the limit of 1.5 °C triggers climate change with severe repercussions for life on Earth. In order to avoid catastrophic and irreversible consequences, we urgently need to curb anthropogenic emissions of greenhouse gases and the rise in global temperatures. As a suggested trajectory, scientific models indicate that global emissions would peak in 2025 and then be reduced until we reach neutrality in 2050, when we should remove every ton of CO_2 equivalent that we put into the atmosphere. Unfortunately, at the current rate, we're far from getting on this path. Even considering the more recent acceleration of commitments and initiatives by the various levels of government and different civil society entities aimed at promoting the decarbonization of economies, we are still rapidly consuming the planet's carbon budget[2].

1 *A bill to create a jurisdictional carbon market in the country (the Brazilian Emissions Reduction Market) is currently before Congress for a vote.*

2 *In 2022, global CO_2 emissions increased by 1.5% compared to the previous year, reaching 36.1 billion tons (Gt). Recent studies have found a scenario for the remaining carbon budget that is even tighter than that described by the IPCC's 2021 report. According to the new estimates, at this rate, in order to reach the target of 1.5 °C, with a 66% probability, we would only have 1.7 years of budget available for use. In the 2 °C scenario, there would still remain 23.7 years (Liu et al. 2023). This account does not take into account non-anthropogenic emissions, such as methane, nitrous oxide and others, which makes the effective slack for emissions even smaller.*

Schematically, the management of carbon removal can be divided into two main categories. The first block represents the so-called "nature-based solutions" (NBS). NBS are an umbrella concept, comprising various approaches and definitions. For our purposes here, NBS refers to the ecological approach to climate risk management, when responses to societal challenges involve initiatives with nature in order to deliver benefits for people and biodiversity, either by considering the economic and social effects for local communities and their surroundings, or through the preservation, resilience and restoration of natural ecosystems. The concept is based on the knowledge that preserved and well-managed natural ecosystems produce a diverse range of services on which human well-being depends, from carbon storage, flood control and coastal protection to the provision of clean air and water, food, fuel, medicines and genetic resources.

The second line of action covers engineering solutions designed to carry out "artificial" carbon removal. These are technologies, equipment or constructions that capture carbon from stationary sources – emission points of industrial plants or energy generating units – or directly from the atmosphere. This paradigm is called carbon capture, utilization and storage (CCUS) when the captured carbon (CC) can be reused in the same industrial facilities where it is produced, transported and sold as a product for utilization in other activities (U) or stored permanently in geological cavities (S). Carbon captured at industrial plants prevents new emissions from reaching the atmosphere. Carbon captured directly from the atmosphere (DAC) removes carbon that has already been emitted, thus reducing the total volume of CO_2 available.

There is also the possibility of combining the two approaches, when, for example, the emissions from a biomass-based energy generating unit are captured and stored, a technology known as BECCS (bioenergy with carbon capture and storage). BECCS has the appeal of an emission-negative technology, since the plants used as biomass remove carbon from the atmosphere and the carbon emitted in the industrial process is captured and stored geologically.

The discussion about the advantages and disadvantages of each of the two sets of technologies has been a long one. NBS are generally more cost-effective and offer other important co-benefits such as biodiversity, climate regulation, protection of water sources, pollution reduction, pollination, and income and work for local communities, among others. It is estimated that around 35% to 50% of mitigation in the short term (up to 2030) will come from NBS, with the capacity to remove around 11.3 billion tons (Gt) of CO_2 , mainly through forest management (BCG, 2022)[3] The main arguments against NBS are: (i) a possible conflict with other land uses, such as food production; (ii) the need to consider the life cycle of the carbon captured and then released back into the atmosphere through the different uses of biomass, and (iii) the fact that NBS eventually displaces efforts/resources that could be allocated directly to reducing the carbon footprint of industrial processes instead of "just" offsetting emissions through removals in nature[4].

