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GREENHOUSE GAS MARKET REPORT



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CARBON MARKETS 3.0

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IETA expresses its gratitude to all authors who have contributed to this report, to the editorial committee and to all others who have worked on the publication.

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Design: Hitman Creative Media Inc.

2022



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INTRO

I have been involved in the carbon market since the start. In fact, since before the start, as I was a negotiator for the Kyoto Protocol, which led to the first iteration of carbon markets. Buoyed by the pioneering EU Emissions Trading System, the Kyoto mechanisms – particularly the Clean Development Mechanism (CDM) – flourished and the world saw what the power of markets could achieve, through the technology transfer to the developing world, the sustainable pathways shown, and industries built around the investment outcomes. That China is the world’s leader in wind power capacity is an enduring legacy of the CDM.

The early boom times were followed by a tough period, when the EU restricted use of credits from CDM projects and there was no real demand from elsewhere. However, this period also saw the emergence of a new wave of compliance markets, including in California, Quebec, South Korea and a series of emissions trading pilots across China. This early action meant that, as the Paris Agreement was being developed, some governments already had a key tool in place to reduce their emissions – if they were ambitious enough.

Of course, cap-and-trade isn’t suitable for everyone; since the deal was reached in 2015, we’ve seen China leverage its pilot programmes to launch a national ETS, and emerging economies including Colombia and South Africa employ carbon tax-and-offset hybrid models. More recently, Japan has begun to develop a regulated voluntary market, building off the success with a similar model under the Kyoto Protocol.

These all have one thing in common: the use of offset credits to help deliver their ambition. This is one reason why we fought so hard for flexibility mechanisms to be included in the Paris Agreement – a successful fight in the end, as evidenced by Article 6. As Parties argue over the finer details of how to bring the mechanisms to life, a crucial point is being overlooked: governments still, for the most part, seem to be reluctant to use the tools they included in the 2015 agreement. (Japan, Switzerland, Norway and Sweden are bucking the trend here, and are all testing the water on bilateral arrangements under Article 6 to fulfil their Nationally Determined Contributions, or NDCs.)

It all boils down, again, to ambition. Ambition to be better, to do better, to cut emissions faster and cheaper, and ambition to live up to the aspirations that drove the Paris Agreement. We know where we want to be in 2050, and we know what we have to do to get there – so it’s time to step up.

For the EU, emissions removals are urgently needed – be they nature-based or technologically driven. The latter are still in their infancy and, for the most part, are financially out of reach for many beyond tech companies, so nature-based solutions should be embraced in the meantime. In the US, the use of market mechanisms could help it close the gap between its NDC and the reductions inherent in the recently passed Inflation Reduction Act.

That China is the world’s leader in wind power capacity is an enduring legacy of the CDM



Dirk Forrister
IETA CEO & President

Carbon markets are a means to an end, the end being the systemic change the world needs

And of course, any meaningful action on climate change will have to include the US and China. While China has hinted that it may allow Article 6 units to help keep costs down for its national ETS, at COP27 US climate envoy John Kerry announced the Energy Transition Accelerator, a voluntary market-based initiative to deploy private finance to developing countries. The ETA partners – which include the Rockefeller Foundation and Bezos Earth Fund – will be developing rules and protocols to ensure the projects achieve real, additional and verifiable reductions.

It is these three concepts that underpin carbon markets, especially the voluntary carbon market which has garnered plenty of attention in recent years, buoyed by surging corporate net-zero commitments. This wave of action is commendable, and needed, but I can't help but think that the amount of attention on the VCM is disproportionate to its value - \$1 billion, versus a \$851 billion compliance market in 2021, according to Refinitiv. Don't misunderstand me: we need the voluntary market to fill in the edges of what the compliance markets are missing. But we need the compliance markets to set the direction to net zero and the mandatory obligations to ensure the world keeps on track to the 1.5°C target.

Over the past few years, IETA has engaged a team from the University of Maryland and Pacific Northwest National Laboratory to model the economic impact of Article 6 and how carbon markets can help with the net-zero transition. From this work, we know

It all boils down, again, to ambition. Ambition to be better, to do better, to cut emissions faster and cheaper, and ambition to live up to the aspirations that drove the Paris Agreement

that to get to 1.5°C, we need a lot of things to go right: we need carbon capture and sequestration to be vastly expanded beyond its current scale; we need more nuclear power than is publicly palatable; we urgently need to scale up renewable energy and storage solutions; and we need solutions to help industry decarbonise. None of these comes cheap.

Emissions trading can help drive the needed capital to these initiatives – and those we haven't even thought of yet. It's a useful tool to engage the private sector in the transition, and brings the best of the business to the fore. Already, we're seeing innovations in digitisation to enable further growth, like digital monitoring, reporting and verification techniques, and enhancing transparency by creating a data layer like the Climate Action Data Trust we partnered with the World Bank and Chia Network on. These efforts will be key in the third wave of carbon markets.

Carbon markets are a means to an end, the end being the systemic change the world needs if we are to fulfil the goals of the Paris Agreement and avert catastrophic climate change. If only governments would step up to the plate and make full use of the policy options they themselves have created. Time is running out – we need to be bold, we need to be ambitious, and we need to be fast.

A VIEW OF THE GLOBAL CARBON MARKETS:

THE TRANSFORMATION WITHIN

The carbon market is evolving for a new generation and new demands. Carbon market pioneer Ken Newcombe shares his views on a topsy-turvy ride from the very beginning of the Kyoto-era markets to what lies ahead, with shifting buyers and desirability driving transformation.

EVERYTHING IS UPSIDE DOWN.
NOTHING TURNED OUT AS EXPECTED.
CONTRADICTIONS ABOUND!

That's the way I think of the evolution of the global carbon market – the North-South trade in greenhouse gas (GHG) emissions reductions. For me, it began with the conception and design of the first ever global carbon fund, the Prototype Carbon Fund, framed with support from Kyoto Protocol negotiators of six market-oriented sovereigns and 13 global and Japanese corporates in the late 1990s. The principles of carbon asset creation and accounting were born there: drafts of the first emissions reduction purchase agreements (ERPAs), the first trial verifications with a third-party auditor, and the rules of emissions auditing.

It was a simple world view that held that the most cost-effective approach to managing climate change was to invest in emission reductions at the lowest cost

It was a simple world view. It held that the most cost-effective approach to managing climate change was to invest in emission reductions at the lowest cost, created and traded in a single global market where the price of carbon reflected the marginal cost of abatement of the buyer. Obviously, that meant investment in upgrading energy production and end-use technology in the developing world, where price pressures were low and access to leading edge technology was limited. It was a world in which the methodologies for quantifying and verifying a real and additional reduction in GHGs created carbon credits of equal atmospheric integrity and value despite rapidly diversifying asset classes and methodologies to quantify, verify and issue them for trade. It was a very naive world. However, its beguiling simplicity was essential to create confidence in a market-based approach to addressing climate change compared to North-South transfers from public finance which was never going to fly.

The illusion of equality of impact and integrity was shattered early in the Clean Development Mechanism's (CDM) life, which was quickly dominated by HFCs and renewable energy, and by projects located in India and China. Renewable energy-based credits were popular and widely supported in the market but perhaps 90% were "anyway tonnes!". Few renewable energy investment decisions hinged on the promise of a stream of carbon revenues to reach minimum hurdle rates of return. The result was, and still is today, a lot of hot air. By contrast, incinerating HFCs at the tail end of large chemical plants in China were despised by many but at least had high atmospheric integrity as there was no justification for these investments without a carbon revenue driver. Of course, this was really due to another hole – not the hole in the ozone layer but a hole in the Montreal Protocol that had not foreseen the crossover effects of climate change at the margin of its controlled substances.

Despite increasingly obvious variation in the atmospheric benefit of a certified emission reduction (CER) generated from different project types and using different methodologies, sovereigns and regulated entities in Europe alike regarded all CERs as equal. A "tonne is a tonne" was the prevailing view, even for normally discriminating large-scale buying sovereigns like Norway. This willing simplification was helpful in creating a commodity, but it was painfully obvious that it belied reality. Not all carbon credits are created equal. It did not turn out as expected!

And then there was the question of sustainable development impact of the Kyoto carbon trade. Canny investors began to look under the hood of the projects they were buying even in the levelling world of the EU Emissions Trading Scheme, where a CER issued from any source was (initially) of equal value when surrendered against compliance obligations.

Its beguiling simplicity was essential to create confidence in a market-based approach to addressing climate change

Today's world of net zero commitments by major corporates could hardly be more different. The development impact of the underlying projects is as much a factor for large corporate buyers as the atmospheric integrity of the carbon credits. Reputational risk extends as much to what you buy as to whether you buy to meet your voluntary obligations. In the opaque world of OTC trading, everyone looks under the hood. It's not just about alignment with value chains and supply chains; it's about accountability for doing good by buying well. Site visits are common for buyers of millions of tonnes in long strips. Due diligence on the underlying project is every bit as important as the credibility of the carbon crediting methodology.

As an instrument to support sustainable development, the CDM was remarkably slow to facilitate recognition of diversity between its projects in terms of their development impact. The CDM's sustainable development impact self-assessment tool, issued late in the Kyoto era, did little to assist buyers who cared about the development impact of the underlying projects in making informed decisions.

When the World Bank established its Community Development Carbon Fund (CDFC) in 2003, seeking to create carbon credits from projects with verified community development attributes, the market could not have cared less. The brilliant Michael Zammit Cutajar, former Executive Secretary of the UNFCCC, chaired the benefits validation committee of the CDFC as he knew the importance of associating verifiable sustainable development alongside carbon credits. Yet the idea was before its time – and now its prime time.

Gold Standard asserts all its projects achieve three SDGs and is now upgrading its verification process to add more credibility to its label issuance. Verra's SDVista is a rigorous accredited third-party process of validation, verification and issuance of SDG labels, though with foreboding transaction costs. The developer and carbon value assessor Viridios claims that serious premia will apply to carbon credits that have SDG labels staked to them through credible processes and CBL/Xpansiv, the carbon exchange, has launched a household credit exchange product that requires five SDGs in order to trade. The carbon world has turned upside down.



The land grab of the Kyoto era wasn't tropical forests at risk, releasable timber concessions and the like, but landfills across the urban South. Bigger the better, drill and flare, maybe gas capture and use, maybe composting. But that gold rush petered out with ever-increasing scrutiny of the baseline – were there really emissions to be avoided and what was suitably conservative. The land grab of the post-Paris world is literally that – a mad tear to grab high biodiversity tropical forests under threat, mangroves that can (with a wish and prayer) be restored, marginal land on which to plant trees, or restoring degraded forests.

In the beginning, while the IPCC promoted sustainable land use and forestry (LULUCF), the Kyoto carbon market was an HFC, energy and methane avoidance market, not a land use market. LULUCF (now AFOLU) sequestration assets were not tradable on par with avoidance credits due to perceived and actual risk of impermanence. Land use assets in the Kyoto era earned temporary credits, tCERs, that had to be renewed and subjected to existence confirmation. They traded where they could at a serious discount to avoidance credits, and were not accepted in the EU ETS. The World Bank had given equal billing to land use management and forestry even in its Prototype Carbon Fund, but especially through its popular Biocarbon Fund.

Yet, despite many overtures to the Europeans to accept land use change and forestry into the carbon market on an equal footing, frustratingly, it gained no traction. When I left the World Bank, I was thrilled to join the Board of Verra to support the move to include AFOLU assets and address the risk of non-permanence with the creation of a global buffer reserve setting aside a portion of all projects to adequately cover the risk on reversal of atmospheric removals. Verra's early initiative unwittingly set the stage for a post Paris Agreement world where there is an almost obsessive preference for removals over avoidance credits.

Today's world of net zero commitments by major corporates could hardly be more different

Today removals carbon credits are traded at 2-3 times the price of avoidance credits. Today, it is avoidance credits that are perceived to be high risk and low value, despite their inherent permanence. Gone is the perceived risk of non-permanence of biomass, the risk of reversal. Either Verra has done a great job of managing a global insurance pool of carbon removals, or the market has forgotten about permanence risk. Both are true. Again, the carbon world is upside down.

Sadly, the avoidance-removals spread in the market is a false dichotomy. Those of us who have lived through the entire market know that it comes down to asset classes, methodologies, and individual projects and their quality control as to whether or not there is atmospheric integrity. The world needs good quality avoidance projects in the short term while it builds to high-quality, high-volume removals in the long term. It's not either/or. Paying \$6-7 for a credit from a project replacing incandescent light bulbs with LEDs or repairing a gas pipeline in the hands of a bankrupt public utility is a bargain for the planet but hardly an adequate incentive to sweep up these early wins world-wide. Avoiding the huge damage of deforestation from charcoal production and open fire cooking while improving the health and welfare of rural women should be priced alongside REDD + assets which currently sell for three times the price. Contradictions abound!

The world needs good quality avoidance projects in the short term while it builds to high-quality, high-volume removals in the long term

Don't get me wrong: we do need removals, but we need a balanced approach to expedite climate change mitigation while truly global-scale removals by biological and technology-led processes mature. To my mind, the most productive way forward, addressing adaptation as well as mitigation, means dramatically increasing the carbon density of agricultural landscapes, with re-introduction of beneficial biodiversity enhancing trees in cropland and improving soil health and soil organic carbon stocks.

Here, there is no fuel-food conflict. Instead, it's a pathway to de-risking smallholder farmers in developing countries, the most climate change vulnerable people in the world, ensuring they can feed themselves and get off the hook of chemical fertilizer as climate variability threatens their livelihoods. The methodologies and tools are just emerging in the voluntary market carbon standards. Farmers everywhere are richly connected to markets and accessible to training and inputs for regenerative agriculture, and can directly benefit from a new cash crop – carbon credits. There is more carbon in the atmosphere from degraded soils than from forest loss. Now is the time to reverse the flow. Let's make this unexpected opportunity work for us all.

Ken has over 45 years of experience in project design, management and policy in the energy, environment, and natural resource management sectors. Ken became the first Head of Energy Planning in Papua New Guinea, and later Chief Executive Officer of PNG Electricity Commission in the late 70s to early 80s. He joined the World Bank as an energy specialist in 1982. In 1992, he promoted a market-based approach to reduce greenhouse gas emissions leading to the launch of the Prototype Carbon Fund in 2000 and over a billion dollars under management in 8 funds by 2006.

Ken joined the private sector in 2006, co-managing Climate Change Capital's carbon fund, and joining Goldman Sachs as a Managing Director New York before being recruited to launch C-Quest Capital as its CEO from 2009. CQC's current investments will produce >500 million credits through 2029. CQC's investment partners include Shell, BP, Macquarie Bank and Temasek.

THE BUSINESS OF NET ZERO

Net Zero is a destination with many pathways leading to it — which one will your business take?

By Mythili Sampathkumar

The Earth is already about 1.1°C warmer than it was at the turn of the 20th century and carbon emissions continue to rise, particularly from western nations, China, and India. In 2015, after decades of negotiations facilitated by the United Nations, nearly 200 countries signed the Paris Agreement, which sought to lay out a plan to limit the average global increase in temperature to 1.5°C.

Every time the Intergovernmental Panel on Climate Change (IPCC) comes out with a report, the news is grim: more needs to be done to contain global warming, and faster. The cross-border group was established to provide policy- and decision-makers with the latest scientific information on man-made climate change and it has repeatedly advised countries and businesses to take action to reduce greenhouse gas emissions. According to the world body: “The global temperature will stabilize when carbon dioxide emissions reach net zero. For 1.5°C (2.7°F), this means achieving net zero carbon dioxide emissions globally in the early 2050s.”

WHAT DOES NET ZERO MEAN?

In theory, achieving net zero carbon emissions is a fairly simple concept—it is the balance between carbon emissions produced by transportation, manufacturing, agriculture, etc., and the amount of emissions removed from the world’s atmosphere. “Net zero means cutting greenhouse gas emissions to as close to zero as possible, with any remaining emissions re-absorbed from the atmosphere, by oceans and forests for instance,” says the United Nations Net Zero Coalition.

By the numbers, this means global carbon emissions need to decrease by 45% within the next eight years in order for the world to reach net zero by the 2050s.

Absolute zero emissions, rather than calculating net emissions, is an unrealistic goal. There are a number of possible issues with the combination and scale of technologies we need to use to reduce carbon emissions, including whether they are cost-effective, produce emissions themselves, or simply do not exist yet. The pace at which countries and businesses can decarbonize, and the world’s growing population and the resultant demands on a variety of industries, are also factors which make achieving net, rather than absolute, zero a more attainable goal.

