

What are Carbon Markets?



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Carbon markets impact our everyday lives. It is therefore important to understand what they are and how we can contribute to repairing our already damaged environment, and reviving it to a livable world for future generations to come.

This White Paper includes mere basic information about the carbon markets, what carbon credits and carbon offsets are and how they are priced. While the markets are still in their infancy, the development is so fast and the growth is so big that the “Wild West” comes to mind.

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Overview

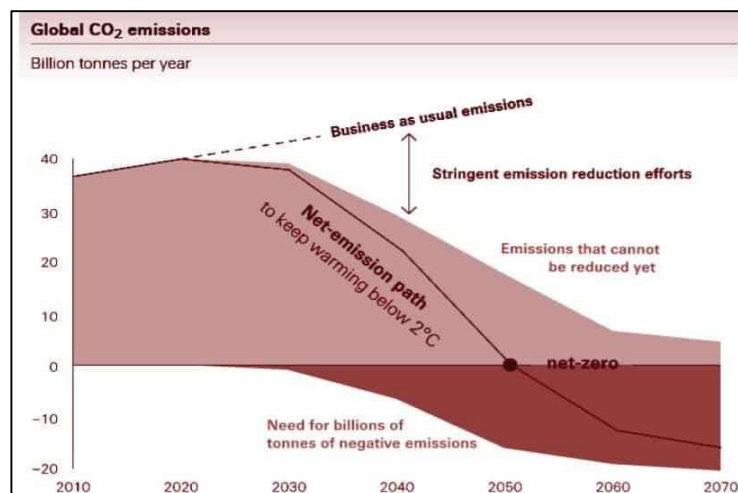
Approximately 2.5 trillion tons of carbon dioxide equivalents (CO₂e) have been released into the atmosphere since humans started emitting carbon dioxide (CO₂). We continue to release 50 billion tons of CO₂e each year¹, a major cause of global warming.

Climate change represents a pressing and potentially irreversible threat to human societies and the planet. In December 2015, 193 parties (192 countries plus the EU) adopted the Paris Climate Agreement. The long-term temperature goal of this international treaty is to strengthen the global response to the threat of climate change by “holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.”

In an Intergovernmental Panel on Climate Change (IPCC) report released on April 4, 2022, scientists have assessed different scenarios – limiting warming to around 1.5°C requires global greenhouse-gas (GHG) emissions to peak before 2025 at the latest, and be reduced by 43 percent by 2030. The report also noted that “global temperature will stabilize when CO₂ emissions reach net zero. For 1.5°C, this means achieving net zero carbon-dioxide emissions globally in the early 2050s; for 2°C, it is in the early 2070s.”²

Figure 1 from IPCC shows how the world can reach net zero by 2050:¹

Figure 1: Global CO₂ Emissions



¹ “What is the Best Carbon Credit to Buy?” Jennifer L., CarbonCredits.com, April 22, 2022. Retrieved on June 25, 2022, <https://carboncredits.com/what-is-the-best-carbon-credit-to-buy>

² “The Evidence is Clear: the Time for Action is Now. We can Halve Emissions by 2030,” IPCC, April 4, 2022. Retrieved on June 24, 2022, <https://www.ipcc.ch/2022/04/04/ipcc-ar6-wgiii-pressrelease>

Refinitiv's annual Carbon Market Year in Review noted that the value of traded global markets for CO₂ permits grew by 164 percent in 2021 to a record EUR760 billion (US\$851 billion), and was the fifth consecutive year of record growth. The report noted that much of the growth came from the European Emissions Trading System (EU ETS), which accounted for 90 percent of global value. Prices in the EU ETS ended 2021 at more than EUR80 a ton, more than double the price at the end of 2020, on expectations that a more ambitious EU climate target of reducing emissions by 55 percent by 2030 would lead to a tighter market.³

World Bank's annual "State and Trends of Carbon Pricing" report, released on May 25, 2021, indicated that a total of 64 carbon-pricing instruments were then in operation around the world, covering over 20 percent of global GHG emissions and generating US\$53 billion in revenue, representing a 17-percent increase in revenue from a year before. The report noted that the full potential of carbon pricing remained largely untapped.⁴

I. About Carbon Markets

A carbon market allows investors and corporations to trade both carbon credits and carbon offsets simultaneously.

International carbon-trading markets have been around since the Kyoto Protocol, an international treaty adopted in 1997 that aimed to reduce the emission of gases that contribute to global warming. The Chicago Climate Exchange (CCX), founded in 2003 with global attention, was a voluntary, legally-binding GHG-reduction-and-trading system for emission sources and offset projects in North America and Brazil; it ceased trading carbon credits at the end of 2010 due to inactivity in the U.S. carbon markets⁵.