CCUS technologies are valued for their potential scale, for being the only possible form of removal in the so-called difficult-to-abate sectors – cement, metallurgy, steel and chemicals – and for theoretically offering very long-lasting capture when properly stored in safe geological deposits. In addition, they can promote the retrofitting of industrial plants and thereby obviate emissions estimated at 8 Gt of CO_2 in 2050 (IEA, 2020); they also offer a platform for low-cost hydrogen production. Because CCUS technologies play a dual role, contributing both to the reduction of CO_2 in strategic sectors and to the removal of emissions from those segments where they cannot be avoided, experts say that achieving net zero will be practically impossible without CCUS. On the other hand, the main concerns vis-à-vis CCUS solutions consist of (i) large investments in the construction of capture plants and generally high per-ton costs of captured CO_2; (ii) the need to

3 *As usual, in order to make the text more fluid, we prefer to keep the list of quotations short. The full references of the material we consulted are available on our website, in the library menu, at www.dynamo.com.br/pt/biblioteca.*

4 *This third argument seems inaccurate to us, as it evaluates the merit of the initiatives in terms of tons of carbon only, disregarding other broader benefits of NBS, as we'll see below.*

develop dedicated transportation infrastructure; (iii) uncertainty about the safety and sustainability of storage; (iv) the lack of a legal and regulatory framework addressing the responsibilities and obligations of the various players involved.

Preferences aside, there is a consensus among experts that the two major groups of actions are complementary and not mutually exclusive. In light of the urgency of the problem, the delay in the trajectory of commitments and the gap in ambitions, the academic discussion of whether we should opt for one set of alternatives versus another is meaningless. At this point, all initiatives are welcome.

NBS have a broad taxonomy, including functional ecological restoration (passive or active) of habitats; ecological intervention; reforestation, rehabilitation; reconstruction; revegetation; marine protection of springs, diverse lands, slopes and mangroves; and climate adaptation management. Just as an illustration of the extent of the possibilities, a systematic mapping of the scientific literature by researchers at the University of Oxford identified almost 22,000 studies examining the effects of NBS interventions on climate issues (Chausson et al., 2020). There is also a broad spectrum of benefits that NBS can provide by regulating variables such as biodiversity; temperature; flooding; sea levels; landslides and slope erosion; saline intrusion; air, water and soil pollution; and urban resilience, offering multiple socio-economic repercussions, such as public health, income, employment and education, among others (IBRD, 2021). This is why investments in NBS have attributes typical of public goods, as they address externalities in other segments.

The CCS industry has been gaining traction again since 2017, after a period of reduced rates of additions to capacity; indeed, in the last two years, projects in "advanced development" have grown substantially. The Global CCS Institute, in its latest report based on data up to September 2022, estimates that the capture capacity of the 196 projects spread across the planet totals 244 Mton/year, an annual compound growth of around 34% over the last five years (GCCSI, 2022). According to IEA estimates, in the Net Zero 2050 Sustainable Development scenario, CCUS technologies would be responsible for 15% of the cumulative reduction in emissions, and should contribute to the capture of 5.6 Gton/year. In other words, despite recent efforts, we are still well behind the curve, and the industry's installed capacity would need to grow by around 23x, or 80% of current production potential, every year.

In the last two years, several countries have advanced public policies to stimulate the development of CCUS, setting budget space and innovation funds, and establishing legal frameworks[5]. Even in regions where there is already a more established carbon credit market, such as the European Community, without government support it is very difficult to overcome the funding equation, the relevant investment and the long implementation cycle of CCUS projects, which can take eight years, between approvals, procurement and execution.

5 *These include the IRA* (Inflation Reduction Act) *in the United States, which expanded the limits of tax incentives available for CCUS projects from USD 35/ton to up to USD 180/ton, depending on the technological route adopted.*

Dynamo Cougar x Ibovespa Performance in R$ up to August 2023

Period	Dynamo Cougar	Ibovespa*
120 months	222.5%	131.4%
60 months	75.6%	50.9%
36 months	-7.6%	16.5%
24 months	-23.1%	-2.6%
12 months	10.0%	5.7%
Year (2023)	10.6%	5.5%
Month (August)	-6.5%	-5.1%

(*) Ibovespa closing. Indices are presented as economic reference only, and not as a benchmark.