Some level of emissions is unavoidable, such as from industries like aviation, manufacturing, and agriculture, but calculating net zero emissions allows the world to continue to innovate technologies and transform industries in a logical process.

WORKING WITH NATURE AND USING IT TO HELP ITSELF

How do we get to net zero though? Removing carbon emissions from the atmosphere is an obvious first step, but how do we do that in a way that does not disrupt the environment and cause collateral damage?

Nature-based solutions have the advantage of working with nature to conserve biodiversity as well as restore ecosystems. Lisa Walker, CEO of Ecosphere+, a B corp helping businesses integrate nature-based solutions, says moving money into these types of projects on the road to net zero “is the most immediate and tangible solution available to businesses looking to take action and without the role played by nature, the climate goalposts move even further away.”

While moving funding quickly and into projects with verifiable results is crucial, so is “long-term and scalable carbon storage whilst also addressing deforestation and ecosystem restoration,” according to Ariel Perez, managing partner at Vertree, a company concentrating on projects combating deforestation. Taking into account the nature of a particular ecosystem, so to speak, will be one of the more important tools used to get the world closer to net zero.

However, nature-based solutions are not a panacea for the problem of emissions reduction, capture, and storage. The world has a diverse set of environments, players, and economies and will need just as diverse a set of solutions to address reduction goals.

A 2022 report by McKinsey for the Coalition for Negative Emissions stated, “It’s increasingly clear that realizing a pathway to 1.5°C of warming will also involve removing carbon dioxide from the atmosphere.” Earlier iterations of carbon capture and storage posed issues with storing emissions underground, but the “negative emissions technology,” as Will Gardiner, CEO of Drax, a power generation company, describes it, has evolved to become more sustainable and permanent.

The solution growing in popularity is bioenergy with carbon capture and storage (BECCS), what the IPCC calls a “saviour technology.” Gardiner is not so quick to canonize it, recognizing the need for a number of solutions and technologies to achieve net zero, but does note that BECCS offers a unique “dual benefit.”

BECCS is the only such technology currently available that both removes and permanently stores carbon emissions in sustainable biomass—any renewable organic material from plants and animals—and also has the capability of generating power on a 24/7 basis. The latter sets it apart from other renewable energy sources dependent on the number of daylight hours or wind conditions.

“Net zero is also about markets and collaboration across industries and borders...cooperation is a must in order to make really ambitious targets feasible”

– Dirk Forrister, IETA

As Gardiner explains, BECCS can help remove emissions while also meeting growing renewable electricity demands as other industries like transportation, heating, and construction work towards decarbonization. It is because of its dual power that Gardiner notes BECCS has the unique capability to offset emissions from industries like aviation and agriculture, in which moving away from high carbon emissions is more complicated and takes more time.

Since the removal and storage of emissions through BECCS is “high integrity and permanent,” Gardiner says, the carbon credits provided by companies like Drax can also help other companies as they try to achieve net zero. He explains it is part of the reason BECCS presents a trillion-dollar market opportunity.

BECCS works well in places like the United States and the United Kingdom, which have dense wooded areas and sustainable forest areas, but it will take more than just nature-based solutions and negative emissions technologies to push us towards net zero. These are just tools, but the world needs people, businesses, and countries to work together with these tools as well.

EMBRACING THE CHALLENGE TOGETHER, ACROSS SECTORS

If this sounds like a daunting task, it is. The pathway to achieving net zero carbon emissions will involve fundamentally changing the nature of the global economy in a significant way while capturing emissions, incorporating more reliance on biofuels and renewable energy sources, and shifting the behaviour of governments, businesses, and individuals.

To put it another way: “Accomplishing this ambition depends on continuing progress on commercially viable technology; government policy; successful negotiations for carbon capture and storage (CCS) and nature-based projects; availability of cost-effective, verifiable offsets in the global market; and granting of necessary permits by governing authorities,” per Jeff Gustavson, President of Chevron New Energies.

Revolutionizing the energy sector, which accounts for about 75% of all carbon dioxide emissions according to the World Resources Institute, is perhaps the largest part of the puzzle of how the world can save itself from what the IPCC has called the “catastrophic” effects of climate change.

However, that is only one piece of a larger puzzle, according to Dirk Forrister, President and CEO of the International Emissions Trading Association (IETA). “Net zero will not be achieved in silos. Net zero emissions, not net zero partnerships,” Forrister says.

At the political level, the United States, China, and the European Union—the world’s largest polluters—have all set net zero targets. These three account for more than three-quarters of the world’s carbon emissions, but the UN points out it is still not enough to contain global warming because of policy challenges and the speed at which the transition to a cleaner, greener economy needs to occur.

The pathway to net zero “is about so much more than avoiding emissions”

- Janaina Dallan, Carbonext

Per the UN Framework Convention on Climate Change (UNFCCC)'s synthesis report from the organization's last conference, held in Glasgow, Scotland, in 2021, the current national climate strategies of all 193 Parties that have signed the Paris Agreement would still lead to an almost 14% increase in carbon emissions within the next decade, as compared to the last.

As Forrister explains, net zero “is also about markets and collaboration across industries and borders... cooperation is a must in order to make really ambitious targets [for carbon emissions reduction] feasible.” To wit, thousands of local and city governments, businesses, educational centres, and financial institutions have stepped up to fill the gap left by national governments and pledged targets to achieve net zero carbon emissions based on climate science.

A flexible mindset is also important when it comes to partnering on this pathway to net zero. The energy sector cannot overhaul itself, by itself, as the global economy continues to be over-reliant on fossil fuels. Ken Newcombe, CEO of social impact project developer C-Quest Capital, understands the pathway to net zero can sometimes make for, if not strange, at least unexpected bedfellows. C-Quest has a number of projects in its portfolio as it sets out to become the “supplier of sustainable energy and land management systems” in the developing world, particularly in Africa—including a few partnering with Shell and BP.

“I am prepared to become partners with any company that is serious,” says Newcombe, adding that companies like Shell and BP are often the most familiar with what others would deem the riskiest markets in the world and also have the capital needed to push those markets towards a more sustainable future.

NET ZERO IS GOOD BUSINESS

While there are companies which are pledging emissions targets in order to save the planet, the motivation is not purely environmental—it also makes financial sense. Carbon trading can be an increasingly lucrative opportunity for businesses and climate finance is a crucial part of driving the world further along the pathway to net zero.

For many businesses, this is and will be on a voluntary basis as customer and investor pressure to address climate change and reduce emissions increases.

This shift in the financial world comes as “the penny started to drop on the systemic risk of climate change,” says Forrister. Gene Hoffman, COO and President of Chia Network, a sustainable blockchain company, says addressing climate risk is “an existential issue and should be a core consideration and an elemental building block for the financial system's evolution.”

While businesses in sectors like energy or manufacturing may see the need to comply with government regulations regarding carbon emissions, the financial sector will necessarily need to adapt. Emissions trading markets develop around policies, as do the players.

Banks and fund managers in particular are facing increased scrutiny and pressure to disclose investments in fossil fuel-related projects from customers. One example is large pension funds in the United States pushing for the divestment of billions of dollars from fossil fuel companies.

It is in the best interest of these financial institutions to tackle the issue now on a voluntary basis, according to Forrister. “You don't want to be invested in companies facing skyrocketing mitigation costs” as they try to comply with changing emissions reduction requirements.

However, as William Pazos, Co-Founder and Managing Director of AirCarbon Exchange (ACX), points out, “transparency, accountability and traceability underpin the Voluntary Carbon Market.” Singapore-based ACX brings the infrastructure of a commodities market to the carbon market as a way of making emissions trading more familiar to traders comfortable with the protections and clarity of a commodities market.

“A secure and auditable environment” is also what Hoffman and ACX are working towards for cryptocurrency. Having a regulatory framework similar to those of traditional markets and “quality benchmarking for carbon credits” in place by organizations like the World Bank and International Finance Corporation (IFC) is what will make financing projects along the road to net zero easier, Hoffman explains.

A future “beyond carbon” is about uplifting the world’s poorest

Solar, wind, and geothermal energies as well as BECCS need more investment at a faster rate to reach science-based targets by 2030—not just for further development of baseline technology, but also for implementation, maintenance, storage, and scalability. Governments are already funding portions of these projects, but the financial sector’s role in helping companies access the carbon market easily could help more businesses pursue net-zero ambitions.

A FUTURE “BEYOND CARBON” IS ABOUT UPLIFTING THE WORLD’S POOREST

While climate finance is an important part of the package of solutions which need to be deployed in order to get to net zero carbon emissions, there also has to be an eye on the world “beyond carbon,” as Newcombe puts it. Climate finance is focused on creating and selling carbon credits; “It is a means to an end,” the C-Quest CEO points out.

“We want to be on the other side of that,” he says.

What lies beyond climate finance is a cleaner, greener, more sustainable global economy for all, which needs to include the billions of people living at the “bottom of the pyramid.” As CEO of Carbonext Janaina Dallan explains, the pathway to net zero “is about so much more than avoiding emissions.”

As long as energy sources like coal and firewood used in traditional cookstoves continue to be inexpensive, methane-intense and land-stripping agricultural practices remain in place because of a lack of alternatives, and selling land for deforestation is the only option for survival, net zero will remain an elusive—or at least an even more difficult—goal to achieve for the world, should these people be left out of the process.

“Women are change agents”
– Ken Newcombe, C-Quest Capital

Aid and development flows to the Global South, but detractors of current development policies of western countries have often cited projects as either impractical, too centred on only one aspect of development instead of being intersectional, or too near-sighted to create a system of economic growth and opportunity rather than just a small bandage on a bleeding wound.

But companies like C-Quest and Brazil-based Carbonext are looking to change that by integrating both carbon finance and community development into their missions.

For Newcombe it is about “mutual prosperity, not just subsistence.” He explains that renewable energy does not need climate finance because it is “purely commercial.” There are obvious returns on those investments that make them profitable without the need for the carbon adder. Instead, he says, it is developing sustainable ecosystems and economies in regions like sub-Saharan Africa which require both financing and a more holistic approach to achieving net zero.

“Women are change agents,” Newcombe says, which is why the company has chosen to concentrate projects on cleaner cookstoves. Presenting alternatives to cooking with coal or firewood not only reduces emissions but also improves the lives of women who can then develop other skills to bring in more income, educate their children, and shore up entire communities. This, in turn, creates an ecosystem ripe for new investment.

Dallan’s company creates carbon credits through projects centred not just on deforestation of the Amazon rainforest but also on the nearly 30 million people who live within it.

“They tell me what is good for them,” Dallan says about how Carbonext’s projects aim to bring people access to education, healthcare, and basic necessities. “Their development is an important part of fighting deforestation,” because when communities have no access to an income, selling land to companies to cut down the trees is the easiest and quickest solution.

Like Newcombe, Dallan sees current solutions to achieve net zero as lacking if they are not also people-focused. Technologies like BECCS are not a great option for countries like Brazil because of the country’s ecology and because it is both capital intensive and can take several years to build up the biomass storage to really see a difference in carbon emissions levels. “We cannot afford to wait,” she notes.

RFQ

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The voice of business on mobilising markets
to meet the climate challenge

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THE YEAR IN REVIEW



While the world tried to move on from the COVID-19 pandemic and war raged in Ukraine, carbon market activity and developments accelerated around the world. The team at Carbon Pulse wrap up the main highlights from a very busy 2022

EMEA

Russia's invasion of Ukraine has dominated energy markets and caused EU carbon prices to crash briefly to €55 (\$57.95), from a record near-€100, as investors reeled at the prospects of a land war in Europe. But prices recovered as the ensuing focus on Europe's energy security failed to shake the bloc's long-term resolve on climate action. Brussels' REPowerEU strategy to hasten the bloc's exit from Russian energy by 2027 doubled down on the deployment of renewables, albeit alongside national initiatives to boost coal power, source alternative gas supplies, and greater attention on energy efficiency and curbing the windfall profits of fossil fuel producers.

For emitters, higher power sector emissions from the temporary reversion back to coal clashed with instances of industrial demand destruction, as the impact of sky-high gas prices crimped factory output. Some reports suggest industrial gas demand is down as much as 30% year-on-year, with metals, fertilisers, and chemicals producers among those decrying the threat as existential. On top of Russian gas supply uncertainty, Europe's energy crisis has been compounded by extensive French nuclear supply maintenance shutdowns, and summer drought conditions across Europe that increased power demand while denting hydroelectric and atomic generation.

The REPowerEU plan's suggested raiding of €20 billion in EU ETS revenues drew market focus, though legislators seem resolved to frontload auction sales from 2027-30 rather than tap the Market Stability Reserve (MSR). At the time of writing, lawmakers are also aiming to complete the long-running legislative process for the 'Fit for 55' by year's end. The bloc's mammoth policy package is designed to recalibrate the bloc's climate actions towards a deeper 2030 emissions target of at least 55% under 1990 levels, up from 40%. (Read more about the EU's Fit for 55 efforts on page 18.)

Related, provisional deals have been reached to extend the EU ETS to much of international shipping from 2024 and to tighten rules governing the market's price spike curbs, though the launch of an adjacent trading market for buildings and transport is proving more divisive. As well, MEPs and member states have all but ruled out introducing controversial measures to limit the participation of non-compliance entities, such as hedge funds. Despite the volatile geopolitical situation globally, EU lawmakers are also pressing ahead with installing a carbon border adjustment mechanism (CBAM) to shield the bloc's industry – to be phased in after 2025 as an alternative to free allocation in providing carbon leakage protection for major industries.

At the end of November, the European Commission presented its long-awaited proposal for a certification scheme for voluntary carbon removals, in a move welcomed as the first step towards a creating a robust regulatory framework for voluntary carbon in Europe. The second year of the UK ETS, which features an emissions cap one-tenth of the size of the EU market, largely moved in step with EUA prices. The UK market's persistent premium to its EU counterpart peaked at above €32 in September but had been fully erased by December amid diminishing confidence that post-Brexit Britain would continue pursuing a path to net zero in light of the energy crisis and soaring inflation.

APAC

In Asia, progress in China's domestic ETS was halted throughout 2022, as the government was busy managing its demanding zero-Covid policy and preparing for President Xi Jinping to secure a third term in power. An early draft allocation plan for 2021 and 2022 was released in February, but was resisted by the power sector. Another draft emerged in October, aiming for a nearly 7% cut in allocation levels compared to 2019-20. In the absence of regulations, trading in the Chinese market was muted throughout the year, seeing low volumes and stable prices around 60 yuan. With the next compliance deadline scheduled for 31 December 2023, activity is not expected to pick up until the second half of next year.

Japan took significant steps towards carbon pricing, announcing it will launch in April 2023 the GX League – a domestic emissions trading market to which some 500 companies have signed up so far, accounting for around a third of the country's total GHG output. Based on voluntary targets, the GX League will be a baseline-and-crediting scheme where emitters can earn credits when they beat their targets. There will also be access to offsets, initially J-Credits and units from Japan's Joint Crediting Mechanism (JCM). (Read more about the GX League on page 30.)

In South Korea, the ETS struggled with oversupply and little demand throughout the year, and by the end of 2022 the government was involved in a market reform process that will see a tightening of the emissions cap, increased share of allocation auctioning, and greater access for financials. (Read more about the South Korea ETS on page 22.)

A change in government means a fresh start for Australia's domestic offset market, with the government consulting on the details around its plan to rapidly lower baselines in the Safeguard Mechanism to drive deeper carbon cuts. But the market has also faced criticism for several project types lacking integrity, and an independent committee will publish recommendations in December on potential changes to ensure credits are of a higher quality.

New Zealand, too, is ending a year of multiple consultation processes expected to result in tougher settings, such as a significantly higher cost containment reserve (CCR) trigger price and lower volume available at auctions. In 2022, as in 2021, the full 7 million-tonne CCR was released into the market, but at the end of November spot NZU prices were still hovering near NZ\$80 (US\$50.51).

Meanwhile, several Southeast Asian nations have moved towards domestic markets in 2022. Indonesia and Malaysia are both working on setting up domestic markets, the latter a voluntary one, with the countries' leading stock exchanges to house trading. India and Vietnam are also reportedly looking at introducing emissions trading to tackle CO₂ emissions.

AMERICAS

The US Congress in August passed the Inflation Reduction Act, earmarking \$369 billion towards climate and energy-related funding. The bill extends or implements new clean energy tax credits, amplifies the existing '45Q' tax credit for carbon capture, utilisation, and storage, and assigns a methane pollution fee to a portion of the oil and gas industry.