It is the pledges from countries all over the world to the Paris Climate Agreement that led to renewed interests in carbon markets, which play key roles in addressing climate change issues.

Though frequently used interchangeably, carbon credits and carbon offsets operate on different mechanisms. Carbon credits, also known as carbon allowances, work like permission slips for emissions. When a company buys a carbon credit, usually from the government, they gain permission to generate one ton of CO₂ emissions. With carbon

³ "Global Carbon Markets Value Surged to Record \$851 billion Last Year," Nina Chestney, Reuters, January 31, 2022, <https://www.reuters.com/business/energy/global-carbon-markets-value-surged-record-851-bln-last-year-refinitiv-2022-01-31>

⁴ "Carbon Prices now Apply to Over a Fifth of Global Greenhouse Gases," The World Bank, May 25, 2021. Retrieved on June 25, 2022, <https://www.worldbank.org/en/news/press-release/2021/05/25/carbon-prices-now-apply-to-over-a-fifth-of-global-greenhouse-gases>

⁵ "Chicago Climate Exchange," Wikipedia. Retrieved on June 24, 2022, https://en.wikipedia.org/wiki/Chicago_Climate_Exchange

credits, carbon revenue flows vertically from companies to regulators, though companies that end up with excess credits can sell them to other companies. Carbon offsets revenue flows horizontally between companies. When one company removes a unit of carbon from the atmosphere as part of its normal business activity, it can generate a carbon offset. Other companies can then purchase that carbon offset to reduce their own carbon footprint.⁶

1. Worldwide Carbon-Credit Initiatives

A carbon credit is a permit that allows the owner to emit a certain amount of CO₂ or other GHGs. One credit permits the emission of one ton of CO₂ or the equivalent in other GHGs.

The 1997 Kyoto Protocol divided countries in the world into industrialized and developing economies. Industrialized countries operate in their own emissions-trading market. If a country emitted less than its target amount of hydrocarbons, it could sell its surplus credits to countries that did not achieve its Kyoto-level goals, through an Emission Reduction Purchase Agreement (ERPA).⁷

In a separate Clean Development Mechanism (CDM) for developing countries, carbon credits called a Certified Emission Reduction (CER) is involved, and the trading of CERs takes place in a separate market. A developing nation could receive these credits for supporting sustainable development initiatives. It allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol to implement an emission-reduction project in developing countries. Such projects can earn saleable CERs, which can be counted towards meeting Kyoto targets.⁷

CDM is the first, and so far largest, carbon-offsetting market. More than 8,100 projects in 111 countries have registered with the scheme, which has handed out more than two billion CERs, representing 2 billion tons of carbon-dioxide reduction or avoidance.⁸

2. Types of Carbon-Offset Projects

There are two main categories of carbon-offset projects: avoidance projects, which elude releasing emissions, and removals projects, which sequester carbon.⁹

⁶ “The Ultimate Guide to Understanding Carbon Credits,” Carboncredits.com. Retrieved on June 26, 2022, <https://carboncredits.com/the-ultimate-guide-to-understanding-carbon-credits>

⁷ “The Clean Development Mechanism,” UNFCCC. Retrieved on June 25, 2022, <https://unfccc.int/process-and-meetings/the-kyoto-protocol/mechanisms-under-the-kyoto-protocol/the-clean-development-mechanism>

⁸ “Factbox: Carbon Offset Credits and Their Pros and Cons,” Shadia Nasralla and Susanna Twidale, Reuters, February 25, 2021. Retrieved on June 27, 2022, <https://www.reuters.com/article/us-climate-change-carbon-offsets-idUSKBN2AP1EZ>

⁹ “Analyzing Carbon Offset Markets’ Role in our Journey to a Net-Zero World,” Carlos Sanchez. Retrieved on June 26, 2022, <https://carlossanchez.eco/blog/carbon-offset-markets>

There are four main types of carbon-offset projects:¹⁰

(1) Forestry and Conservation: Credits are created based on either the carbon captured by new trees or the carbon not released through protecting old trees. Forestry projects are not the cheapest offset option, but they are often chosen for their many benefits outside of the carbon credits they offer. Protecting eco-systems, wildlife, and social heritage is significant for companies offsetting their carbon emissions for the corporate social responsibility (CSR) element.

(2) Renewable Energy: Renewable-energy offsets help to build or maintain chiefly solar, wind or hydro sites across the world. By investing in these projects, a company is boosting the amount of renewable energy on the grid, creating jobs, decreasing reliance on fossil fuels, and bolstering the sector's global growth.