With this brief overview as a backdrop, let's move on to the trip. In April, we took part in the Carbon Negative Conference, an event promoted by Credit Suisse in partnership with Elon Musk's Musk Foundation. The meeting brought together around 500 investors and 130 companies at a hotel in San Francisco, CA. Most of the companies present took part in the XPRIZE Carbon Removal competition.

Launched in 2021, the XPRIZE Carbon Removal is a global incentive prize sponsored by the Musk Foundation that promises to distribute USD 100 million over four years, with the main objective of stimulating viable, high-quality carbon dioxide removal (CDR) projects. Participating teams must produce work that demonstrates the feasibility of removing at least one thousand tons of CO_2 per year, as well as submitting a plan capable of removing up to gigatons per year. Basically, the evaluation criteria look at whether the proposal is scientifically and operationally robust, whether it can be scaled up in a sustainable way and whether it makes economic sense (reasonable cost). The response to the initiative was a success and garnered applications from 1,180 groups around the world. In February 2022, XPRIZE awarded 15 prizes of USD 1 million and announced the 60 best teams from this first stage of evaluation. In 2025, the rest of the prize money will be awarded to the grand prize winner and three runner-up teams.

In its third edition, the conference was an opportunity for companies to present their projects and network with potential financial backers. The environment was one of startups and early-stage investors, so it was quite different from the "traditional" conferences we usually attend, where we meet public companies sharing slots with equity analysts.

All 60 winning projects from the first round were present at the conference. The companies were classified into four groups according to the main CO_2 removal vector/technology: air, land, rocks, and oceans. The conference followed the format of this original division. On the first day, there were panels on air and land. On the second day, it was the turn of companies with projects based on rocks and oceans. Each panel was attended by five companies, usually the CEO and/or founder, plus an XPRIZE representative as moderator. The following two days were dedicated to discussions with experts. A direct carbon capture (DAC) project in Iceland was presented, as well as panels on due diligence/investment in CDR companies, prospects for the voluntary carbon market, liquidity in carbon markets and, finally, a conversation with executives from Microsoft and Salesforce addressing the perspective of buyers of carbon removal projects.

The agenda for the first three days included slots for meetings between investors and companies. As the ratio of investors to companies was low, it was possible to get exclusive meetings or with just one or two other investors, which meant the conversations flowed well. In addition, the interlocutors' interest was also homogeneous: trying to understand the nature of each solution and assessing its growth viability. The experience also contrasted with that of conferences with listed companies where, no matter how hard the hosts try, it is common for investors with different approaches, interests and investment horizons to wind up meeting in the same slot, which often ends up reducing the take-up rate of each meeting.

The carbon removal industry is still facing numerous difficulties, delays and skepticism. In addition, the situation has been aggravated by the setback imposed by the war in Ukraine, when energy security overshadowed the environmental agenda, precisely in the region with the most leading role and a climate vanguard, the European Community. Despite this more adverse macro-environment, it was very interesting to see the participants' enthusiasm. Just in terms of reference, the most "established" companies present at the conference had annual revenues of between 1 and 5 million dollars. The vast majority were still at the "pre-revenue" stage. Many of them, presented by the scientists who created the solution, looked like newborn projects from academia, trying to attract their first investors and make their way through the tight funnel of competitive financing in an emerging industry. That's why the certificates for the first million dollars won in the competition were invariably presented as an eloquent trophy.

As a curiosity and an illustration of the diversity of alternative solutions, below we describe the profile of some of the companies present at the conference. In a balanced approach, we have selected twelve groups, three in each technological vector:

Air

ZS2 – Based in Calgary, Canada, ZS2 has developed a technology that uses tailings, saline water and CO_2 captured directly from the atmosphere to produce a new cement formulation (based on magnesium oxysulfate$_4$) that is carbon negative, fire- and bacteria-resistant, cost effective and energy efficient. Cement is one of the most widely used materials in the world and the industry, considered one of the "difficult to abate" sectors, accounts for around 6% of global emissions.