California's Air Resources Board (ARB) in November published its final Scoping Plan update for the state's climate strategy, aiming to reduce economy-wide GHG emissions to 48% below 1990 levels by 2030, up from the current statutory target of at least 40%. In line with the more ambitious goal, the ARB said it will commence a public process to evaluate and potentially make changes to the emissions caps and other elements of its market regulations.

Pennsylvania briefly became the 12th RGGI member this summer before a court order blocked the state's membership in the programme. Republican lawmakers and the coal industry argue the Keystone state's RGGI-modelled market regulation imposes an illegal tax. Meanwhile, Virginia Governor Glenn Youngkin (R) in August said he will seek to rescind his state's participation in RGGI by the end of 2023.

Allowance prices in WCI and RGGI set new auction settlement records in the first half of 2022, before prices slid over the remainder of the year. Traders have attributed this to bearish macroeconomic conditions that have blunted investor appetites in the two programmes.

To the north, Canadian Prime Minister Justin Trudeau's government in June finalised the federal GHG offset system, through questions remain about whether any demand will materialise. Ottawa is also considering either a cap-and-trade system or modifying its existing 'backstop' CO₂ pricing approach for the oil and gas sector.

To the south, Mexico's environment ministry in September confirmed the government will begin the operational phase of the national ETS in January 2023, after a pilot phase took place over the past three years. However, the ministry is not expected to publish the final regulations until June 2023, which will reportedly contain details on the allowance caps. Auctions are not expected to take place until 2025 at the earliest.

In South America, Colombian lawmakers in November passed tax reform legislation that sets out several changes the country's roughly \$5/tonne carbon levy. Beginning in 2023, the bill halves the offset usage limit from domestic carbon cutting projects against the carbon tax to 50% from 100%. On the other hand, the reform gradually phases in thermal coal to full coverage under the CO₂ levy over 2025-28.

VOLUNTARY

Voluntary carbon credits descended into a bear market in 2022, as prices across the board steadily retreated from the record highs seen at the start of the year amid receding demand from hesitant buyers and wider macroeconomic weakness. These factors combined to push VER prices back to levels last seen in 2020. Standardised nature-based futures tumbled from over \$16 in January to under \$6 in November, while equivalent renewables credits crashed from around \$9 in the first quarter to around \$3 by Q4. Further fragmentation was seen, with the cheapest credits falling below \$2 while other highly-priced units, such as those issued to cookstove and blue carbon projects, largely holding their value throughout the year. Prices in the nascent removal credit market also remained high in comparison.

On the policy side, the question of credit quality dominated discussions, as the July release of draft principles by the IC-VCM and initial recommendations for best buying practices from the VCMI only added confusion for voluntary market participants, with final guidelines expected early next year. [Read more about the IC-VCM on page 37.]

The rise of multiple ratings agencies magnified the integrity debate, as a number of established projects were awarded low grades. Despite this, credit retirements have been marginally higher year-on-year suggesting corporate buying has held largely stable, though new supply continues to exceed demand, creating an increasing surplus in the market. Bottlenecks have built up at certification bodies, with one registry reporting the rush of new projects requiring issuance was intensifying into Q4.

The UN's civil aviation offsetting scheme CORSIA revised its emissions baseline to 85% of 2019 sectoral emissions, weaker in ambition than the previous approach, with observers predicting compliance buying will be minimal before 2024 as a result.

Negotiations on the Paris Agreement's Article 6 at COP27 in Sharm el-Sheikh, Egypt pushed many of the key decisions to 2023, with more concrete methodological guidance for reductions and removals now expected to be agreed at next year's COP28 in Dubai. One new clarification in the Article 6.4 text defined new "mitigation contribution" credits as units that do not require corresponding adjustment, which could open up some Article 6 units to the VCM. [Read more about the Article 6 outcomes and next steps on page 34.]

Multiple countries, such as Switzerland and Singapore on the buy side and Ghana and several Southeast Asian countries on the sell side, have emerged as first-movers in securing bilateral trade deals under Article 6, even with the rules still to be finalised. Indonesia and Papua New Guinea imposed moratoria on the export of credits to the VCM awaiting further clarity on such trade rules, while the Indian energy minister suggested in August that offsets would be banned from export until the country met its climate needs, though the government later reversed this position. Indonesian supply is likely facing a halt until the second half of 2023 at least.

Rainforest nations continued to apply pressure to allow their forest carbon to be sold internationally in the VCM. Through UNFCCC vetting and accredited by REDD.plus, Gabon said it would release more than 90 million credits of sovereign credits into the VCM, with other countries also set to attempt to monetise their supply. Several Brazilian Amazon states are said to be looking into the sale of several billions of tonnes worth of forestry units. COP27 also saw moves by Middle East nations Saudi Arabia and the UAE to enter the market, while an African initiative was launched that aims to drive regional supply to 300 million by 2030.



1.0

STRIKING A BALANCE

It's been a year of turmoil and tumult for Europe, with war in Ukraine sparking an energy crisis for the bloc – yet EU leaders have tried to both meet short-term needs while turbocharging longer-term decarbonisation ambitions, writes Kavita Ahluwalia

What a difference a year makes... seldomly has a phrase been more apt. This time last year, few could have ever imagined the string of events that would ensue following Russia's invasion of Ukraine. While we had witnessed a rise in commodity prices in the fourth quarter of 2021, there was little indication of what was to follow. Having firmly set its focus on decarbonisation and aligning the EU policy framework with the continent's net zero ambitions by 2050, the European Commission under President Ursula von der Leyen was forced to reset its work programme to deal with an unimaginable and unprecedented (energy) crisis.

Security of supply and affordability have since been thrust to the forefront of the agenda, with most resources being devoted to crisis management and related emergency policy measures in the short-term. Thankfully, the EU machinery along with its various cogs in the form of key players in the EU institutions have proven relentless and carried on their work with the various proposals under "Fit for 55". Now in its final stages, one can only commend MEP Peter Liese and others for this and wish them luck for the final negotiations upon which the bloc's medium- and long-term decarbonisation ambitions hang.

But let us take a step back and reflect on the sheer craziness of the past few months, also to better understand how the events have and will continue to shape the ongoing policy discussions. This time last year, prices had more than doubled in the EU ETS as investor interest soared. By November, EUA prices had hit new records at around €70 (\$73.76) apiece. The rise had taken many analysts by surprise. While for most, it was clear that the market was simply responding to the calls made by Europe's policymakers for further tightening under the bloc's Fit for 55 package, wariness of speculation in the EU ETS was beginning to grow.

The EU machinery along with its various cogs in the form of key players in the EU institutions have proven relentless

As part of the Fit for 55 package, designed to align the bloc's climate policies with a higher 2030 emissions reduction target of 55% (compared with 1990 levels) and its net zero pledge, the EU ETS was to be firmly reinstated as Europe's flagship climate policy by upping its overall targets and extending its scope to international shipping from 2023 and through the launch of an adjacent market for buildings and transport in 2026. While the former seems to have been agreed at the time of going to press with a phased in approach foreseen from 2024, the latter is proving difficult with politicians increasingly wary of overburdening the electorate at a time of exceptionally high fuel prices.

The weeks and months that have ensued since Russia's unprovoked and unjustified military aggression against Ukraine began in February has massively disrupted Europe's, and the world's, energy system. It continues to cause hardship not just to the people of Ukraine but also to the continent as a whole in the form of high energy prices and heightened energy security concerns.

In March 2022, EU leaders thus agreed to phase out Europe's dependency on Russian energy imports as soon as possible and invited the European Commission to swiftly put forward a detailed plan. 'REPowerEU's central aim is twofold: first to end Europe's dependence on Russian fossil fuels as quickly as possible, in principle by 2027, with a two-thirds cut in Russian gas consumption by the end of 2022; and second, to secure a long-term sustainable, cost-effective energy supply through a controlled departure from this long-entrenched relationship with Russia.

Achieving these goals will require a combination of short-, medium- and long-term targets and measures covering the following three pillars: (i) demand reduction, (ii) diversification of suppliers for conventional (fossil) fuel imports while future-proofing the corresponding infrastructure, and (iii) acceleration of the transition to renewable energy sources. As such, the EU's 2030 target for renewables, for example, has been increased from the current 40% to 45% thereby bringing Europe's total renewable energy generation capacity to 1,236 GW by 2030, in comparison to the 1,067 GW originally envisaged. To some extent, this is akin to a war-economy level of mobilisation. The timeline and level of ambition are such that the speed and scope of action will have to go far beyond the already ambitious proposals outlined in Fit for 55.

REPowerEU's central aim is twofold: to end Europe's dependence on Russian fossil fuels as quickly as possible, and to secure a long-term sustainable, cost-effective energy supply

However, this fast tracked clean energy transition comes at a price. The Commission has estimated that an additional €210 billion of investments are needed between now and 2027 to phase out Russian fossil fuel imports. High inflation, energy prices and interest rates have also certainly not helped in this regard. While 'fairness and solidarity' – both defining principles of the European Green Deal – were always key aspects to be taken into account and funded accordingly, European policymakers have now had to be extra creative in coming up with novel ways of finding funds.

The Commission's initial idea was to beef up the EU's Recovery and Resilience Facility (RRF), with new RRF grants funded by the auctioning of EU ETS allowances, currently held in the Market Stability Reserve (MSR) to the tune of €20 billion. The prospect of setting such a precedent, whereby Member states could draw from the MSR at will, sent shockwaves across the market. Luckily, both the European Parliament and Council staved off such interventionist measures, who instead have opted to preserve market integrity and the cap by sourcing frontloaded allowances from the Innovation Fund and member state auctions to generate the necessary funds. What remains to be done is for the EU ETS Directive and the MSR Decision to be amended accordingly.

**In spite of a few
wobbles, this is a story
of increased ambition**

Whilst the Parliament may have handled that issue well, MEPs – faced with increasing pressure from the electorate on high energy prices – did at one point flirt with the idea of restricting financial access to the EU's carbon market to address supposed speculation. What began as populist rhetoric soon emerged as amendments to the EU ETS Directive proposing to limit participation in the market solely to compliance entities and financial intermediaries purchasing allowances on their behalf. These were tabled and supported by mainstream MEPs – including the Rapporteur himself. IETA and many of its members became active. While as a rule 'nothing is agreed until everything is agreed', we can assume that when the compromise on the overall EU ETS Review is reached, the amended Directive will not contain any legal restrictions on participation in the EU ETS. Instead, as a compromise, enhanced market oversight is likely to be put in place.

One can safely say that 2022 has been a year of upheaval for Europe. In light of the ongoing energy crisis, we can expect this to remain the norm for the coming years. In the short-term, decarbonisation efforts will continue to take a back seat as Member States scramble to ensure security of supply but medium- and long-term, the 'Fit for 55' policy agenda has been set and even turbo-charged through RePowerEU. In spite of a few wobbles, this is a story of increased ambition and one can only hope that the EU does not encounter any further hurdles in the coming years.

Kavita Ahluwalia is Head of Global Positioning at Uniper and Co-Chair of IETA's EU WG. Now based in Düsseldorf, Germany, she spent most of her career in Brussels and as such is no stranger to European policymaking. She has worked for E.ON, the NGO E3G and Burson-Marsteller (now Burson Cohn & Wolfe), as a Parliamentary Assistant to Avril Doyle MEP and within the European Commission. She assisted Doyle in her work as Rapporteur for the EU Emissions Trading Directive Review in 2008/09 and also worked as an intern and contractual agent in the then Climate Directorate of DG Environment (now CLIMA) under Jos Delbeke. Kavita holds an M.Econ.Sc. in European Economic and Public Affairs, as well as a Bachelor of Business and Legal Studies (BBL) both from University College Dublin (UCD).

THE CASE FOR EXTENDING CALIFORNIA'S CAP-AND-TRADE PROGRAMME

Clayton Munnings makes the case for why California's carbon market programme should be extended beyond 2030

Critiques of California's cap-and-trade programme are increasingly making headlines. A bank of 320 million allowances, roughly equivalent to the annual cap, repeatedly shows up in news stories as being problematic. Given upcoming 2023 rulemakings for the cap-and-trade programme, we can expect the chorus of criticism around the allowance bank to grow and, as such, we should carefully listen to and thoughtfully address these concerns with solutions that strengthen the market.

One legal concern is that this bank may allow regulated entities to retire these allowances in 2030, thereby permitting additional pollution in that year and raising the probability that the state misses its mandated 2030 emissions target. This is a legitimate legal concern stemming from the California legislature's desire to hit annual rather than cumulative emissions targets. By design, the cap-and-trade programme achieves cumulative emissions targets over its lifetime, given that banking between compliance periods is permitted. This allows for temporal flexibility that yields substantial cost savings and incentivises early action.

The cap-and-trade programme achieves cumulative emissions targets over its lifetime

An extension would virtually eliminate any concern over California meeting its 2030 emissions target

A second policy concern is that the allowance bank somehow means that the cap-and-trade programme is not doing enough to reduce emissions. This notion has little substance behind it: indeed, a large bank could indicate substantial early abatement. In most cap-and-trade programmes, this hypothesis has been tested via statistical analysis. For example, in the Regional Greenhouse Gas Initiative, as economists Dr. Brian Murray and Dr. Peter Maniloff show, the programme reduced emissions by 24% all while its allowance bank grew. Such analysis is not possible in California because the government constantly issues climate policies which overlap with cap-and-trade, thereby adding too much noise to discern any clear signals from a single policy. This proliferation of policies in and of itself may explain a large allowance bank. All this said, this concern stands.

California's legislature in 2017 extended the cap-and-trade programme from 2020 to 2030 when it passed Assembly Bill 398. This bill also created the Independent Emissions Market Advisory Committee (IEMAC), a five expert panel that analyses and recommends improvements to the cap-and-trade programme. The IEMAC asserts solutions to the perceived problems mentioned above. Specifically, the IEMAC outlines two categories of improvements. The first would adjust supply by reducing auction volumes, reducing free allocations to utilities, reducing free allocation to industry, or reducing offset availability. The second would adjust prices by raising the price floor, introducing additional price steps, making offset availability conditional on auction prices, or implementing a market-stability reserve as in the EU Emissions Trading System.

The ambition of the recent bills passed in the legislature will require California to ramp up its abatement efforts

While the set of solutions set forth by IEMAC seem comprehensive, they miss the most effective and simple solution: extending the cap-and-trade programme beyond 2030. An extension would virtually eliminate any concern over California meeting its 2030 emissions target. This is because regulated entities would not use a substantial quantity of banked allowances if they knew these banked allowances were needed to hit future emissions targets. Indeed, a substantial use of banked allowances only occurs around 2030 if the programme ceases to exist at that time. In addition, an extension in and of itself, but especially when combined with lower caps and an emissions containment reserve, ensures that the cap-and-trade programme achieves a substantial amount of abatement over time.

Given the elegance of extension as a potent policy intervention, IETA's California working group made enquiries to try to understand why this solution was not on the table. Across numerous stakeholders, the answer was a belief that an extension is legally and/or politically difficult. Legally difficult in that most believed the California Air Resources Board (ARB), the state climate regulator, did not have the legal authority to extend the programme on its own, relegating that decision to the legislature. Politically difficult in that most believed that the legislature would have to pass a cap-and-trade extension with a two-thirds majority, which although achieved in 2017 is a task now viewed as more difficult given rising critiques.

Both arguments seemed wrong. Therefore, we hired Nico van Aelstyn and his team at Sheppard Mullin to conduct a legal analysis. The resulting memo finds some uncertainty regarding whether ARB can extend the cap-and-trade programme by itself, although ultimately arguing that the better argument is that the agency can do just that. In any case, the memo makes a clear case that this uncertainty can be resolved by the legislature with a simple majority rather than a two-thirds majority. Nico presented the compelling memo at an IEMAC meeting, during which it was well-received.

Now that we know extension is achievable, we must act to do so imminently. During the last legislative session, where Governor Gavin Newsom managed to push several climate bills through the legislature, IETA advocated to government officials and many legislators asking for an extension of cap-and-trade with lowered caps and an emissions containment reserve. While well-received by many, the bills that the governor signed made no mention of cap-and-trade, let alone extension. This gives us cause for concern.

The ambition of the recent bills passed in the legislature, particularly the codification of carbon neutrality by 2045, will require California to ramp up its abatement efforts. If the cap-and-trade programme is not extended imminently, then that abatement will have to be achieved through California's suite of direct regulations and government subsidies. In a public memo, we estimated that these policies would cost at least \$255 per tonne to achieve, based on analyses completed by ARB, while the cap-and-trade programme would achieve these same goals at \$59/t. Beyond being costly, direct regulations and government subsidies are not guaranteed to work, whereas the cap-and-trade programme operates with virtually perfect compliance. An assertive advocacy campaign to extend the cap-and-trade programme during this legislative session could ensure that the mechanism does the heavy lifting, rather than costly direct regulations and government subsidies.