(3) Community Projects: Community projects often help to introduce energy-efficient methods or technology to undeveloped communities around the world. There are many potential benefits to these projects that far surpass carbon credits. Projects like this do not only help make the entire regions more sustainable, but can also provide empowerment and independence that can lift communities out of poverty. This means that projects that were, at one time, purely philanthropic can now provide organisations with direct benefits like carbon credits.

(4) Waste-to-Energy: A waste-to-energy project often involves capturing methane and converting it into electricity. Sometimes this means capturing landfill gas, or in smaller villages, human or agricultural waste.

II. Two Forms of Carbon Pricing¹¹

Cap-and-trade and baseline-and-credit systems are two forms of carbon pricing, they are two different systems with different methodologies.

Cap-and-trade is a mechanism to control carbon emissions that sets an upper limit on total emissions, allowing entities to trade credits according to their usage. Baseline-and-credit sets a baseline on total emissions; reducing emissions below this level generates credits that can be sold to others.

Cap-and-trade and baseline-and-credit do not have a significant impact on global carbon emissions. Although they may incentivize companies to reduce their CO₂

¹⁰ "4 Types of Carbon Offset Projects," EIC, December 2, 2022. Retrieved on June 26, 2022, <https://www.eic.co.uk/4-types-of-carbon-offset-projects>

¹¹ "Cap and Trade vs Baseline and Credit: What's the Difference?" Grace Smoot, Impactful Ninja. Retrieved on June 25, 2022, <https://impactful.ninja/cap-and-trade-vs-baseline-and-credit-differences>

emissions, the immediate effect of reducing emissions under both systems is about benefiting a company's bottom line.

1. Cap-and-Trade

Cap-and-trade markets are established after signing of the Kyoto Protocol. It set a maximum amount of GHG emissions that could be released into the atmosphere, both globally and nationally. The amount of total emissions reduction is predetermined with cap-and-trade, but the price of emissions is not. In this market, unused carbon credits can be sold to entities that have exceeded the cap.

Cap-and-trade represents indirect emission reductions. Putting a cap on emissions and decreasing this cap over time reduces carbon emissions over time, preventing CO₂ from entering the atmosphere.

2. Baseline-and-Credit

Baseline-and-credit systems set a standard level for carbon emissions. If an entity reduces its emissions below the baseline more than they are otherwise obliged to, they generate carbon credits which can be sold to others looking to stay at or below their baselines. Those emitting more than their baseline do not necessarily face penalties, but they would also not generate carbon credits.

Baseline-and-credit represents indirect emission reductions. Entities reducing their emissions below the set baseline generate carbon credits which can be sold to other entities. This monetary incentive prompts emission reductions.

3. Comparing Cap-and-Trade and Baseline-and-Credit in Carbon-Footprint Impact

Impact	Cap-and-Trade	Baseline-and-Credit
How are carbon emissions reduced	Carbon credits cap how much CO ₂ can be emitted by an entity. This cap on emissions can be gradually reduced over time, leading to less and less overall emissions.	Carbon credits are generated when entities reduce their carbon emissions below the set baseline. The monetary incentive prompts emission reductions.
Impact on own carbon emissions	Does not directly reduce one's carbon footprint.	Does not directly reduce one's carbon footprint.
Impact on global carbon emissions	Mitigates the problem, but it does not work at the core issue of reducing overall CO ₂ emissions.	Mitigates the problem, but it does not work at the core issue of reducing overall CO ₂ emissions.
Environmental benefits	Facilitates the switch to greener energy sources and promotes energy independence.	Facilitates the switch to greener energy sources and promotes energy independence.

Overall effectiveness in reducing carbon emissions	Improper reporting and discrepancies in maximum GHG levels between countries limits cap-and-trade effectiveness on a global scale.	Establishing accurate baselines and the inherent incentive limits baseline-and-credit effectiveness on a global scale.
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Source: Impactful Ninja, <https://impactful.ninja/cap-and-trade-vs-baseline-and-credit-differences>

III. Two Types of Carbon Markets

Carbon markets can be divided into compliance carbon markets (CCMs) and voluntary carbon markets (VCMs) – see Figure 2.

In the compliance space, carbon markets have an instrument called a carbon allowance, or an offset, which is used to meet regulatory requirements to decarbonize. They are important because they place a price on carbon, which can then influence business actions to decarbonize¹². In the voluntary-market space, carbon credits are used by companies and individuals on a voluntary basis to offset their carbon footprint rather than for meeting regulatory requirements. They play an important role in driving investment in carbon-compensation and carbon-neutralization projects to offset their emissions¹³.