Air Company – Working out of a hangar in Brooklyn, NY, Air Company has developed a sustainable aviation fuel (SAF), combining in a hydrogen reactor (obtained from the electrolysis of water using renewable energy), CO_2 captured from various sources, including the atmosphere, and some proprietary catalysts, added as a secret sauce. The result of the process is a liquid paraffin, which, after several separations, makes SAF. The aviation sector is responsible for 3% of global emissions and is also considered hard to abate. The company plans to make its fuel commercial in 2027 and is already in talks with JetBlue and Virgin Atlantic.

Carbon (Direct Air Capture LLC) – The technology patented by the company's founding chemistry professor transforms carbon from the atmosphere into carbon products based on nanomaterials, substances with valuable properties, stronger than steel, with multiple applications, such as construction and high-capacity lithium battery manufacturing. The nanofiber is obtained at low cost in a simple electrochemical reactor using solar energy. The process removes CO_2 from the atmosphere without the need to concentrate it. As the graphite products are very stable, the solution offers permanent removal and does not need a carbon market to be viable.

Rocks

Carbfix – Rocks are natural storers of large amounts of carbon. The company has developed a technology that mimics and accelerates these natural processes, where carbon dioxide captured from industrial emission sources is dissolved in water without the addition of any other chemical element and interacts with reactive rock formations, such as basalts, to form stable carbonate minerals, providing permanent and safe removal of CO_2. For the Carbfix technology to work, only three ingredients are needed: favorable rocks, water and a source of carbon dioxide. The company already has a plant in operation in Iceland, where it uses geothermal energy. Moreover, Carbfix has received funding from the European Community Innovation Fund to scale up the project with a new, even more optimized plant.

CarbonCure – Knowing that the construction sector accounts for around 36% of global emissions, the company has developed a technology that consists of capturing carbon dioxide by injecting it during the concrete manufacturing process. Once injected into the mix, the CO reacts with the calcium ions in the cement to form a nano-sized mineral, calcium carbonate, which is incorporated into the concrete. The reaction produces an even stronger concrete and the CO_2 chemically converted into a mineral is stored permanently, even if the structure is demolished. CarbonCure currently operates with a removal scale of 100,000 tons/year of CO_2 .

Carbonaught – The company has developed an innovative solution based on a weathering protocol. Weathering is the process by which rocks are broken down by natural forces. Carbonaught's solution accelerates this process by crushing waste rock from mining activities and pulverizing it in degraded soils. The nutrient-rich minerals increase agricultural productivity and the

bicarbonate ions that are formed flow into the oceans, increasing their alkalinity, which allows them to absorb twice as much CO_2, depending on the composition of the rocks. Through a less common solution – the treatment of inorganic carbon in the soil – the company aims to address two major problems at the same time: climate change and food security.

Land

Netzero – Netzero has developed its own technology for producing biochar from agricultural waste. Biochar is, in essence, atmospheric carbon captured by the process of plant photosynthesis and stabilized in solid form through a pyrolysis reaction whereby the material is heated to 650 °C in the absence of oxygen. Due to its physical and thermal properties, the end product is used in agriculture as a soil conditioner. Its high porosity increases the soil's ability to absorb water; its surface has a negative magnetic charge, thus contributing to better nutrient retention; and the large amount of carbon helps to balance acidic soils. The result is high crop yields over a long period of time, allowing producers to adopt 100% organic farming. In the system developed by Netzero, the energy needed to heat the biomass is generated internally in the process itself: when the syngas generated is burned, it maintains the temperature needed for the pyrolysis furnace to function properly. As biochar is highly stable and has a long-lasting effect on the soil, the net effect of the process is to sequester carbon, a fact that has already been scientifically validated by various IPCC studies.