There is also a logical element to answering the question of extension before California starts its regulatory rulemaking review of the cap-and-trade programme. At the moment, the cap-and-trade programme is not aligned with the state's long-term emissions targets, which now include a legally mandated net-zero by 2045 target. Before diving into the minute details of the programme via a rulemaking, it would behoove California to affirm the programme's extension through 2045 and beyond. As explained by economist Dr. Meredith Fowlie, it is "hard to assess the oversupply problem when no formal commitments have been made to allocate permits—or extend the program—past 2030".

Clayton Munnings is US Strategic Advisor, IETA. He is also the founder of the Munnings Consulting Group and is studying for his PhD at UC Berkeley.

CUTTING EMISSIONS IN AN ECONOMIC POWERHOUSE

Many Asian nations are dealing with the challenge of growing economies and population while needing to decarbonise. South Korea is at the forefront of this challenge and remains committed to its climate goals while still growing its economy – with an emissions trading system at its core. Maureen Lee shares the Korean experience.

The ‘Miracle of the Han River’ saw South Korea’s remarkable post-war economic rise from poverty to wealth. South Korea was mainly an agricultural country in the 1960s with a per capita income of less than \$100, and its rapid transformation has made it one of the largest economies in the world, with a per capita income of \$31,000 as of 2020. By establishing an export-oriented economic structure, South Korea’s GDP has risen from \$400 billion in 1990 to \$1.8 trillion in 2020 and it is among the top 10 biggest exporting countries.

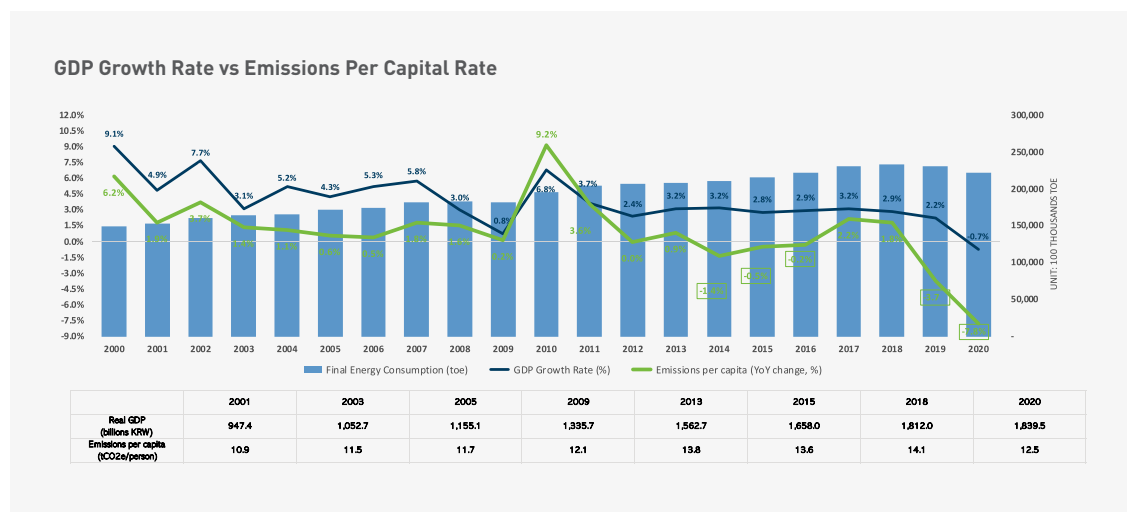
However, the rapid industrialisation, increase in population and emergence of carbon-intensive economy has made South Korea the seventh-largest emitter in the world and one of the countries with the fastest-growing GHG emissions. In 2019, South Korea’s per capita emissions stood at 13.60 tCO₂e per person, double the 1990 figure and well above the world’s average of 4.5 tCO₂e and the OECD average of 8.5 tCO₂e.

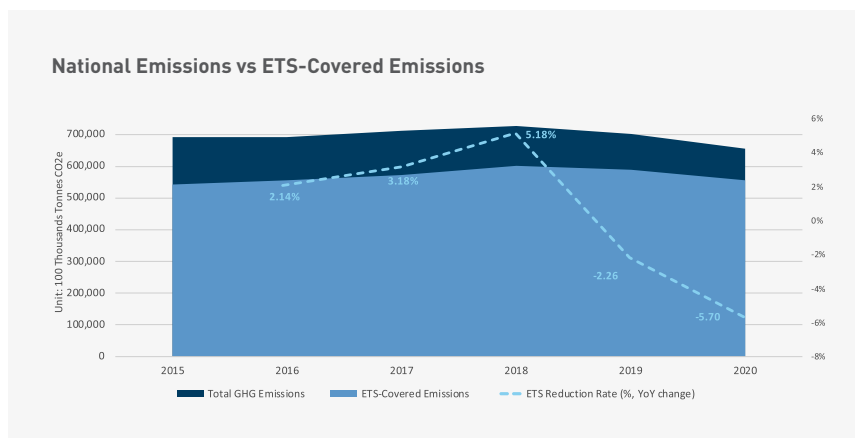
South Korea saw the opportunity in transitioning to a low-carbon society and embraced green growth-related policies early. The government established a national

green growth strategy in 2009, enacted the Low Carbon Green Growth Act in 2010, aligned core energy and sustainable development regulations with low-carbon objectives, and implemented the national ETS in 2015 – the first in north-east Asia.

The nationwide carbon pricing scheme covers around 70% of the country’s total GHG emissions. The first three years of the ETS aimed to establish the infrastructure while the second and third phases placed emphasis on gradually increasing the reductions achieved through the expansion of the ETS, improvement of standards and methodologies, flexibility enhancements, and participation of non-compliance players.

The K-ETS, along with energy transition and clean technology investments, plays a central part in the country’s climate policies. The inclusion of major emitters in the market made it easier to accurately monitor, report and verify emissions and see area for improvements. Since the establishment of the ETS, there have been many policy changes that followed, most notably the Korean Green New Deal announced in 2020 and the passage and enactment of the Carbon Neutrality Law in 2021 and 2022, respectively.





South Korea saw the opportunity in transitioning to a low-carbon society and embraced green growth-related policies early

ETS IMPACTS

The domestic ETS showed gradual results in terms of emissions reductions. There were no noticeable reductions in the first phase largely due to the generous provisions (full free allocation and the use of grandfathering) to quell concerns about industrial competitiveness.

Emissions finally started declining in 2019, dropping by around 2.2% followed by another estimated drop of 5.7% in 2020 amid the Covid-19 pandemic. The greatest reductions were in the power sector (down 7.3% in 2019 year-on-year, and 11.9% in 2020) due to reduced fuel consumption for heating, fuel switching, decreased electricity demand, and a decline in coal-fired power generation. In 2020, there was a simultaneous decrease in emissions from all the major sectors such as industries (down 1.2%), road transport and aviation (21.7%), buildings (4.4%) due to the prolonged pandemic and economic deterioration.

The K-ETS is viewed by market participants as generally effective due to several factors:

- it is a cost-effective measure that provides incentives to decarbonise through having allowances act as 'assets' that can be cashed in when reduction measures have been successful;
- the 'polluter pays' principle pushes companies to keep track of their emissions and optimise their productivity and operations in environmentally-friendly ways to avoid being penalised for their carbon liabilities;
- it opens opportunities to invest in new facilities and green technologies as a result of tougher targets and regulations;
- it encourages innovation, research and development, fostering climate-friendly solutions,
- it increases long-term global competitiveness by aligning domestic methodologies with international standards and trends;
- carbon management has become a key part of corporate policymaking,
- provides a strategy for global digitalisation and decarbonisation.

According to modelling forecasts by the Korea Energy Economics Institute, Korea's total energy demand is predicted to keep rising in the mid-term as the national economy recovers from the pandemic and demand in the transport and industrial sectors rise. However, emissions in the power generation sector are expected

to keep decreasing due to the scheduled shutdown of coal power plants, planned increase in nuclear power output and growth in renewable energy generation—measures that were impacted by the ETS.

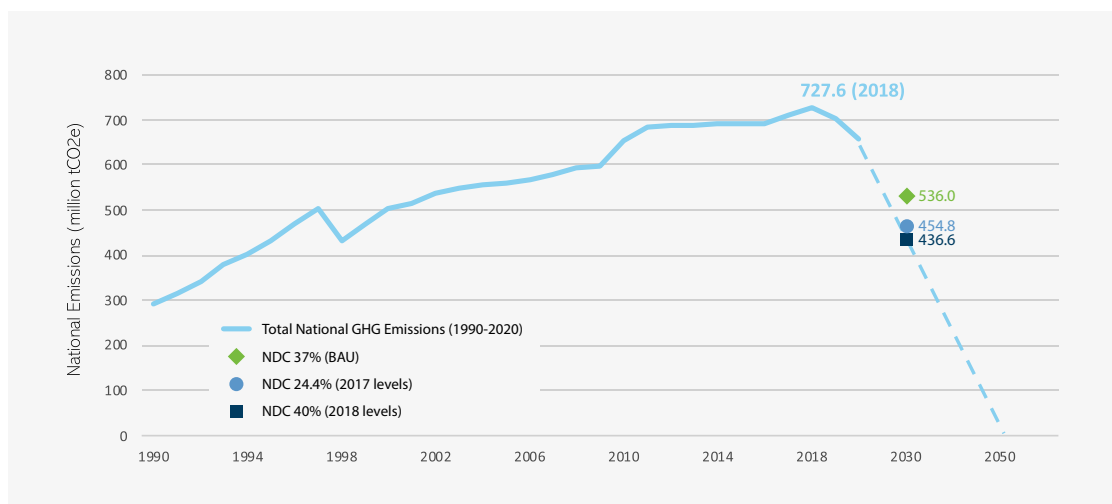
CHALLENGES AND FUTURE DIRECTION

The Korean government aims to decouple economic growth from carbon emissions while sustaining its export-based economy without sacrificing energy security. Aiming to support economic recovery from the pandemic while incorporating climate change goals, the 2020 Korean New Deal was formed, encompassing all sectors of the society, including capacity building, digitalisation, carbon neutrality and local initiatives. Part of the Korean New Deal is the KRW 220-trillion (US\$164 billion) Green New Deal aimed at stimulating a green economy.

In 2021, South Korea became the 14th nation to pass a carbon neutrality law, requiring a minimum greenhouse gas emissions cut of 35% from 2018 levels by 2030. At the end of 2021, the government presented a more aggressive target, of a 40% reduction, in its updated Nationally Determined Contribution (NDC), reflecting the government's climate ambition despite its highly energy-intensive industrial structure, semi-liberalised power market, zero cross-border energy connectivity, and heavy dependence on imported fossil fuels.

The government has set measures to face up to these challenges, such as actively operating the ETS and taking advantage of the Fourth Industrial Revolution to support the energy transition by harnessing the benefits of artificial intelligence, smart automation, and interconnectivity to promote low-carbon industrial complexes.

Korea's total energy demand is predicted to keep rising in the mid-term ... however, emissions in the power generation sector are expected to keep decreasing



Establishing an interconnected and consistent climate, environment, and energy policy roadmap is one of the success factors of an ETS

The K-ETS still has a lot of opportunities for improvement, meaning that this 'live' system will continuously be subject to reforms to fit with national and international developments. Various stakeholders from the government, private, academic and public sectors hold constant consultations towards reform agendas and these discussions put emphasis on the ETS emissions budget, methodologies, operations, and policy reviews.

Establishing an emissions cap aligned with the national reduction target will strengthen the function of the K-ETS. The setting of this cap means greater predictability for covered entities who can then structure their consumption, production, and investments accordingly.

Korea uses a benchmarking system for allocation, based on the average emission efficiency level (instead of using the average of the most efficient facilities). This process will be reviewed in consideration of international developments, such as the EU's forthcoming Carbon Border Adjustment Mechanism, and for the planned increase in volumes to be auctioned.

In terms of the power and electricity sector, a myriad of issues must be resolved including expanding the share of renewable energy and reforms to the electricity market design and pricing system. These issues include the lack of adequate substations to connect renewable energy facilities to the grid, long processing and permitting procedures, public resistance from local communities for renewables' expansion, and absence of a cost pass-through in wholesale electricity prices that reflects marginal cost abatements. Planned reforms to the retail tariffs to reflect environmental merit order are expected to pave the way for full carbon cost pass through in the coming years.

To remove barriers to market liquidity and prevent high volatility, the government has tried various measures to revitalise the K-ETS and improve liquidity, such as the introduction of banking and borrowing restrictions, participation of third parties, and expansion of the market-making system. Focus is also on low prices and the government will also introduce carbon derivative products to improve price discovery. According to a research report jointly initiated by several ministries, carbon prices of KRW 40,000 and KRW 60,000 per tonne for the power sector and industrial sector, respectively, are needed to achieve the NDC's 40% reduction target – at least double the prevailing price of KRW 21,000.

Clear regulations on the use of auction revenues must also be established to encourage and incentivise all sectors of the economy.

LESSONS FROM KOREA

Establishing an interconnected and consistent climate, environment, and energy policy roadmap is one of the success factors of an ETS, supported by an effective MRV system to build a comprehensive emissions inventory. An acceptable transition scheme according to one's capacity and resources must also be introduced to enable businesses to take proactive action in emission reduction activities without sacrificing their productivity or endangering their competitiveness.

Regular capacity building, information sharing, and education programs are also necessary to grow experience and expertise. Flexibility mechanisms to reduce burden and provide support are also essential in fostering low-carbon transition and investments.

Maureen Lee is a market analyst for the Korea ETS at Korea-based environmental consulting firm, Ecoeye. She has more than five years of experience in carbon markets and nearly 15 years of combined experience in the field of policy development and research in the energy and environmental sector.

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OVERCOMING MRV HURDLES

Accurate and transparent data is the cornerstone of any effective emissions trading system. Min Li explains how China's national ETS is dealing with MRV challenges

Since the launch of China's national carbon market on 16 July 2021, it has successfully completed the first two-year compliance cycle (for 2019 and 2020). The closing trading price on 15 July 2022 was 57.80 yuan/tonne, up 21% from its opening price a year earlier. As of November 2022, cumulative trading volume was nearly 200 million tonnes, with a turnover exceeding 8.8 billion yuan (around €1.26 billion). These suggest that the current top-level regulation system, MRV protocols, allowance allocation, trading platform, compliance procedure, info disclosure and other market elements, have been successfully tested so far at the first compliance cycle of China ETS. But there is still a lot of fundamental work needed to further improve and strengthen the national carbon market's construction and operation.

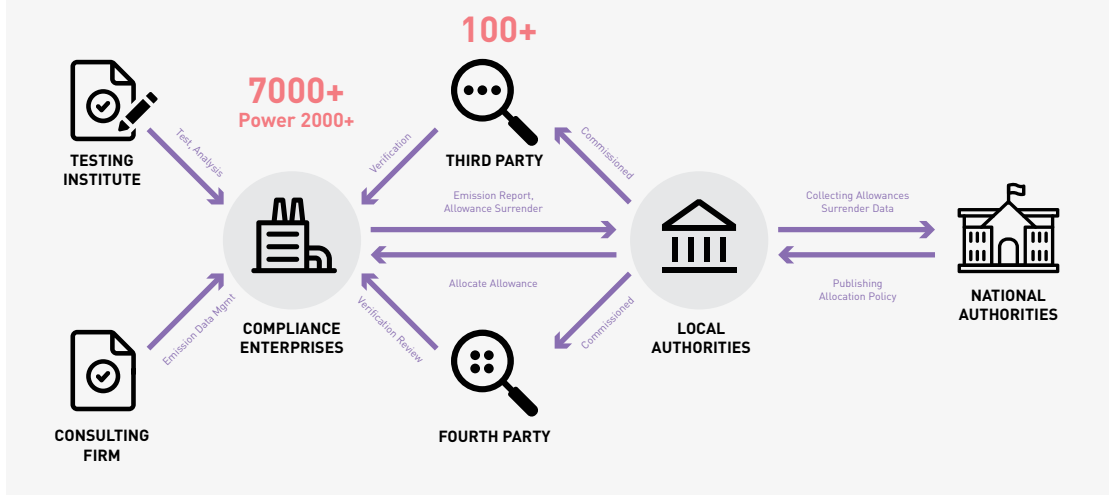
A sound and effective MRV system is fundamental for any carbon market, and data quality is the lifeline to ensure the healthy and orderly development of any ETS. It is also a prominent element affecting the effectiveness of emissions control of the China national ETS. The expansion and vitality of the national carbon market needs to be based on comprehensive, accurate, and true emissions data. From the very beginning of its design, China's carbon market established a complete emissions data monitoring, reporting and verification system, comprising a series of emissions data measurement methods covering 24 industrial sectors. The main stakeholders involved in China's carbon market MRV system include government authorities, regulated enterprises (key emitters), third-party verification entities, testing institutions, consulting service companies, among others. All kinds of entities need to play their due roles, and all links are indispensable. The main responsibilities and workflow relationships of various entities involved in China's carbon market MRV system are shown in Figure 1.