Figure 2: Two Types of Carbon Markets



Source: Carboncredits.com, <https://carboncredits.com/the-ultimate-guide-to-understanding-carbon-credits>

¹² "The Path to Net Zero: Investing in Carbon Markets," McKinsey & Company, January 26, 2022. Retrieved on June 25, 2022, <https://www.mckinsey.com/featured-insights/future-of-asia/the-path-to-net-zero-investing-in-carbon-markets>

¹³ "Putting Carbon Markets to Work on the Path to New Zero," McKinsey & Company, October 28, 2021. Retrieved on June 25, 2022, <https://www.mckinsey.com/business-functions/sustainability/our-insights/putting-carbon-markets-to-work-on-the-path-to-net-zero>

1. Compliance Carbon Markets

As noted earlier, the global-compliance carbon markets grew 164 percent to US\$851 billion in 2021, and that 90 percent of the value of such growth was driven by the EU ETS.

Compliance carbon markets operate as cap-and-trade programs with rules and requirements established by emissions-trading schemes, which are in turn regulated by government entities and laws. These emissions-trading schemes (ETS) establish a “cap” on the amount of emissions that regulated companies can produce, and allow them to then “trade” these allowances between companies that have exceeded their allowed cap and those that have reduced emissions below it. In this way, a cap-and-trade program provides incentives for emissions reductions to occur at the lowest possible cost. Also, putting a price on emissions shifts the economic incentives by making it more expensive to pollute.¹⁴

As of January 2022, there are a total of 25 emission-trading systems in force that cover 17 percent of global emissions¹⁴. The EU ETS, started in 2005, has provided a great deal of experiences. Table 1 below shows the different phases of EU ETS’ development.

Table 1: Different Phases of EU ETS

Phases	Overarching Theme
Phase 1 (2005-2007)	A three-year pilot phase aimed to create an infrastructure for the free trade of carbon and establish its pricing mechanism. This phase was marked with lower carbon prices as supply exceeded demand in the absence of reliable emissions data.
Phase 2 (2008-2012)	The pilot phase (Phase 1) served to create headways in recording verified direct-emissions data which proved to be useful in Phase 2. Using the emissions data, regulators created an emissions cap for various firms and reduced the carbon allowances supply. However, the 2008 global financial crisis resulted in dampened economic activities leading to lower demand for carbon allowances, driving carbon prices down.
Phase 3 (2013-2020)	The oversupply of carbon allowances in Phase 1 and Phase 2 laid the foundation of this phase which mainly focused on regulating the excess supply. This phase experienced an increase in carbon prices on the back of reforms such as “backloading” (backloading is a reform of the carbon market introduced in 2014 with the aim of increasing carbon prices and therefore the incentive to invest in low-carbon technology), Market Stability Reserve, annual reduction of carbon allowance cap, etc.
Phase 4 (2021-2030)	Phase 4 introduced more stringent policy measures to reduce the carbon emissions, e.g. the allowances supply cap will reduce at a higher rate of 2.22% every year, compared to 1.74% earlier. This phase also focuses on

¹⁴ “Understanding Carbon Markets,” RBC Corporate Governance and Responsible Investment Team, Global Asset Management, November 26, 2021. Retrieved on June 25, 2022, <https://www.rbcgam.com/en/ca/article/understanding-carbon-markets/detail>

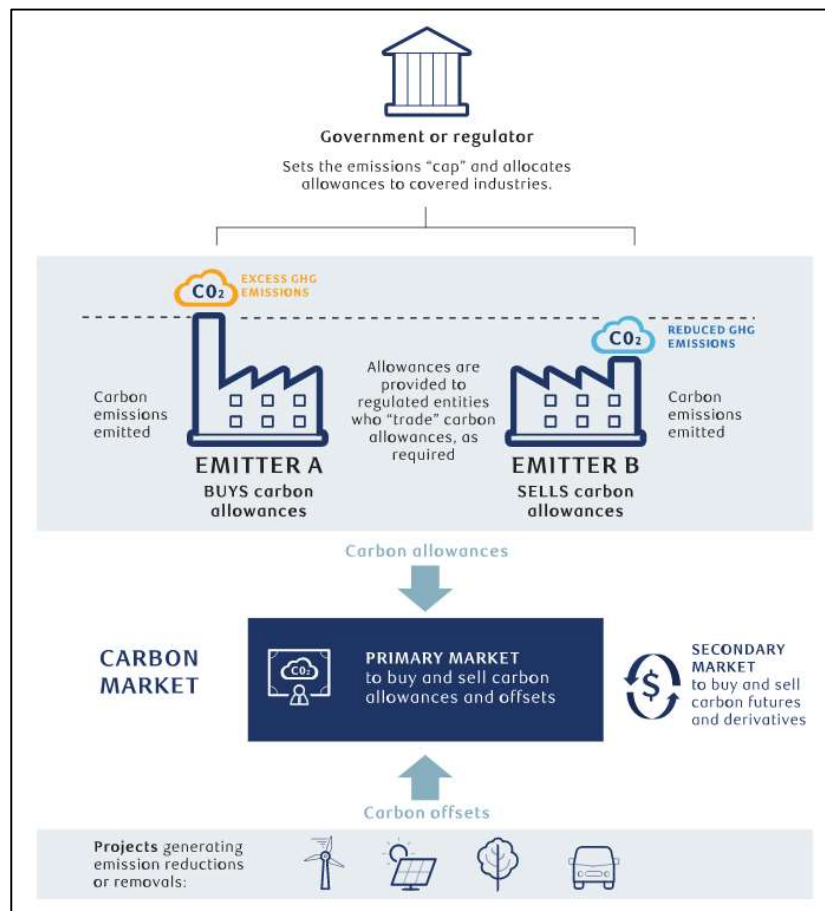
	providing funding mechanisms for low-carbon innovations to help energy-intensive sectors in their transition to low-carbon economy.
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Source: MSCI, <https://www.msci.com/www/blog-posts/introducing-the-carbon-market/03227158119>