Mercurius Biorefining – The company has developed a patented REACH™ technology that can convert any lignocellulosic waste material into hydrocarbons; these can be used as renewable diesel, fuel for airplanes and ships, as well as chemicals, all with a negative carbon footprint. Mercurius scientists claim that their liquid-phase catalytic technology does away with the high temperatures and pressures of traditional thermochemical conversion processes (pyrolysis), thus reducing the number of steps and the need for equipment and investment. The carbon is captured by photosynthesis (from plants such as sugarcane, corn, wheat and trees) and the biomass is converted with high yields into lignin-based biochar, which can be used to increase soil productivity or as a substitute for fossil bitumen in the composition of asphalt, for example.

Thermaquatica Inc – The company uses biomass waste as its main raw material to produce a low-viscosity aqueous solution (liquor) containing around 90% of the carbon in the original biomass. The innovative technology is called oxidative hydrothermal dissolution (OHD), which, in addition to biomass, uses only water, heat and oxygen. The liquid can easily be injected into geological reservoirs, where the carbon is used by microbes already present in the environment, thus ensuring its long-term sequestration. Unlike direct air capture with sequestration (DACS), the process does not require high pressures and can be injected into shallow cavities, requiring simpler injection permits (i.e., class I, rather than class VI). The solution can also be (i) used as a biostimulant in agriculture; (ii) refined to recover monomers used in the production of biodegradable plastics, or (iii) fermented to make a variety of useful products. The company claims that operating at scale, the net cost of removal would be around USD 82/ton.

Oceans

The oceans generate 50% of the oxygen we need, absorb 25% of total CO_2 emissions and capture 90% of the excess heat generated by these emissions.

Ocean Nourishment – OCN is an Australian biotechnology company that has developed a pioneering solution for removing carbon dioxide from the oceans using phytoplankton. The technology is based on the understanding that balancing limiting macronutrients (nitrogen, phosphorus, iron and silica) on the ocean's surface harnesses a controlled growing of

phytoplankton. This group of microorganisms removes CO_2 from the atmosphere via photosynthesis. The carbon is captured after multiple cycles of phytoplankton growth, at which point the carbon is exported via different pathways to the ocean floor, remaining there for a long time. The company has developed its own nutrient compound, which mimics whale excreta, and is working on a project to produce green ammonia in order to add it to the nutrient mix, which would exponentially accelerate the technology's reach. In addition to the potential for carbon removal, the solution sees other relevant benefits such as restoring aquatic ecosystems and increasing wild fisheries.

Seaforestation.co – Kelp forests are one of the most vibrant biomes and dynamic carbon sinks on Earth, capable of removing similar and even higher amounts of CO_2 from the atmosphere per area than terrestrial rainforests. They play an important role in combating ocean acidification, climate change and biomass loss, making a substantial contribution to the global effort to reverse the effects of global warming. In addition, they are the habitat and base of the food chain for countless fish and crustaceans, which provide an important part of our dietary protein. Seaforestation has developed an offshore seaweed mariculture platform aimed at contributing to food security, regenerating ecosystems and removing carbon from the atmosphere. The proprietary, remotely operated system submerges at night, absorbing more nutrients from deep waters, and emerges during the day to optimize exposure to sunlight and facilitate photosynthesis. As a result, the farm grows all the faster. The solution also involves a refining technology that processes the algae into food, feed and biostimulants (fertilizers). The carbon is fixed biologically and sequestered for a long time (100 to 1,000 years) when some of the algae fall into the depths of the oceans.

Ebb Carbon – Ebb's technology uses electrochemistry to separate salt water into its acidic and alkaline components. The alkaline water is returned to the sea where it mimics the natural process of alkalinization, creating chemical reactions that extract CO_2 from the air and storing it safely for a very long time (10,000 years plus) as a stable form of bicarbonate (HCO_3). The acid component, when applied to certain rocks, can extract additional CO_2 and at the same time isolate valuable minerals used in electric vehicle batteries. It can also reduce the environmental impact of highly alkaline waste such as cement and concrete. The idea is to speed up a natural process that would otherwise take millions of years, so that it only takes weeks or months. The company operates a site on the coast of Washington, USA, with the capacity to remove 100 tons/year of CO_2 at a cost of USD 100/ton.