There is still a lot of fundamental work needed to further improve and strengthen the national carbon market

At present, the activity and liquidity of China's carbon market trading are still insufficient compared to the EU ETS or other matured carbon market, and the market expansion for the next phase is slowing down. Through the evaluation of the construction and operation of the first compliance cycle of the national carbon market in 2021, many obstacles were found remaining in its construction, especially with regards to the quality management of the emissions data in compliance enterprises and the design of MRV system, which are reflected in the following aspects:

- The carbon measurement standards and monitoring guidelines need to be updated. At present, among the 24 industrial sectors' measurement standards, only the power industry standard was updated in 2022. The other guidelines have not been integrated and updated for several years; indeed, some of them still use a 2014 version. Meanwhile, the new published measurement facilities guide for the power generation sector have a quite complicated calculation procedure and various parameters which need to be periodically tested. All these issues have directly affected the accuracy and reliability of data.
- Entities' emissions reports depend on the validation and verification skills of the third-party verification performing that work and the related standards of scientific nature, rationality and feasibility still need to further improve. At the same time, the proficiency of the third-party verification institutions entrusted by local government departments varies, with inconsistent understanding of measurement report guidelines and an inconsistent grasp of standards, and the verification skills of auditors need to be further improved.
- For the "high threshold" policy, carbon content ratios for coal-fired power generators released at the end of 2019 strongly promote the awareness of emissions management and led to a substantial increase in onsite testing (from 66% to more than 98%). However, to a certain extent, it also induced or amplified the problem of inconsistent monitoring and reporting of emissions data in the first compliance cycle, leading to "inflated" carbon emissions in the verification results of many coal-fired units.

Figure 1. Main Stakeholders of China's MRV system¹



Data quality is the lifeline to ensure the healthy and orderly development of any ETS

To address issues in the MRV system, especially with regard to the accounting and verification of carbon emissions data, Chinese authorities have issued a series of documents, including the Notice on Adjusting Key Tasks Related to the Management of Greenhouse Gas Emission Reporting by Enterprises in June 2022 and the Guidelines on Greenhouse Gas Emission Accounting Methods and Reporting by Enterprises for Power Generation Entities (Draft for Comments) and the Technical Guidelines on Greenhouse Gas Emission Accounting (Draft for Comments) issued in November. These will revise the technical standards for GHG emission accounting and reporting of power generation entities and enhance the standardisation, effectiveness and transparency of emissions reporting and verification. Starting from a top-level design and system design, the authorities will take measures to establish and improve the long-term mechanism of carbon market data quality management to facilitate the healthy and effective operation of China's carbon market in the future. Specific improvements include:

- Ensure the measurement, verification, and traceability of emissions data, and replace the data which need a complex conversion to a direct simplified measurement data. Under the premise of ensuring accuracy, simplify the measurement and calculation method as much as possible, compress the chain of calculation technical parameters, and reduce the difficulty of the implementation for compliance enterprises.
- Draw lessons and experience from the local pilot ETSs and the EU ETS to improve data quality in the monitoring plan and data quality management requirements. Refining the information documentation rules and enhance process management to prevent emissions data fraud of the compliance entities. Meantime, parallel with the actual management process of power generation facilities, simplify and streamline the overall monitoring and data recording procedures.

- Improve the verification proficiency of the third-party auditors, to improve and unify the understanding of measurement standards and guidelines for different industrial sectors. Meanwhile, the role of the data quality control system should be further strengthened to improve the efficiency and standardisation of verification work.
- To solve the issues of "high threshold" of carbon content ratio, organised experts in power generation industry to study and draw lessons from the domestic pilot ETS markets and other international carbon markets. The June notice on adjusting key tasks was issued to correct the default values of relevant parameters (from 0.03356 tC/GJ to 0.03085tC/GJ) in a timely manner. For small and medium-sized unconventional coal-fired units' measurement (1/3 of the total), the adjusted value is closer to their actual level of the same type of units, which not only ensures the data quality, but also simplifies the measurement process, reduce the technical and management burden of enterprises, and ensure that the measurement results of enterprise carbon emission data are "true and accurate".

Li Min is IETA's China Representative. Li Min has almost 20 years' experience of carbon trading experience in China, and initially working in the Project Coordination Unit of the EU-China Environmental Management Cooperation Programme (EMCP) in the Ministry of Science and Technology of PRC since 2004. After that, she took charge of Germany's BMU CDM Service Unit China Programme as the Country Coordinator for German Technology Cooperation (GTZ) before establishing the Beijing Representative Office of Blue World Carbon Capital, where she led the China carbon trading team for six years, which became one of the biggest buyers of the post-Kyoto CDM credits.

Starting from a top-level design and system design, the authorities will take measures to improve carbon market data quality management

[1] There are more than 7000 regulated enterprises in total covered 8 main sectors in China national ETS. In the 1st compliance cycle only around 2000 power generation entities were included. Source: SinoCarbon.

EVOLUTION OF COLOMBIAN CARBON PRICING

Like other emerging economies, Colombia’s first foray into carbon pricing took the form of a tax-and-offset hybrid, developing domestic capacity and systems. Carlos Trujillo and Juan David Duran Hernandez chart the evolution of the Colombian carbon space.

Colombia has been always very active in the implementation of sustainable development mechanisms as part of a development plan to improve the conservation and restauration of our nature and biodiversity. The government has ratified different approaches and solutions towards a more sustainable future in Colombia, including the development of the carbon tax that led to a market-based offsetting scheme and the design of an emissions trading system.

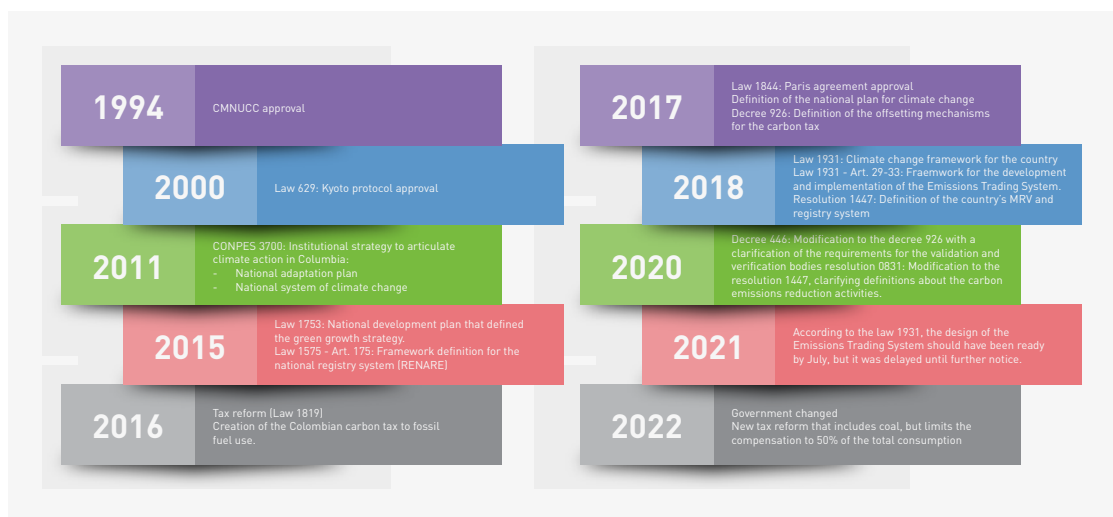
According to the latest Colombian Nationally Determined Contribution (NDC), the country needs to reduce its emissions by 2030 by 169.4 million tonnes of carbon dioxide equivalent, corresponding to 51% of total emissions. Other commitments made by the Colombian government during 2021 include plans to also achieve carbon neutrality by 2050 and zero deforestation by 2030. One of the main milestones to reach the goal of zero deforestation was declaring 30% of the national territory as protected areas in 2022.

Allowing offsets as a compliance option led to a dynamic carbon market, enabling participants from all around the world to participate

THE CARBON TAX

The carbon tax was first introduced in 2016 as part of tax reforms and, in mid-2017, the government published the options and rules for the carbon tax, which applies a levy of around US\$5/t CO2 to sales and imports of fuels. Allowing offsets as a compliance option led to a dynamic carbon market, enabling participants from all around the world to participate, giving birth to and building capacity at multiple companies, such as project developers, validation and verification bodies, registry systems, carbon crediting programmes and an industry association, Asocarbano. It also awoke a new concept for companies in Colombia, defining exactly what it means to compensate for emissions and to participate in sustainable development. The tax was designed so that the companies that consume fossil fuels like airlines, other transportation types, cement manufacturers, among others, could deduct the levy in their fuel invoice by buying Colombian carbon credits.

The carbon tax has incentivised the implementation of REDD+ projects greatly so that they account for just over 50%, followed by the implementation of afforestation, reforestation and revegetation solutions and energy projects. As we all know, nature-based solutions are important to preserve the Amazon and coastal regions that allow the development of great biodiversity. Over the last six years, 87 million Colombian carbon credits have been used to comply with the



tax. This means that, for the projects, they have delivered investment in excess of US\$350 million for environmental and social impact.

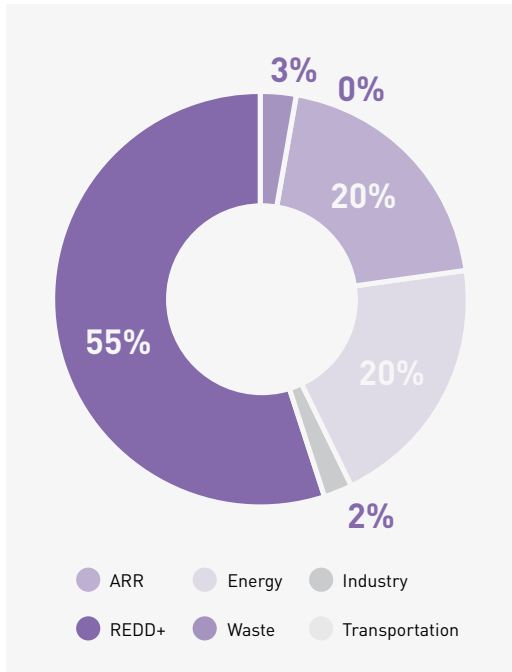
The evolution of the carbon market shows a constant growth of the use of offsets in relation with the fuel consumption in the country. This will be accounted for in the Colombian NDC and has incentivised the implementation of emissions reduction projects. The carbon tax will have two important changes with the new reform that was signed during 2022:

COAL CONSUMPTION WILL BE PART OF THE TAX

- This new tax will be introduced gradually.
 - 2024 25% of the tax
 - 2025 50% of the tax
 - 2026 75% of the tax
 - 2027 100%

OFFSET UNITS CAN BE USED FOR UP TO 50% OF THE FUEL CONSUMPTION BY EACH PARTY

- This measure will start on January 2023 and will impact the carbon market, its 250 projects, and also affect the development of new projects.



THE VOLUNTARY CARBON MARKET

Due to the rapid development of the domestic market, the quality of the Colombian carbon crediting standards and the slow growth of the offer for the international market, it is important to note that most of the nature-based solutions being developed in the country are reaching the international market. The international market can be very interesting for project developers and project owners in Colombia, because it leverages a wider field for negotiations and opens opportunities to find new types of buyers. The voluntary market has made Colombian companies improve their quality to meet buyers' criteria and also find a way of starting operations in other countries around Latin America.

ADDING AN ETS

The ETS in Colombia has been defined in legislation since 2018, and was to be designed by 2021, according to law 1931. The final design of the ETS for Colombia

The VCM has made Colombian companies improve their quality to meet buyers' criteria and also find a way of starting operations in other countries around Latin America

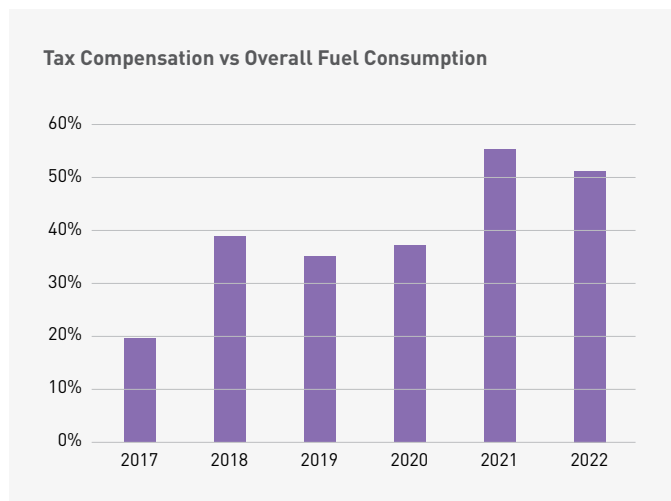
has not been presented yet, but some consultations have been undertaken, around the scope, types of solutions, ways of auctioning and other issues. A simulation with multiple participants was also implemented during 2021 and afterwards the results were posted. The ETS remains under design for the moment, but there is no clear path for implementation and operationalisation yet.

One of the main reasons to start developing a compliance market is to build the institutions needed to define, plan, operate, oversee and improve the carbon markets. The new government that was established in August 2022 has been working on the national development plan to include the evolution of the climate change policy. This will define the institutions and the interaction between the carbon tax and the compliance market.

The purposes of adding the right institutions to develop and implement the climate policy in general is to be sure that the communities are included in all activities around sustainable development. Different frameworks around fair treatment, transparency and active participation of the communities are being developed by NGOs, carbon crediting programmes and the government in Colombia, in order to continue the development of the carbon market and ensure opportunities are generated for the communities that are conserving the nature.

Carlos Trujillo is the founder and CEO of Cercarbono, a Colombian carbon certification programme. He has an MBA in IE Business School and has previously worked in developing agricultural exports to European countries as well as in ecommerce.

Juan David Duran Hernandez is CEO of EcoRegistry, combining his passion for technology with his love for sustainable development, biodiversity and society. He started his career developing software for electrical mobility, and after moving back to Colombia, worked at the independent system operator and wholesale energy market administrator before starting EcoRegistry.



IN A LEAGUE OF ITS OWN

With its GX League, the Japanese government is looking to maximise corporates' voluntary efforts to meet its longer-term climate objectives.

Takashi Hongo explains how.

Japan has set a target of reducing greenhouse gas (GHG) emissions by 46% from 2013 levels by 2030. Many Japanese companies have set or are considering emission reduction target. The proposed GX League covers both the national and voluntary goals, as emissions trading is key for achieving these targets. Excess reduction amount (ER), credits from the Paris Agreement mechanisms, and voluntary credits will be used for achieving company's target.

GX League is initiated by the government but is not a regulation. The government's move is motivated by the success of the Voluntary Action Plan which operated during the Kyoto Protocol's first commitment period (2008-12), and Japan achieved its goal to cut emissions to 6% below 1990 levels.

Since the GX League is not a mandatory system, only participating companies are obliged to comply. But it will have a dashboard where companies must publish their targets and progress. When they cannot achieve their target, they must explain why.

A link to financial markets is planned. This would put pressure on participating companies, especially as the GX League is considered a system that expects corporate social responsibility.

The government is motivated by the success of the Voluntary Action Plan which operated during the Kyoto Protocol's first commitment period

GX LEAGUE: THE BASICS

In February 2022, the Ministry of Economy, Trade and Industry (METI) announced the basic concept of GX League and invited submissions for rule-making. By 1 April 2022, 440 companies had agreed to participate.

It is noteworthy that electric power and gas companies as well as energy intensive industrial companies from the steel, metals, chemicals, and pulp and paper sector want to participate. The total emissions of these companies in Japan are estimated to be 320 million tonnes of carbon dioxide (CO₂). This is equivalent to 28% of Japan's annual CO₂ emissions and 38% of emission from industry.

The League is proposed to cover supply chain and international emissions as well as Scope 1 and 2 emissions. The system also aims to generate new business streams, such as carbon neutral products, and set carbon management. The rules for these are being discussed by various groups of participating companies.

GX League is planned to be fully operational in April 2023, and rules will be developed by the end of 2022.