Jurisdictions that host regulated emissions trading schemes and carbon markets include China (launched July 2021), South Korea, Kazakhstan, New Zealand, the EU, 10 U.S. states (including California and New York), Québec, and Tokyo. There are also systems being developed or considered in Mexico, Turkey, Ukraine, Brazil, Taiwan, and Thailand, among others. In May 2021, Canada announced efforts to create a national carbon-trading marketplace. While rules vary by jurisdiction, the sectors or groups typically regulated under an ETS include power generation, oil and gas refining, chemical manufacturing, mining and steel production, pulp and paper processing, cement, and transportation.¹⁴

Figure 3 shows how the cap-and-trade system in the compliance carbon market works.

Figure 3: The Cap-and-Trade Program



Source: Global Asset Management,
<https://www.rbcgam.com/en/ca/article/understanding-carbon-markets/detail>

2. Voluntary Carbon Markets

Voluntary carbon markets operate outside compliance carbon markets.

VCMs are unregulated markets that enable individuals, firms, governments, and non-governmental organizations to buy carbon offsets from project developers on a voluntary basis to achieve carbon compensation and neutralization. Compensation includes environmentally and socially useful projects to avoid further carbon emissions and support new technologies, resulting in less carbon emissions. Neutralization includes carbon-emission-reduction projects using natural and technology-based carbon-capture and carbon-storage techniques. Companies can voluntarily purchase carbon offsets, certified by private standards, as part of their sustainability strategy.¹⁵

There are four participating groups in VCMs:¹⁶

- (1) Project Developers: the ones creating the carbon-offset project(s).
- (2) Standard Bodies: parties that review the projects against a criteria and operate a registry to allow the issuance and retirement of the carbon offsets.
- (3) Brokers: parties that provide advice and facilitate credit transactions between buyers and project developers.
- (4) End-Users/Buyers: the ones purchasing the credits. They include corporates looking to achieve their net-zero commitments or significant funds looking to buy and sell later at higher prices or hedging against climate-change risks in their portfolios.

The State of the Voluntary Carbon Markets (SOVCM) bulletin from Ecosystem Marketplace shows that voluntary carbon markets hit a record US\$1 billion in 2021, prices are on the rise and that projects with additional co-benefits achieve higher prices than the rest¹⁷. The Taskforce on Scaling Voluntary Carbon Markets (TSVCM) estimates that demand for carbon credits could increase by a factor of 15 or more by 2030 and by a factor of up to 100 by 2050. Overall, the voluntary market for carbon credits could be worth upward of US\$50 billion in 2030¹⁸.

¹⁵ "Introducing the Carbon Market Age," Hitendra D. Varsani and Rohit Gupta, MSCI, June 8, 2022. Retrieved on June 26, 2022, <https://www.msci.com/www/blog-posts/introducing-the-carbon-market/03227158119>

¹⁶ "COP26: Key Outcomes and Impact on Voluntary Carbon Markets," Dana Saric, Sander Duncanson Jacob A. Sadikman, Jesse Baker, Maeve O'Neill Sanger, Stephan Pacholok and Jordan Mulligan, Osler, December 22, 2021. Retrieved on June 26, 2022, <https://www.osler.com/en/blogs/energy/december-2021/cop26-key-outcomes-and-impact-on-voluntary-carbon-markets>

¹⁷ "Voluntary Carbon Markets Top \$1 Billion in 2021 with Newly Reported Trades," Special Ecosystem Marketplace COP26 Bulletin, Ecosystem Marketplace, November 10, 2021. Retrieved on June 25, 2022, <https://www.ecosystemmarketplace.com/articles/voluntary-carbon-markets-top-1-billion-in-2021-with-newly-reported-trades-special-ecosystem-marketplace-cop26-bulletin>

¹⁸ "A Blueprint for Scaling Voluntary Carbon Markets to Meet the Climate Challenge," Christopher Blaufelder, Cindy Levy, Peter Mannion, and Dickon Pinner, McKinsey Sustainability, January 29, 2021. Retrieved on June 26, 2022,

IV. No Single Standard in Carbon-Offset Markets

While the carbon-credit/carbon-allowance markets are regulated by government entities and laws, there is no single standard in the carbon-offset markets.