This short sample of projects that we have selected reveals the broad spectrum of innovations in the various environments. Despite the diversity of technological routes, the companies face common challenges, which were addressed in the collective panel discussions and explored in more depth in the individual conference meetings. Among them, three obstacles emerged as recurring themes: (i) how to scale up solutions to the 1Gt (one gigaton) level within a competitive cost reality; (ii) how to effectively measure, report and verify (MRV) the various stages of the carbon capture, transportation, use and storage process; (iii) what the prospects are for the permanent development of carbon credit markets.

Converting a good pilot project into a reality on a competitive commercial scale is a central challenge for any innovation effort. Large scale can reveal physical, thermodynamic and engineering inconsistencies that were previously inhibited. The most common problems include the difficulty of stabilizing processes, finding adequate sourcing of raw materials or even avoiding oversizing structures, which can end up increasing costs exponentially and making large-scale economic production unfeasible.

In all the conversations, concerns about how to measure, report and verify effective carbon capture were at the top of the agenda. The quality of the credit certification, according to the criteria of additionality,

integrity and permanence, are essential to justify the raison d'être of the projects and confirm their economic viability. Because these technologies are innovative, there are no available MRV protocols for most of the proposed pathways. Companies are therefore developing them themselves, which increases costs and requires third-party certification. Given the reality of low-quality credits, with market prices beaten down, companies are committed to establishing a scientifically robust MRV mechanism.

The third recurring theme at the conference involved discussions on the carbon market. The topic was the subject of three different panels: one on the voluntary market, another on how to promote liquidity, and a third dealing with the perspective of the offtakers, i.e., the companies that buy the credits. The participants, in consensus, reinforced the idea that the development and dissemination of carbon markets is a necessary condition in the battle to bring global warming within reasonable limits, in line with what we observed in Dynamo Report 113.

Voluntary markets continue to show significant growth, albeit on a reduced basis, reflecting the growing interest of private agents in making progress on their decarbonization commitments. The so-called regulated jurisdictional markets also continue to expand geographically, but still at an insufficient rate to promote incentives compatible with the net emissions targets for 2030. In 2022, the prices of trading schemes fluctuated significantly as a result of interventions by governments, which were forced to recalibrate the incentives of their energy policies following the outbreak of the conflict in Ukraine.

At this point, our reader might have a legitimate question in mind: what would an analysis team that basically invests in public companies – a reality of organization and maturity completely different from this set of fledgling ideas/projects – be doing at a conference discussing a market that is not yet fully developed?

The question has merit and warrants justification. The central motivation for our participation is due to the fact that the growing understanding of climate urgency, and the resulting social pressure, should progressively lead companies to internalize the externalities of their emissions as well as any other environmental dysfunctionalities they may produce. Carbon markets are one of the most efficient tools for dealing with these negative effects as an economic reality. And so it is hoped that they will cover ever more extensive geographies. If this is the case, there's nothing more fundamentalist than going to inspect the incubator of ideas and the genesis of technologies that will probably be later available amongst the array of valid possibilities for companies to promote the decarbonization of their production processes.

In addition to this main objective, we did reap, fortunately, some second-order benefits. The conference was an intensive gathering of scientific knowledge and entrepreneurial ingenuity in service of the search for innovative solutions and imbued with the spirit of overcoming a global problem that could jeopardize the very existence of humanity. Under this magnanimous statement, the atmosphere exuded entrepreneurial vibrancy and startup spirit. At the beginning of a company's life, the "integral" of what is to be achieved is always much greater than what has already been accomplished. The drive to break new ground and the incitement to occupy unexplored regions is contagious, forges dispositions, and instills culture. Of course, for the experienced investor, all of this will be factored into the risk coefficient of the venture. However, as a value in itself, it was very useful to understand the chemistry of this enthusiasm and to reflect on the effect of these valences on behaviors and dispositions. From such vivid impressions, we saw the contrast between the more mature companies – generally absorbed in the quotidian of processes and routines when the imperative of execution prevails over entrepreneurial drive – and we were reminded of the danger of losing the early inspiration of beginnings as a continuous source of energy and good purposes.