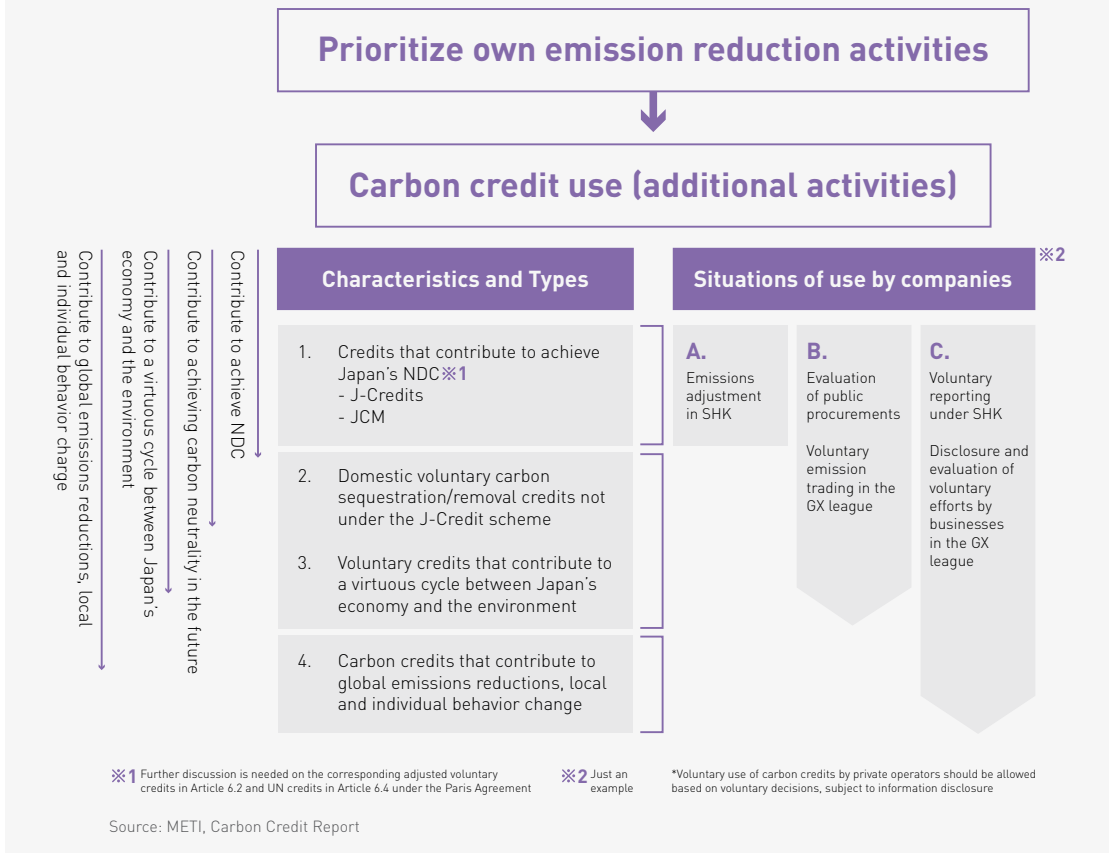
Critical rules would include reduction targets, eligible units, and confirmation of compliance. These are likely to be determined by the GX League Secretariat, housed within METI.

Companies are required to explain whether their own targets and strategies align with Japan's Nationally Determined Contribution (NDC) under the Paris Agreement. However, this alone could lead to significant differences among companies, so METI recommends that companies refer to its Roadmap for Transition Finances. So far, these have been published for steel, chemicals, electricity, gas, petroleum, pulp and paper, and cement.

Participants can choose the base year for these targets, from between 2013 and 2020. An interim target is also needed, most likely in 2025. Compliance will be confirmed by phase to phase, say first phase and second phase.

Basic stance towards accepted credits can be seen in the Carbon Credit Report released in May 2022, and in Figure 1. If an entity's Scope 1 emissions are lower than its target for a given year, it will receive an ER, which is tradable. This is designed as an incentive to participate GX League.

Figure 1: Eligible types of offset credits



This diagram (Figure 1) seems to be complex. However, considering what is important for the government, the core concept of credits is clear. It is highly likely that credits contributing to Japan's NDC will be used to offset domestic Scope 1 and 2 emissions. Under the national reporting system, J-credits, from domestic emission reductions, and the Joint Crediting Mechanism (JCM), which is considered as a cooperative bilateral arrangement under Article 6.2 of the Paris Agreement, are eligible too. Credits from the mechanism established by the Paris Agreement's Article 6.4 will also contribute to Japan's climate goals. At this time there is no indication, but they are likely to be eligible. Eligibility of voluntary credits with corresponding adjustments is not explicitly stated, but this does not mean it is ruled out.

It is likely that a variety of credits, including international voluntary credits, will be used for offsetting supply chain emissions. The report stated that credits without corresponding adjustment will contribute to the host country's NDC. So far, no criteria for international voluntary credits have been set forth.

In anticipation of the market's start in 2023, experimental emissions trading of J-Credits is being conducted at the Tokyo Stock Exchange from September 2022 to January 2023. Most of the units traded originate from renewable energy, and the prices are similar to those of the government's J-credit auction programme of around JPY 3,300 (US\$23.78) to 3,500.

Requirements for participants in the experimental trading are that they should have a J-credit account and bank account in Japan. Non-Japanese firms are not excluded; however, all documents such as participation application, terms of use, and system operation are in Japanese. It is not confirmed whether these requirements will be carried over to full operation phase.

KEY DECISIONS TO COME

2030 Target and interim target

The biggest contention in the rulemaking is the reduction target for each company.

The system also aims to generate new business streams, such as carbon neutral products

METI uses the Roadmap for Transition Finance as a reference. However, the roadmap is a conceptual diagram of the path to become carbon neutral by 2050, and does not indicate specific emission levels or reductions. METI is consulting with power and energy intensive industries as hard-to-abate industries. Although targets are likely to be set in consideration of the international competitiveness, particularly for industries, the Japanese NDC is a tough target and the supply of ER units is likely to be limited. External offset credits, particularly from the JCM, will be major sources.

Japan's NDC assumes the increase of renewable energy generation and the use of a significant amount of nuclear power – both of which have a degree of uncertainty so offset credits will be a measure to balance.

JCM supply

The Japanese government plans to increase the number of partner countries from 17 to 30; 25 countries had signed up to join by the end of COP27 in November 2022. Negotiations are thought to be underway with Brazil and India, both of which have great potential for reductions.

Until now, most JCM projects have been funded by the Ministry of the Environment's equipment subsidy programme, and issued credits were acquired by the government in return. So, in addition to the subsidy programme, the government has begun to promote Private Driven JCM to supply credits for private sector demand. Energy saving credits that can be supplied in the short term and CCS credits with large long term supply potential are noted.

Private Driven JCM will contribute to the host country's NDC, depending on credit sharing. In addition, it will bring benefits for host countries, such as increased direct investment, technology transfer, capital inflows, and stabilised energy markets.

JCM partnership agreement are based on corresponding adjustments. If the GX League decides JCM is eligible, it is thought companies are free from the risk of corresponding adjustment.

Countermeasure for price volatility

Industry is wary of price volatility from emissions trading and price hikes due to speculative activity. As a countermeasure, a mechanism to contain the price within a certain range is being considered – effectively a price collar. If prices soar and exceed the ceiling, the government would issue GX Certificates in order to keep prices down.

The biggest contention in the rulemaking is the reduction target for each company

However, it is not easy to determine the appropriate price range. Another point for discussion is whether it is necessary to secure emission reductions to back-up GX Certificates.

Administrative burden and cost

Third-party verification is a global standard process.

However, if the required level is too stringent, the burden on companies risks becoming too heavy, especially for small and medium enterprises.

GX League has proposed the idea of strengthening the requirements step by step. Assurance by verification is also an important discussion point. It is thought to be limited assurance.

In Japan, a national GHG reporting system has been implemented, and many companies already disclose their emissions in corporate sustainability reports. It is expected that these existing systems will be considered.

GX League is understood as voluntary ETS, but has the potential to later be developed into regulation, building on experiences. Dialogue with industry is the basis for rule making, say bottom-up approach. "Start with what we can do" seems to be its initial principle. While the GX League is unique, it could also be a reference for other countries, including across Asia where energy consumption is increasing and regulations are not easily adopted.

Takashi Hongo is Senior Fellow of Mitsui & Co. Global Strategic Studies Institute and a member of the IETA Council. He joined the institute in 2011 after working for the Japan Bank for International Cooperation. He has written numerous articles on climate change and energy issues, and emissions trading, from the perspective of market mechanisms. He has also participated in various government committees, such as vice chair of Environment, Energy, Science and Technology Committee of Ministry of Education, Culture, Sports, Science and Technology Japan, study group for carbon credit report for the GX League. He has organized the Net Zero Emission Study Group from 2020. He is a lecturer at Dokkyo University.

ERD



PROCESS OVER SUBSTANCE

Amy Merrill wraps up the COP27 outcomes on Article 6 and what the next steps are for market development under the Paris Agreement

As December comes around, we finally reach the low season in UN climate change negotiations; the world has churned through yet another climate conference and it is time for an end-of-year mental pause. For the Paris Agreement's Article 6, it was neither a wonderful nor a terrible COP, with the big political highs and lows mainly happening in other negotiating rooms. This article peruses some (but not all) of the Article 6 outcomes¹.

CMA (Paris Agreement countries) decisions this year do advance Article 6 implementation and, overall, it was decent progress, despite key issues not making it to consensus and adoption. Decisions about processes prevailed over substantive advances, with most difficult issues being pushed to next year. That was no surprise; at COP26 in Glasgow, the one-year work programmes were overloaded by political necessity. Agreeing processes and procedures in Egypt may thus have amounted to relatively easy wins. But still, some core and difficult decisions will be needed at COP28. The show never stops.

THE 6.4 MECHANISM

The 6.4 Supervisory Body (6.4SB) pulled a pre-COP all-nighter to try to complete work on methodological rules for the mechanism. Despite the effort, the complexity of this most central of issues was too much, the 6.4SB could not agree² and the CMA requested it to continue next year.

Rules for GHG emission removals activities also remain in progress; despite the 6.4SB making high-level recommendations for adoption³, the CMA sent the issue back for further work. The CMA requested the 6.4SB to consider inputs from stakeholders on these issues in a structured public consultation. The user-perspective is critical to any business operation and listening to stakeholder input on these core substantive matters is essential if the mechanism is to become useable at scale.

The detailed progress on transitioning CDM activities was disproportionate, given the 6.4 mechanism lacks new methodological and procedural rules for new activities

But by not having methodological implementation rules completed this year, the mechanism will not be truly operational before 2024. As the 6.4SB only started work in July 2022, it is impressive that it achieved so much in 2022, even if the work was on more prosaic matters such as meeting management (rules of procedure) and fee structures (including allocating 3% of issuance fees annually to the Adaptation Fund).

On other aspects of implementation, countries made progress on technicalities for the mechanism registry, including how 6.4ERs levied for share of proceeds and overall mitigation in global emissions will be managed. Registry discussions got bogged down in the interoperability debate (see below) but enough came through to understand more clearly how it will work. Pushed out to next year are the substantive, and political questions of the (greater) role of host countries and their national arrangements, and the thorny question of emissions avoidance and conservation enhancement.

Perhaps the most remarkable or remarked upon outcome from this COP in Article 6 is the difficult nuance that countries gave to possible uses for unauthorised 6.4ERs⁴, identified (but not defined) as "mitigation contribution 6.4ERs" and its precedent, if any, for voluntary carbon markets. The tricky wording is set out in the section of rules relating to what the mechanism registry will track: "A6.4ERs not specified as authorized for use towards achievement of NDCs and/or for other international mitigation purposes (mitigation contribution A6.4ERs), which may be used, inter alia, for results-based climate finance, domestic mitigation pricing schemes, or domestic price-based measures, for the purpose of contributing to the reduction of emission levels in the host Party."

The combination of the inter alia, the commas, and "for the purpose of..." makes it hard to be sure what countries intended in relation to uses of unauthorised 6.4ERs. Perhaps the provision seeks to limit uses of such 6.4ERs to domestic type scenarios or perhaps merely provide examples of uses. Two of the three given examples, "domestic mitigation pricing schemes" and "domestic price-based measures", are probably not different to each other.⁵ So the wording may not be a classic case of UNFCCC constructive ambiguity, and rather, may just be ambiguous. After a year of commentary and deep debate in the voluntary markets about authorisation under Article 6, in the context of use claims by corporates and avoiding double counting and claiming, and discussions among countries about the role of unauthorised 6.4ERs, the naming of mitigation contribution 6.4ERs might be best left to just serve as a tracking tool for the 6.4 registry, rather than being overly interpreted and used as any precedent in the voluntary markets.

For the first time in a generation of carbon markets, Article 6 negotiators had to do something really difficult: move from a negotiation mindset to an implementation one

TRANSITIONING CDM AND CERs

The detailed progress on transitioning CDM activities was disproportionate, given the 6.4 mechanism lacks new methodological and procedural rules for new activities. Transitioning CDM activities can keep their CDM methodology until the earlier of the end of their current crediting period or the end of 2025, after which 6.4 mechanism methodologies must be used. The CMA requested the 6.4SB to apply “interim solutions” for methodologies to transitioning CDM activities whose current crediting periods are about to expire. This may have a galvanising effect on the 6.4SB work on methodologies. The CMA also adopted transition provisions on aligning CDM activities with 6.4 mechanism design and set out the numerous transition steps.

Taking a step back, the CMA request that the procedures enabling CDM activities to request transition be ready by June 2023 probably means the first 6.4 activities will just be transitioned CDM ones. While pragmatic in resolving the current CDM holding pattern, that likelihood gives a disappointing political signal given the urgent need to incentivise new mitigation action before the 1.5°C goal evaporates.

As for CERs, rules for their transfer from the CDM registry to the 6.4 registry for use by countries for first and updated NDCs were coordinated between the CMA and CMP (Kyoto Protocol countries).

The CDM decision focussed on preparing for phase-down, with CMP requesting technical analysis from the secretariat for next COP.

COOPERATIVE APPROACHES

Going into COP, the main goals seemed to be to agree implementation rules for infrastructure – the international registry, the Article 6 database and the centralised accounting and reporting platform (CARP) – and to agree templates for how countries would report cooperative approaches and ITMO transactions, and how such reports would be reviewed by experts.

Countries agreed the templates: reporting outlines for the initial report and updated initial report that they will need to fill in; the outline for regular reporting; guidelines for how reports are reviewed, and the outline for how that review report is structured. Countries also agreed the design of the training programme for expert reviewers. Process wise, that amounts to a lot of good work.

However, some countries considered that the content of the templates for reporting and review was insufficient, and that better guided and harmonised reporting, a deeper review, and a stronger role of the review teams was needed to ensure that cooperative approaches deliver higher ambition. One crucial part of the reporting process – the agreed electronic format (AEF) – was not adopted, perhaps because of relatively low engagement on the issue during this busy year. The CMA encouraged countries to test use a draft version of the AEF, and to provide feedback, and as it is a first, and key, building block for consistent reporting, countries acknowledge it will need to be agreed at COP28 to avoid reporting delays.

Infrastructure discussions made progress on the Article 6 database and the CARP. Countries sought to agree the functionality and interoperability between Party registries, the international registry and the 6.4 mechanism registry. Clearly opposing views of the roles of infrastructure under the UNFCCC meant that, as a compromise, the international registry will have basic functionality for any country that wants to voluntarily use it and further work will be done in the future to consider what, if anything, it might additionally do. This is substance and principle and not just technical possibility; the more that the UNFCCC is mandated to track, the more it might appear to be claiming jurisdiction over country-to-country cooperation.

A substantive issue for both Article 6 market tools was whether countries could agree more detail on the timing of and changes to authorisations of ITMOs

The question of how to deal with tracking ITMOs as accounting amounts (based on net flows or an underlayer of units) as well as unitised ITMOs (units), which has persisted for years, evolved through a number of options and in the end arrived at a limited compromise text, noting that ITMOs have to be uniquely identifiable so that they are traceable to the mitigation outcome(s) they represent, and that ITMOs can be tracked and reported in blocks. Countries will continue work on infrastructure in 2023.

A substantive issue for both Article 6 market tools was whether countries could agree more detail on the timing of and changes to authorisations of ITMOs. Options during COP ran out of steam, with both CMA decisions pushing that question into 2023. This is an important issue of country-level and Article 6 risk management in commercial (non-country) ITMO/6.4ER transactions. In very brief form, the more flexible countries decide they need the rules on changes to authorisation of use of ITMOs to be, the more risk that market participants need to manage in terms of changes to authorisations⁶.