1. Lack of Transparency

There is currently a wide pricing range for voluntary carbon credits, depending on the nature and quality of an offset-generating project, the location and vintage year of its generation, and the degree of difficulty in verifying the legitimacy of its offsetting activity¹⁶.

“Today’s carbon-credits market is fragmented and complex,” McKinsey & Company noted, and that “some credits have turned out to represent emissions reductions that were questionable at best. Limited pricing data make it challenging for buyers to know whether they are paying a fair price, and for suppliers to manage the risk they take on by financing and working on carbon-reduction projects without knowing how much buyers will ultimately pay for carbon credits.”¹⁸

Companies’ major challenge when buying credits from carbon-offset markets is the instrument reputation for not delivering the emissions reduction they promise. This reputation is an immediate concern for offset-credit buyers that do not want customers, investors, or employees to associate their brand with greenwashing. Offsets’ bad reputation is due to the many standards available, the intended use for the offsets and the complexity to measure its quality.⁹

2. Standard is Badly Needed

There is no single globalized carbon-offset standard. Instead, a handful of registries issue credits according to a specific set of criteria checked by third-party verifiers. Local communities typically work with western-based developers and brokers to set up projects to underpin credits.⁸

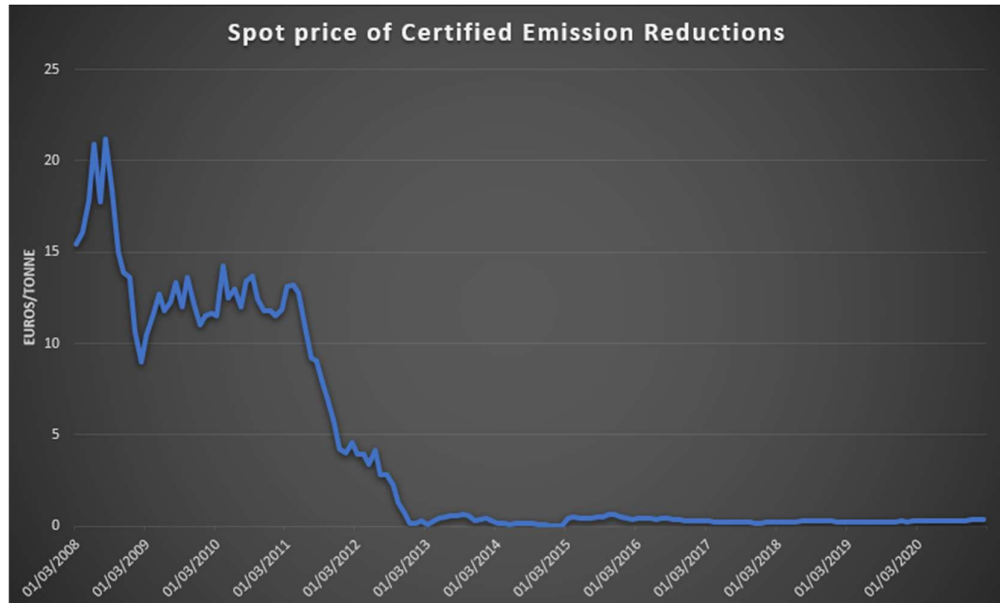
The lack of global core-carbon principles to guide the market on high-quality carbon offsets is responsible for the wide range of voluntary credits prices. Prices range from US\$0.02 for some forest-protection projects to US\$1,200 per tonne of CO₂ abated by technologies such as Direct Air Capture.⁹

A January 2021 *Reuters* report pointed out that around 45 percent of the CDM credits were awarded to a handful of projects, mainly in Asia, for cutting industrial gases. Concerns over the environmental integrity of the gas-project credits that were cheap to generate led the European Union to ban their use for compliance in its ETS in 2013. The

<https://www.mckinsey.com/business-functions/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge>

EU has said it does not intend to accept any international credits from 2021. With no clear signals about the future marketplace for CDM credits, prices crashed to levels below EUR1 per ton in 2013 where they have remained, as indicated in Figure 4 below.⁸

Figure 4: Spot Price of CDM's CERs



Source: Reuters, <https://www.reuters.com/article/us-climate-change-carbon-offsets-idUSKBN2AP1FZ>

In November 2021 at the Glasgow COP26 Climate Change Summit, negotiators agreed to create a global carbon-credit-offset trading market¹⁹. If successful, this can be very helpful to provide transparency and better facilitate carbon-offset trading.