Also, as a more practical lesson, we came back with a reinforced understanding that we are at the epicenter of auspicious transformations. Brazil is once

again in a privileged position, with the largest portfolio of cost-effective opportunities for nature-based solutions (NBS) to remove atmospheric emissions, estimated at around 2.9 Gt of CO_2 eq/year. This means that we could be the largest provider of carbon offset credits in the world. With most of our emissions linked to deforestation and land use issues, a very clean electricity matrix and a low percentage of emissions from industry, in theory we have much more favorable conditions to meet our Nationally Defined Contributions (NDCs) and quickly reach the reality of net-zero emissions, possibly without having to rely on the development of new technologies.

We know about the opportunities in CCUS technology, especially in the O&G sector, where, for example, Petrobras has pioneered one of the largest global capture and geological storage projects in the Santos basin, through natural gas processing, with a capacity of 7 Mton CO_2 eq/year. We also already have a Brazilian Atlas (org. Ketzer, 2018), mapping our main geological storage options and stationary sources of CO_2. Finally, the Senate Environment Committee recently approved a proposal to regulate the capture and storage of carbon in geological reservoirs in the country, such as oil and gas wells, saline aquifers and coal beds. This means that we will certainly see valid initiatives with CCUS technology here.

However, given the repertoire of attributes generously laid out by the various ecosystems present in our country, it's no surprise that here at Dynamo we favor the NBS line of initiatives. The order of nature uses efficiency and parsimony as its selection filter. It has formulated a biochemical engineering solution, distilled over 3.6 billion years, which at the same time regulates the climate, produces food and generates energy, three essential conditions for life and pressing threats for humanity. Thus, photosynthesis, the process by which plants use sunlight, water and capture CO_2 to produce glucose (food and energy) and oxygen.

But isn't photosynthesis a free, abundant and undifferentiated good? Or at most a commodity with very little added value? Strictly speaking, yes, without a doubt. From a more refined point of view, no. Brazil stands out not only for its territorial extension, biodiversity, tropical climate, favorable topography, sun and rainfall, which offer favorable conditions for radiation, precipitation, evaporation and transport of materials, including CO_2; indeed, these are essential for plant growth and for the proper performance of chloroplasts/production of photosynthesis (Kleidon, 2021). Although these natural ingredients, combined, are essential, fortunately, we have many more.

Our stock of photosynthesis capacity can be associated with: (i) the restoration of native forests and ecosystems; (ii) the large-scale planted tree industry, state-of-the-art forestry, highly competitive, the lowest-cost global producer; (iii) the most productive and sustainable agriculture on the planet (the only one capable of producing second and even third crops, with intensive use of "natural" allies such as bio-inputs, biodefensives, no-till farming, ICLF (integrated crop-livestock-forest), among others); (iv) the efficient production of ethanol, even using second-generation technology; (v) the supply of biomass and waste, versatile energy inputs (cogeneration, charcoal, biodiesel, biogas, biomethane and potentially even hydrogen); and (vi) through various technological routes, the manufacture of fabrics, paints, resins, dispersants, biocomposites, medicines and countless other applications. From this expanded perspective, photosynthesis is no longer a commodity but the basis of a platform of greater integrated value, which combines the richness of our natural ecosystems with decades of hard work, technological development, scientific knowledge, empirical studies, applied research and careful execution in the field.