AND FINALLY...

And last, but absolutely not least: an auspicious first in the history of the UNFCCC, the formal closure of a UNFCCC “constituted body”. The Kyoto Protocol’s Joint Implementation Supervisory Committee was shut down. A relief, for sure, for its committed but somewhat underoccupied members and alternates, who have been dutifully saving costs ever since work really ran out in 2014. Onwards!

For the first time in a generation of carbon markets, after the success of COP26, Article 6 negotiators had to do something really difficult: move from a negotiation mindset to an implementation one. In that new frame, the centrality of capacity-building in the coming years becomes plain. The experience gap between countries that have known and used carbon markets for decades, and those whose journey is just starting now needs to be fully addressed. This is urgently needed to ensure all the opportunities for incentivising mitigation action are enabled and all countries can benefit from the mitigation, sustainable development, and social and environmental benefits that carbon markets, when done as well as we know they can be, bring.

The author would like to acknowledge the helpful perspectives of Perumal Arumugam and Sana Lingorsky of the UNFCCC secretariat Article 6 team, and of Andrea Bonzanni of IETA.

[1] Only some of the many decisions in relation to cooperative approaches (6.2), the 6.4 mechanism and CDM transition are covered in this article. The framework for non-market approaches is not covered in this article. 6.2 decision: Matters relating to cooperative approaches referred to in Article 6, paragraph 2, of the Paris Agreement. Draft decision -/CMA.4 (unfccc.int), 6.4 decision: CMA4_AUV_Guidance_on_the_mecanism_established_by_Article_6_paragraph_4_of_the_Paris_Agreement (unfccc.int), 6.8 decision: CMA4_AUV_TEMPLATE (unfccc.int) [2] See paragraph 15 of the meeting report of the 3rd SB meeting: SB003_meeting_report (unfccc.int) [3] 6.4 SB recommendation: a64-sb003-a03.pdf (unfccc.int) [4] Those for which Parties (countries part of the Paris Agreement) do not provide authorisation per paragraph 42 of decision 3/CMA.3. Authorised 6.4ERs are the 6.4ERs that are subject to the Article 6, paragraph 2 guidance (and are internationally transferred mitigation outcomes under that guidance), which includes the obligation to undertake a corresponding adjustment. [5] It also seems confusing to say that 6.4ERs themselves contribute “to the reduction of emission levels in the host Party”. The 6.4 activity leads to lower GHG emissions than would otherwise have occurred, and where the country does not authorise the 6.4ERs and so does not undertake a corresponding adjustment for them, the GHG emissions reduction benefit of the activity may show as lower inventory emissions than in the absence of the 6.4 activity. But the 6.4ER itself is probably counterfactual.[6] From the Party perspective see: Lo Re, L., J. Ellis and S. Greiner [2022], “The birth of an ITMO: Authorisation under Article 6 of the Paris Agreement”, OECD/IEA Climate Change Expert Group Papers, No. 2022/03, OECD Publishing, Paris, <https://doi.org/10.1787/3d175652-en>.

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SCALING THE VCM WITH INTEGRITY

Chris Leeds explains why environmental integrity is vital for scaling global carbon markets and for net-zero ambitions

According to the IPCC, the world needs to cut emissions by 45% from 2010 levels by 2030 and reach net zero by 2050. Such a transition requires substantial scaling of market and policy mechanisms that incentivise decarbonisation and emissions reductions. Global CO₂ emissions fell by 6.4% (or 2.3 billion tonnes) in 2020, due to the pandemic, but need to fall at least 7.6% annually for the next decade to avoid warming greater than 1.5°C. With recent events in Ukraine and the economic recovery post the pandemic, we are not getting there – but the tools are available. The goal must be to reduce emissions in line with the science, while at the same time allowing global economic growth that will support investment in new technology and allow for all nations and people to prosper. Effective carbon markets are a vital component of this transition.

The Paris Agreement calls for a balance between sinks and sources of emissions in order to achieve global net zero, where greenhouse gas emissions are reduced as close to zero as possible and any residual emissions are balanced by permanent removals from the atmosphere by 2050. Over 3,000 companies have now committed to the Science Based Target initiative's (SBTi) Corporate Net Zero Standard, a framework for corporate net-zero target setting in line with climate science, now seen by many as the principal body overseeing such commitments.

Effective carbon markets are a vital component of the transition

Under the SBTi Corporate Net Zero Standard, companies must commit to cut their own value chain emissions as well as making investments outside their science-based targets to help mitigate climate change elsewhere. This, by definition, is what companies are doing when they buy carbon credits – investing beyond their value chain.

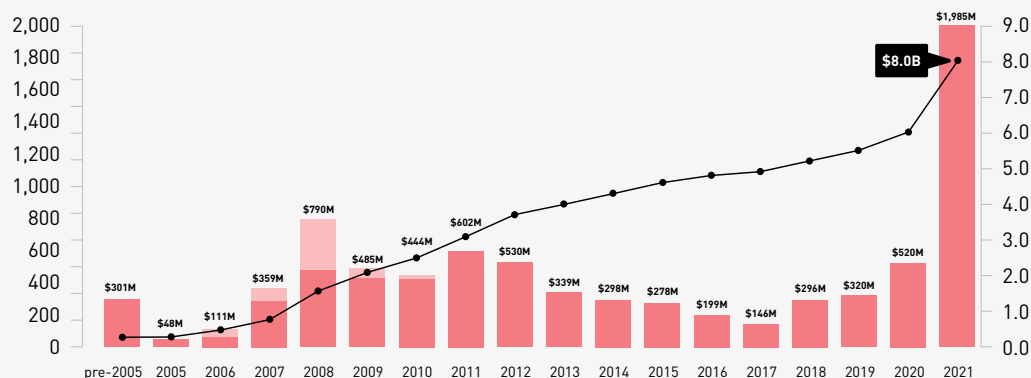
THE CASE FOR VOLUNTARY CARBON EFFORTS

Governments and philanthropy cannot finance transition at the speed and scale required; mobilising private capital is critical. High integrity carbon markets can unlock urgently needed finance that wouldn't otherwise be available to reduce and remove billions of tonnes of emissions that wouldn't otherwise happen. A high-integrity Voluntary Carbon Market (VCM) is part of the solution; depending on different price scenarios and their underlying drivers, the market size at stake in 2030 could be between \$5 billion and \$30 billion at the lowest end of the spectrum, and up to over \$50 billion at the highest end (both ranges assuming demand of 1-2 Gt CO₂)¹.

Carbon credits can bridge the gap between the emissions reductions that can be made now and the longer lead time structural decarbonisation solutions that require more investment, innovation, and a longer implementation runway. Decarbonising heavy manufacturing processes, for example, cannot typically rely entirely on rapid clean electrification. The solutions will be delivered through the scaling of newer technologies, such as clean hydrogen or carbon capture and storage, which require longer term investment cycles. They also provide signals for companies to reduce their own emissions. As prices for carbon credits rise, the incentives and decision making around whether to 'make' internal emissions reductions or 'buy' carbon credits will change. A company which has to buy 1 million carbon credits to cover its residual annual emissions at, say, \$30/tonne – an additional cost to the business of \$30 million that did not exist previously – will do everything it can to find internal abatement opportunities below \$30/t to reduce that liability.

[1] Taskforce on Scaling Voluntary Carbon Markets Final report, January 2021. Accessed November 2022 at https://www.iif.com/Portals/1/Files/TSVCM_Report.pdf.

Figure 1. Voluntary Carbon Market Size by Value of Traded Carbon Credits, pre-2005 to 31 Dec. 2021



Source: Ecosystem Marketplace, a Forest Trends Initiative.

Carbon credits can bridge the gap between the emissions reductions that can be made now and the solutions that require a longer implementation runway

However voluntary carbon markets remain illiquid, fragmented and relatively small. The main obstacles to scaling the VCM are a lack of standardisation, definition of quality, good governance and lack of funding. Every carbon credit project has somewhat different attributes, for example carbon removal vs. avoidance, geography, vintage or project type, and every buyer has different attribute preferences. Some buyers look to purchase credits linked to their geography or supply chain or credits which offer co-benefits linked to the Sustainable Development Goals (SDGs). Matching each individual buyer with a corresponding supplier is a time-consuming and inefficient process. As a result, “liquid” reference contracts, either spot or futures, with a daily, reliable price reference are yet to emerge, which in turn makes price risk management almost impossible and serves as an impediment to the growth of good quality supply.

The Taskforce for Scaling the Voluntary Carbon Markets was launched in September 2020 to address these concerns. The Taskforce’s more than 250 members representing buyers and sellers of carbon credits, standard setters, the financial sector and market infrastructure providers, recommended actions for the most pressing pain-points facing voluntary carbon markets. The two main recommendations were to set up an independent Governance Body for the market, the Integrity Council for the Voluntary Carbon Market (IC-VCM) established in September 2021, and to establish the criteria for high-integrity carbon credits – the Core Carbon Principles (CCPs).

The CCPs will make it easy to identify and price a high-integrity carbon credit no matter which programme issued it, what kind of credit it is, whether it is a removal or reduction, a nature-based solution or an emerging technology and wherever on the planet that activity is happening.

In the summer of 2022, the IC-VCM carried out a consultation on the CCPs and assessment framework and, at the time of writing in November 2022, is reviewing the results. Engagement was very strong, with well over 5,000 comments and more than 350 submissions, many representing multiple organisations and individuals.

THE VCM AND THE PARIS AGREEMENT MECHANISMS

Linking carbon markets globally can magnify the gains from carbon trading. Article 6 of the Paris Agreement offers the opportunity for market-based mechanisms to develop internationally but much work remains to be done to put in place the required infrastructure. Linking reduces overall compliance costs, increases market liquidity, promotes market stability, and reduces the risk of leakage. Access to markets could therefore enable countries to go beyond their Nationally Determined Contributions (NDCs), and at a lower cost. The provision for internationally transferrable mitigation outcomes (ITMOs) in Article 6 of the Paris Agreement will help drive deeper emissions reductions, quicker than would otherwise occur.

This linking is likely to lead to the development of a global carbon market. Governments are realising that carbon is a sovereign asset and will want to extract maximum value from it while using the markets to support achievement of their decarbonisation goals. A set of regional markets will evolve, with countries in Asia vying for supremacy.

The success of the global carbon market rests on building a market with both high-integrity and sufficient liquidity

Linking carbon markets globally can magnify the gains from carbon trading

Article 6.2 sets out the principles for issuing ITMOs and allows governments to take control of the issuance process, while Article 6.4 delegates the process to the UN. It may have more trust than 6.2 but its establishment is proving cumbersome and bureaucratic. On the other hand, Article 6.2 can leverage the existing VCM standards (Verra, GS, ACR, etc) to issue ITMOs, so the delays in the formation of the Article 6.4 mechanism could mean it becomes irrelevant. As a result, governments are looking more closely at Article 6.2 as they can come up with their own procedures for issuing ITMOs. If they have the infrastructure to do so and buyers trust them then there is no need to use 6.4. The recent deals announced between Switzerland and Ghana attest to that.

VCM credits can still be issued without authorisation, but it would be difficult for companies to use them for an environmental claim, such as carbon neutral or net-zero, due to risks related to double claiming by the corporate and the country. Instead, the credits would remain within the country of origin and the corporate would be able to make a financing or contribution claim.

INTEGRITY IS KING

One area that generates a great deal of attention is the environmental integrity and inherent ambition associated with the units created under Article 6. With a focus on ambition, there is expected to be greater scrutiny over the selection of projects, the baselines chosen and the verification process. Certainly, these were important aspects of the process surrounding the Clean Development Mechanism (CDM). But Article 6 functions differently to the CDM, with one critical extra requirement – corresponding adjustments (CAs), which require host countries to deliver a guarantee that transferred credits won't be used against their own NDCs. This process aims to ensure that emissions reductions can only be claimed once.

For example, if a host country wants to attract inward investment for an avoided emissions project through the sale of 100 ITMO units, under the transfer provisions of 6.2, the host country adjusts its inventory by 100 through a CA for the sale, but then must take enhanced domestic action to maintain its net zero emissions NDC goal. This could come in the form of additional natural sinks or whatever else it has that can remove emissions from the atmosphere. The difference with the CDM is that this last step would not have taken place. Governments now have first refusal on carbon credits and are expected to claim the cheapest available credits to use against their NDCs.

As a result, the CA and the subsequent domestic actions it triggers is as important as the project itself. Provided the adjustment is transparent and the change is balanced by other actions by the host country, then the integrity of the project is less important than would otherwise be the case. Countries will not want to sell too many ITMOs for fear of being in breach of their NDC and being forced to cut emissions internally at higher cost. We are seeing this fear manifest itself in some of the regulation being enacted in places like Indonesia and Gabon. These countries have realised that carbon is a sovereign asset, in the same way as any other commodity. Not only are countries going to want to approve the 'export' of carbon credits via a CA, but they will want to have oversight or approval of any project developed within their borders to ensure it is compatible with achieving their NDC and to maximise the commercial opportunities domestically.

Many international carbon related schemes (eg, Japan's GX League, Korea's ETS, the China ETS and Singapore) are working on rules to accept international carbon credits, which may significantly impact overall demand and drive further fungibility and liquidity across carbon markets. It looks increasingly likely that CAs will be required by buyers, even with the rules still yet to be finalised. For example, China announced at COP27 that it would be open to use international carbon credits generated under Article 6. As a result, it is likely that a series of national or regional exchange-traded markets will emerge, with some linking between them. The VCM could play a role here, if countries allow companies to use standardised carbon credits to meet compliance obligations, hence creating international arbitrage.

High-integrity carbon credits are one mechanism to facilitate much needed financial support towards decarbonising the global economy. The success of the global carbon market rests on building a market with both high-integrity and sufficient liquidity. The CCPs will enable high-integrity standardised reference contracts to develop that assure buyers and the wider ecosystem that genuine emissions reductions are made.

All of this means that the role of the IC-VCM is more important than ever to help determine what makes a high-quality carbon credit, where the VCM sits in the global carbon market, its linkage to the compliance markets and what makes an appropriate corporate claim.

Chris Leeds is the Head of Carbon Markets Development at Standard Chartered, building the bank's environmental trading and financing business and growing its profile as a global leader in sustainable finance. This involves advising clients, supporting trade bodies, originating carbon related transactions and building the trading infrastructure. He supported SCB's Group CEO Bill Winters in his role as Chair of the Taskforce for Scaling the Voluntary Carbon Markets (TSVCM) and is now a board member of the newly formed Integrity Council for the Voluntary Carbon Markets (IC-VCM). He is also a member of the Climate Impact X (CIX) Advisory Forum and serves as a member of the CPLC's Advisory Group.

TRANSPARENCY FOR GROWTH

In order for carbon markets to scale and realise their potential, there is a need for greater data transparency. Enter the Climate Action Data Trust, outlined by Lars Kvale



Carbon markets have a role to play in enabling countries and companies to achieve net-zero climate goals and are poised for significant growth as a result. One of the tools to support the growth and maturation of these markets is a common data system that serves all stakeholders and ultimately accelerates reaching the net zero. To address this, the World Bank created the Climate Warehouse end-to-end digital ecosystem and the Climate Action Data Trust to drive climate action.

The Climate Action Data Trust is a global platform that links, aggregates and harmonises all carbon credit data from project registries to facilitate transparent accounting. The CAD Trust open-source metadata system uses distributed ledger technology to create a decentralised record of carbon market activity with the aim to avoid double-counting, increase trust in carbon credit data, and build confidence in carbon markets.

But this metadata technology didn't exist until recently. Organisations have long relied on trusting each member of a federated database to accurately provide and audit their own data. With public blockchains, we now have the ability to leverage an immutable and auditable ledger, but didn't yet have the metadata network technology and process controls to fully and efficiently replace a regular federated database. So we built it.