Some key implications of the Glasgow-established rules for how voluntary carbon markets should operate are:¹⁶

- Increase the standardization and transparency of carbon credits, which should lead to increased carbon-credit-price standardization, at least with project types.
- Standardization of carbon-credit recognition-principles and further development of carbon-credit trading platforms and exchanges to facilitate an increase in credit liquidity.
- Create opportunities for businesses in the agricultural and agribusiness sectors, among others.

¹⁹ "Carbon Credit," Will Kenton, Investopedia, November 19, 2021. Retrieved on June 25, 2022, https://www.investopedia.com/terms/c/carbon_credit.asp

3. Top Four Carbon-Offset Programs²⁰

A carbon-offset program refers to a set of standards made by an organization to measure, regulate, and review carbon-offset projects.

The best carbon-offset programs are also known as carbon standards or registries. They allow individuals or companies to invest in carbon-offset projects locally or internationally to balance their carbon footprint. They ensure that the projects are trustworthy.





Carboncredits.com named the four largest and best carbon offset programs for 2022, noting that they have solid track records of performance. Three of them are headquartered in the United States and one in Switzerland:

- Verified Carbon Standard (VCS) is a standard for certifying carbon-emissions reductions launched in 2006. VCS is administered by Verra, a non-profit organization headquartered in the United States.
- The Gold Standard is a standard and logo-certification program for non-governmental emission reductions projects in the CDM; it focuses on UN Sustainable Development Goals (SDGs). Launched in 2003, it is headquartered in Switzerland.
- Climate Action Reserve (CAR) began in 2001 as the California Climate Action Registry with a mission to encourage companies and other organizations to measure, manage and reduce GHG emissions. CAR is a national offsets program. It is headquartered in the United States.
- American Carbon Registry (ACR) was founded in 1996 by the Environmental Resources Trust (ERT) as the first GHG registry. It became the ACR in 2008. In 2012, ACR was accepted as an approved Offset Project Registry by the California Air Resources Board. It's the regulatory body of the California cap-and-trade carbon-offset market. ACR is headquartered in the United States.

Carboncredits.com summarized in Table 2 the key comparison among these four best carbon-offset programs it named for 2022.

²⁰ "The 4 Best Carbon Offset Programs for 2022," Jennifer L. CarbonCredits.com, June 29, 2022. Retrieved on July 2, 2022, <https://carboncredits.com/the-4-best-carbon-offset-programs-for-2022>

Table 2: The Four Best Carbon-Offset Programs for 2022

Carbon Offset Program	Market Volume (in M)	Name of carbon credits issued	Project Locations	Projects Sector
 Verified Carbon Standard (VCS)	746 M carbon credits (70% share)	Verified Carbon Units (VCUs)	Projects dominant in developing countries	Covers all sectors
 Gold Standard (GS)	184 M carbon credits (17% share)	Verified Emission Reductions (VER)	Over 80 countries, mostly developing nations	Covers all sectors, excluding REDD+ projects
 American Carbon Registry (ACR)	63 M carbon credits (6% share)	Emission Reduction Tons (ERTs)	United States	Covers AFOLU projects, industrial processes and wastes
 Climate Action Reserve (CAR)	66M carbon credits (6.2% share)	Climate Reserve Tonnes (CRTs)	United States, Canada, Mexico	Agriculture, forestry, wastes, energy, and non-carbon emission reductions

Source: Carboncredits.com, <https://carboncredits.com/the-4-best-carbon-offset-programs-for-2022>

V. Convergence of the Two Types of Carbon Markets

Currently, the compliance carbon markets operate at a significantly larger scale than the voluntary markets.

Though the voluntary carbon markets lack in size, Ecosystem Marketplace pointed out that “they make up in their flexibility – spinning off innovations in project finance, monitoring, and methodologies that also influence regulatory market mechanisms.” The article provided an example: the voluntary carbon market has spawned its own standards, registries, and project types beyond the scope of existing compliance-market mechanisms. In recent years, governments worldwide have increasingly turned to voluntary carbon-market mechanisms – particularly standards and registries – to inform the development of or serve as compliance instruments themselves.²¹

On May 25, 2022, at the European Climate Summit, various speakers noted that “converging the two (carbon) markets could enable the harmonization of national accounting practices, create transparency that would avoid the double counting of emissions and should assist in aligning with local regulations.”²²