As a long-term investor focused on Brazil, here at Dynamo we have been looking for opportunities and allocating resources to companies that bring together these favorable natural conditions for photosynthesis with other strategic ingredients involving science, biotechnology, scale and good management, capable of offering cost-effective nature-based solutions of outstanding quality. The combination of these elements with the understanding that incentives need to be established as soon as possible to get the planet off a disastrous climate collision course ushers in a period in which environmental services cease to

DYNAMO COUGAR x IBOVESPA (Performance in US$)*

Period	DYNAMO COUGAR Year	DYNAMO COUGAR Since Sep 1, 1993	IBOVESPA** Year	IBOVESPA** Since Sep 1, 1993
1993	38.8%	38.8%	7.7%	7.7%
1994	245.6%	379.5%	62.6%	75.1%
1995	-3.6%	362.2%	-14.0%	50.5%
1996	53.6%	609.8%	53.2%	130.6%
1997	-6.2%	565.5%	34.7%	210.6%
1998	-19.1%	438.1%	-38.5%	91.0%
1999	104.6%	1,001.2%	70.2%	224.9%
2000	3.0%	1,034.5%	-18.3%	165.4%
2001	-6.4%	962.4%	-25.0%	99.0%
2002	-7.9%	878.9%	-45.5%	8.5%
2003	93.9%	1,798.5%	141.3%	161.8%
2004	64.4%	3,020.2%	28.2%	235.7%
2005	41.2%	4,305.5%	44.8%	386.1%
2006	49.8%	6,498.3%	45.5%	607.5%
2007	59.7%	10,436.6%	73.4%	1,126.8%
2008	-47.1%	5,470.1%	-55.4%	446.5%
2009	143.7%	13,472.6%	145.2%	1,239.9%
2010	28.1%	17,282.0%	5.6%	1,331.8%
2011	-4.4%	16,514.5%	-27.3%	929.1%
2012	14.0%	18,844.6%	-1.4%	914.5%
2013	-7.3%	17,456.8%	-26.3%	647.9%
2014	-6.0%	16,401.5%	-14.4%	540.4%
2015	-23.3%	12,560.8%	-41.0%	277.6%
2016	42.4%	17,926.4%	66.5%	528.6%
2017	25.8%	22,574.0%	25.0%	685.6%
2018	-8.9%	20,567.8%	-1.8%	671.5%
2019	53.2%	31,570.4%	26.5%	875.9%
2020	-2.2%	30,886.1%	-20.2%	679.0%
2021	-23.0%	23,762.3%	-18.0%	538.9%
2022	-7.8%	21,899.9%	12.0%	615.4%
2023***	17.3%	25,697.9%	11.8%	699.9%

(*) Considering that this is a Fund that has existed since 1993, the figures were converted into dollars (US$) as a way to eliminate the volatility of the Brazilian currency throughout the period and, in this way, minimize the risk of possible misinterpretations by the reader in the case of an investment decision/ divestment. Dynamo Cougar is a fund that invests in NAV of an equity investment fund and is currently closed for new investments. (**) Ibovespa closing price. The index is presented as a mere economic reference and does not constitute a target or benchmark for the Fund. (***) Return up to August 2023.

be free goods and begin to acquire the status of an economic good with differentiated value. We believe that by aligning these credentials, we will be able to participate advantageously in the promising carbon credit markets that lie ahead.

Rio de Janeiro, 29th September 2023.

Additional information:

- **Inception:** 09/01/1993
- **Objective:** Deliver NAV appreciation above inflation in a medium/long term horizon by investing at least 95% (ninety-five percent) of the fund´s net worth in the NAV of Dynamo Cougar Master Equity Investment Fund ("Master Fund")
- **Target investor:** Qualified investors
- **Status:** Closed for new investments
- **Redemption grace period:** 12 months grace period or liquidity fee of 3% for redemption within this time period*
- **Redemption NAV:** D+12 (calendar days)*
- **Redemption payment:** D+2 (working days) after NAV conversion*
- **Applicable taxation:** Equity
- **Anbima´s classification:** "Equity – Free Portfolio"
- **Management fee:** 1,90% per year for the Fund + 0,10% for the Master Fund
- **Performance fee:** on the top of IPCA + IMAB*
- **Average monthly net worth last 12 months:** R$ 5,764.5 Million.

(*) Detailed description provided in the bylaws

To find more information about Dynamo and our funds, or if you wish to compare the performance of Dynamo Cougar to other indices in different time periods, please visit our website:

www.dynamo.com.br

DYNAMO

DYNAMO ADMINISTRAÇÃO DE RECURSOS LTDA.

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