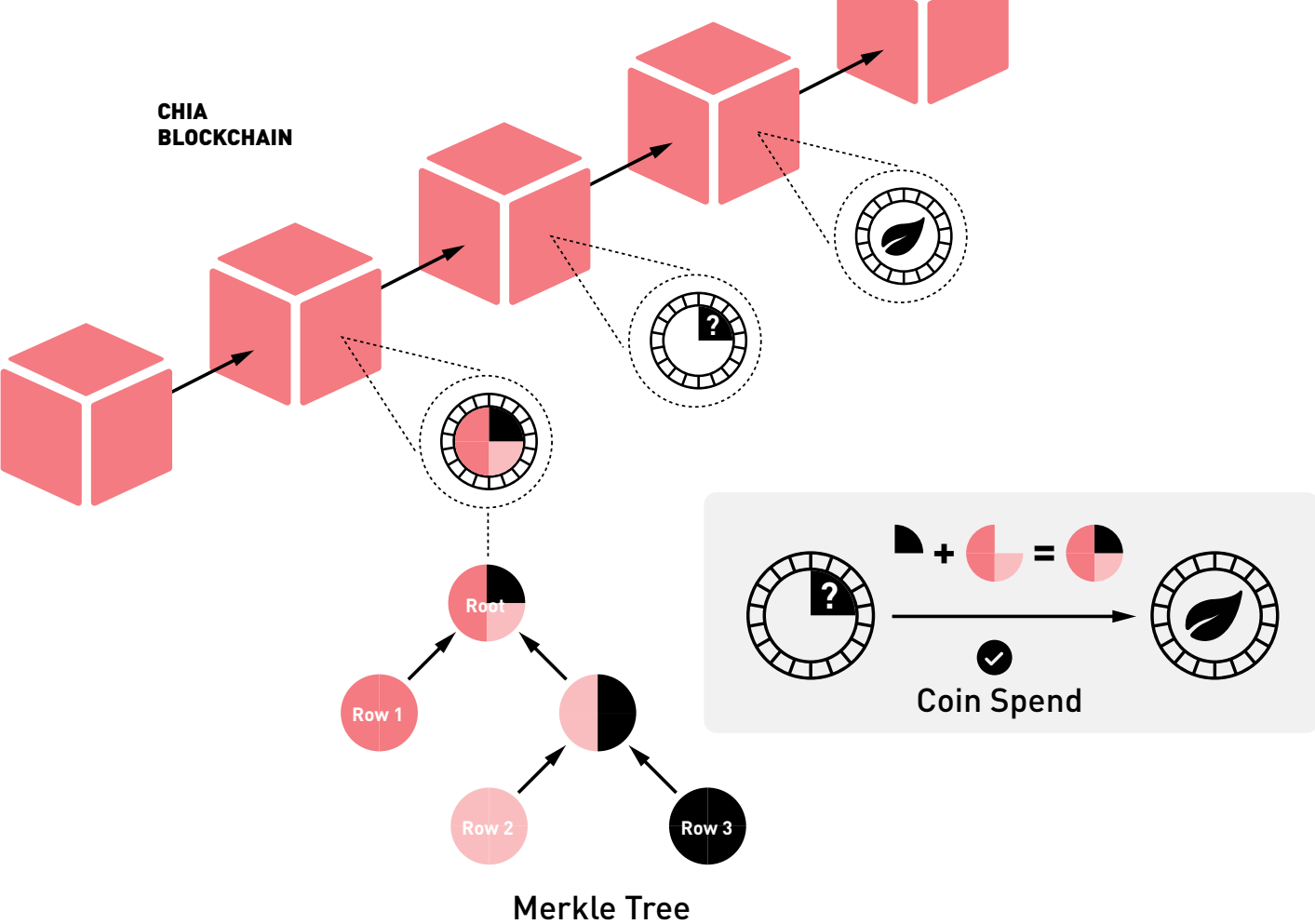
THE TECHNOLOGY

Chia DataLayer technology serves as the foundation to increase the scope of applications enabled through the immutability, transparency, and auditability of public blockchains. It offers a ledger with private write and public read access, with all transactions recorded on-chain, creating total and novel transparency with respect to data.

We built this technology to drive trusted data sharing across parties to achieve common business outcomes, even when enterprises, institutions, and governments all have different approaches to managing data. DataLayer enables and maintains effective collaboration through data sharing:

- **Transparency:** Data can only be updated by its owner. All updates are visible and unchangeable on the blockchain, and can be confirmed by anyone with read access.
- **Auditability:** Users are able to review the permanent history changes to data tables.
- **Durability:** Data survives as long as anyone has a copy of it, original publisher or not.
- **Permissioned:** Access to the data can be permissioned only to approved viewers.
- **Smart Contracting:** Data can be presented and validated in on-chain smart contracts.

Carbon markets have a role to play in enabling countries and companies to achieve net-zero



HOW IT WORKS

Chia DataLayer is a shared data network with no central authority. Data is stored locally by a member (in this case: registries and governments), while proofs of the data are stored on the blockchain with URLs that can be used to fetch the stored data. Members in this network can subscribe to data from other nodes and receive updates whenever the data changes and can compare the received data to the proof on the blockchain and confirm that the data is correct.

In use, each participant in the CAD Trust publishes data in their DataLayer tables, using their Chia wallet and keys, running on its own infrastructure. The "governance" node publishes another DataLayer table with the list of DataLayer tables published by each of the recognised participants. Each participant and observer only needs to know the DataLayer table ID for the governance node to locate all of the other participants' data.

Because this is done on the public blockchain, anyone can subscribe to the data and transactions – ensuring transparency and auditability.

THE FUTURE OF CLIMATE ACTION

The Climate Action Data Trust demonstrates a real-world use case of the Chia DataLayer. Spearheaded by the World Bank, the CAD Trust seeks to bring transparency and trust to carbon markets as part of the Climate Warehouse end-to-end digital ecosystem. The World Bank developed several simulations using various blockchains in an effort to

The CAD Trust seeks to bring transparency and trust to carbon markets as part of the Climate Warehouse end-to-end digital ecosystem

explore the breadth of technology and options, including the Chia blockchain in the third and final simulation. The operational CADT will run on the Chia Blockchain leveraging the functionality of Data Layer and will have a secretariat led by IETA with the continued support of the World Bank and the Government of Singapore. More information on the World Bank's efforts can be found online and access to a read-only "observer" node is available at app.climatewarehouse.chia.net.

Climate change is an existential challenge and we're proud to be building the infrastructure and technology to drive climate action.

Lars Kvale helps environmental markets and projects create the structure and clarity needed to accelerate climate action. He is currently focused on developing web3 solutions to solve carbon market challenges. His background includes launching and managing carbon and REC registries, blue carbon project development, and leading the Chia Network efforts in the carbon market.

TECH FOR GOOD

Digitisation is changing the face of all sectors of the economy – and the climate space is no exception, with an ever-growing number of digital and technological innovations changing the way things are done. Three of IETA's trailblazers outline what their business offers and how it benefits the wider carbon market.

SYLVERA: DATA FOR SCALING THE VCM

A key criticism of carbon crediting projects is the difficulty of verifying the emissions reductions or removals achieved. For example, a recent report from the UK Government's Climate Change Committee highlighted poor quality credits as the major factor limiting the impact of the voluntary carbon market (VCM) in helping achieve net zero. More robust and independent data is needed to legitimise these projects and rapidly scale the VCM, maximising climate impacts and co-benefits.

The Integrity Council for the VCM (IC-VCM) has been bringing focus to the issue of supply-side integrity. However, the challenges it has faced in actually implementing its Core Carbon Principles demonstrate the difficulty of top-down, methodology-level assessments. Carbon credit ratings companies such as Sylvera are able to address these challenges through bottom-up assessments at the project level, using novel data solutions.

Sylvera has pioneered this approach as the first carbon credit ratings provider. Starting with REDD+, Sylvera has since developed frameworks to assess ARR, IFM and renewables projects, with frameworks in the pipeline for jurisdictional REDD+, cookstoves, DAC, biochar and more. These ratings are fully independent and free from conflicts of interest as Sylvera does not sell credits nor does it accept payment from developers to rate projects.

Rigorous and reliable carbon credit ratings give buyers the confidence to invest in the VCM without fear of wasted spend or reputational risk. By shining a light on project quality, Sylvera's ratings ensure that funding is channeled to the most effective projects, and that the most impactful projects receive a price premium as buyers are willing to spend more on good quality carbon credits, if they can identify them.

A key criticism of carbon crediting projects is the difficulty of verifying the emissions reductions or removals achieved

Reliable ratings depend on accurate data, which has previously been sorely lacking for nature-based projects. In contrast to legacy sample-based approaches, Sylvera gathers satellite Earth observation (EO) data across entire project areas. Sylvera uses machine learning (ML) to interpret this EO imagery and detect land cover changes. The models output data forest cover as well as biophysical characteristics such as canopy height, canopy cover and above ground biomass (AGB).

ML approaches need to be trained and calibrated using data collected in the field. To date, a significant limitation of using remote sensing and ML to monitor forest biomass has been the poor quality of AGB data. Traditionally, AGB has been estimated using allometrics, which correlate hand-measurable parameters such as stem diameter with AGB. These allometric-derived estimates are often highly uncertain (→40%) and biased to underestimate carbon stocks, particularly in tropical and subtropical forests. Sylvera's unique next generation ML models are trained using much more accurate ground-truth AGB datasets gathered using multi-level LiDAR (MSL) scanning. MSL measurements are collected from both the ground and air and combined with novel processing algorithms to produce high resolution maps of biomass cover. These reduce the uncertainty of AGB by over 90%.

By using MSL to sample representative forest areas, ML and EO can be scaled to monitor forest and biomass changes across whole jurisdictions. Sylvera has worked with the World Bank to deploy these approaches in forested nations looking to access climate finance.

The rapid development of this ground-breaking approach has been facilitated through collaboration with a number of technical partners, including UCLA, University College London, and the University of Leicester through the SSpace Research and Innovation Network for Technology (SPRINT), as well as a research grant from Innovate UK's Small Business Research and Innovation programme.

Ben Rattenbury
Sylvera

TOUCAN: TOKENISED TRADING OPENS NEW DOORS

Blockchain technology enables shared public ledgers where data can't be altered and is publicly verifiable at any time. This sparked the concept of 'tokenisation' — the process of creating the digital representation of any real-world asset/entity on the blockchain. Many projects have developed ways to tokenise different things: real estate, invoices, bonds backed by home loans, kilowatt-hours of electricity, and carbon credits.

Carbon credits are transferred from a source registry onto a blockchain-based smart contract registry, along with their individual attributes. Each carbon token represents one credit. Tokenised carbon credits can be held, transferred, or used in Web3 applications. They can also be 'retired' on the blockchain, which means they are permanently taken out of circulation.

Tokenisation can help the voluntary carbon market (VCM) resolve some of its biggest pain points to make it more scalable and accessible.

- **More trust:** The data of each asset on the blockchain is publicly visible. The movements of individual tokenised carbon credits can be viewed by everyone. This layer of transparency and publicly accessible data creates trust.
- **Improved market experience:** Tokenisation has the potential to improve the supply and demand experience for market participants. Suppliers can directly transact and sell credits without the need for intermediaries, while buyers encounter less friction and counterparty risk. Open and efficient markets lead to faster price discovery.
- **Eradicate double-counting:** Double-counting happens when different entities lay claims on the same carbon credit. Public ledgers hold actors accountable, as all carbon credit data will be visible to everyone. This improves the integrity of net-zero claims and adds value to entities' retirement portfolios.
- **Deeper liquidity:** Tokenised carbon credits with similar attributes can be pooled together. This brings liquidity into a fragmented market and makes buy and sell transactions faster and more transparent.

Blockchain technology enables shared public ledgers where data can't be altered and is publicly verifiable at any time

With a "two-way" carbon bridge, credits can flow freely back and forth between traditional and smart contract-based registries. Tokenised credits can be easily 'detokenised' — ie, brought back to the registry of the originating standard. A two-way bridge brings the benefits of tokenisation to all carbon credit holders, without the risk of taking an irreversible step.

What are the potential benefits of tokenisation, beyond improved integrity and market scalability? Tokenised carbon credits are compatible with a growing range of Decentralised Finance applications. They can be traded on efficient, smart-contract-based exchanges. Climate action (retirements) can be automated and built into individual transactions. Carbon credits could also be connected to smart contract-based debt markets, used to earn yield, and even function as green in-game assets with real-world value.

We anticipate that the majority of carbon trades will move onto the blockchain in the future, driven by access to efficient and open marketplaces, countless new demand sources, and better verifiability of sustainability claims.

Vasisakh Hari
Toucan

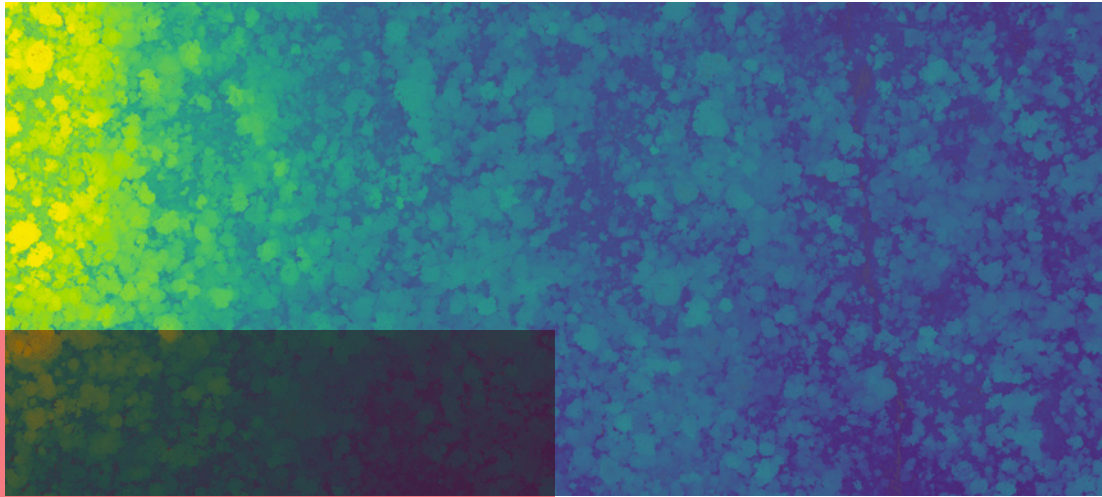


Image caption: Airborne lidar point cloud processed by Pachama, acquired by the Brazilian Enterprise for Agricultural research (EMBRAPA) and the United States forest Service, in the Brazilian state of Pará.

PACHAMA: A FRESH APPROACH TO MRV

As demand for high quality carbon credits surges, registries and technology companies are coming together to implement new digital measurement, reporting and verification (DMRV) tools, bringing enhanced transparency, efficiency and integrity to voluntary carbon markets. On Biodiversity Day at COP27, the world's largest carbon programme, Verra, and innovative technology company Pachama announced the first DMRV pilot for forest carbon, signalling a move toward a future of automated, standardised measurement and issuance.

Today, carbon registries rely on PDF files, spreadsheets, and hand-based measurements to measure and verify forest carbon credits. These manual tools are prone to subjectivity and human error, and result in a lengthy, time-intensive process that both i) hinders the pace and scale at which new carbon projects can be generated and ii) erodes the essential trust needed for carbon markets to achieve their full potential.

New digital tools offer a far more compelling alternative. Today, thanks to significant advancements in technology, companies like Pachama have advanced work to estimate forest carbon using machine learning-based algorithms trained by data captured from remote sensing sources like satellite imagery, lidar and radar. For four years, Pachama's team of scientists and engineers have been honing these algorithms, enhancing uncertainty models and developing clear documentation to enable the auditing of these techniques in order to enable a future in which remote-sensing based carbon estimates can be standardised, transparent and high integrity.

Today, carbon registries rely on PDF files, spreadsheets, and hand-based measurements to measure and verify forest carbon credits.

These new digital tools offer the potential to issue credits at a fraction of the time and cost of traditional methods. Today, each individual forest carbon project can take over two years and over \$1 million to complete the arduous process to issue credits. With these digital tools, measurements and documentation could be produced in 30 minutes at a fraction of the cost. As opposed to the series of verifications and audits imposed on each individual project, this new approach would instead certify and audit the DMRV tools themselves, bringing unprecedented efficiency to the credit issuance process.

What could this mean for carbon markets? In the near future, this could allow tens of thousands of landowners and project proponents worldwide to access the necessary funding more quickly, all while ensuring strong additionality, permanence and verifiability of the carbon reductions credited.

The market is welcoming these advancements, with major registries implementing pilots to determine how to best integrate these new tools. These pilots will leverage now-operational tools like Pachama's to set clear frameworks and standards to certify future tools and establish pathways to harness the enhanced transparency and efficiency without sacrificing the critically important quality of these carbon measurements.

Nature restoration cannot wait. To sequester the gigatons of carbon and protect biodiversity at the pace our planet demands, we must rebuild the trust in carbon markets with tools that eliminate bias and streamline slow, arcane systems. Digital MRV tools are now reaching maturity. If we can move quickly to integrate these new high-integrity tools, we can modernise our foundational institutions and unleash the full potential of carbon markets.

Diego Saez Gil
Pachama

**2022
GREENHOUSE GAS
MARKET REPORT**

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