David Antonioli, CEO Verra, stated: “These two markets are designed based on the same infrastructure, on the same goals, and in some cases, there is a direct overlap with a guaranteed price. However, it is important to understand that the drivers of these

²¹ “Carbon Market Overview,” Ecosystem Marketplace. Retrieved on July 3, 2022, <https://www.ecosystemmarketplace.com/marketwatch/carbon>

²² “ECS 2022: Convergence Calls for Compliance and Voluntary Carbon Markets – OPIS,” Market Watch, Dow Jones Newswires, May 25, 2022. Retrieved on July 3, 2022, <https://www.marketwatch.com/story/ecs-2022-convergence-calls-for-compliance-and-voluntary-carbon-markets-opis-271653501019>

markets are very different.” He further noted: “We need to be sure that private sector activity does not replace governmental actions. Figuring out how to make the voluntary market more aligned with regulatory will be key.”²²

Mark Woodall, Chief Investment Officer at C-Quest Capital, said that price calculations for the two markets are totally different. The compliance market is priced as cost-to-production while the voluntary market is priced as cost-to-value. He suggested that convergence could be achieved if we calculate for the voluntary market as the cost per abated metric ton of carbon dioxide and adding to it the social and technological benefits. It needs a different mindset to calculate the cost of abatement and the cost of production. Woodall pointed out that “other regions, such as Singapore and Japan, are taking steps to bring non-compliance systems into their compliance systems.” Singapore is considering using 10 percent of its compliance market for approved, quality, voluntary projects.²²

VI. Carbon Credit Exchanges

As noted earlier, jurisdictions that host regulated emissions trading schemes and carbon markets include China, South Korea, Kazakhstan, New Zealand, the EU, 10 U.S. states, Québec, and Tokyo. There are also systems being developed or considered in Mexico, Turkey, Ukraine, Brazil, Taiwan, and Thailand, among others.

However, there is no unified global marketplace for carbon trading that exists yet.

There are several regional markets created where cap-and-trade programs exist, and such markets are usually regulated; examples include the EU ETS, or California’s cap-and-trade program. Other various trading platforms are not regulated, and are there for the voluntary market. Some buyers in the voluntary markets buy directly from developers who sell credits granted to their carbon projects.²³

At present, many buyers and sellers of carbon credits are transacting their trades via digital carbon exchanges. Many of them even prefer to do it using carbon tokens enabled by blockchain technology. The tokenization of carbon credits helps the transparency and liquidity of the market. Blockchain technology can create secure, standardized, and real-time carbon credit exchanges.²³

Carboncredits.com has identified the top four carbon-credit exchanges in the marketplace for 2022, they are:²³

- AirCarbon Exchange (ACX) is a digital exchange platform launched in Singapore in 2019 for airlines to trade carbon credits.

²³ “The Top 4 Carbon Exchanges for 2022,” Jennifer L., Carboncredits.com, May 19, 2022. Retrieved on July 3, 2022, <https://carboncredits.com/the-top-4-carbon-exchanges-for-2022>

- Carbon Trade Exchange (CTX), started in 2009 in the U.K., is a member-based spot exchange. It allows for trading credits from Gold Standard, VCS, and CDM.
- Toucan Protocol is a carbon-to-crypto market started in 2020 in the U.S. It allows anybody to tokenize their carbon offsets and make them available in the world of DeFi (decentralized finance).
- Xpansiv, started in 2019 and based in the U.S., is the global marketplace to trade various data-driven, ESG-inclusive commodities.

Carboncredits.com provided a summary of these four exchanges in Table 3.

Table 3: The Four Top Carbon Exchanges for 2022

Carbon Exchange	Headquarter	Clients	Minimum contract size	Blockchain (Yes=✓; No=X)	Market Operation	Offset Contracts/ Tokens
AirCarbon Exchange (ACX)	Singapore	130+; Individuals and corporations	1,000 tCO ₂ e	✓	Compliance and Voluntary	CET RET GNT GNT+ SDT HOT
Carbon Trade Exchange (CTX)	UK	Global Individuals and corporations	100 tCO ₂ e	X	Voluntary	VER CER VCU EUA EUUA
Toucan	US	150+ Individuals and corporations	1,000 tCO ₂ e	✓	Voluntary	BCT
Xpansiv (CBL)	US	400+ Individuals and corporations	1,000 tCO ₂ e	X	Compliance and Voluntary	CBL GEO CBL N-GEO CBL C-GEO Aviation/CORSIA

Source: Carboncredits.com, <https://carboncredits.com/the-4-best-carbon-offset-programs-for-2022>

Going Forward

Dealing with climate-change issues and reducing GHG emissions appear to be high on the priority in many countries around the world.

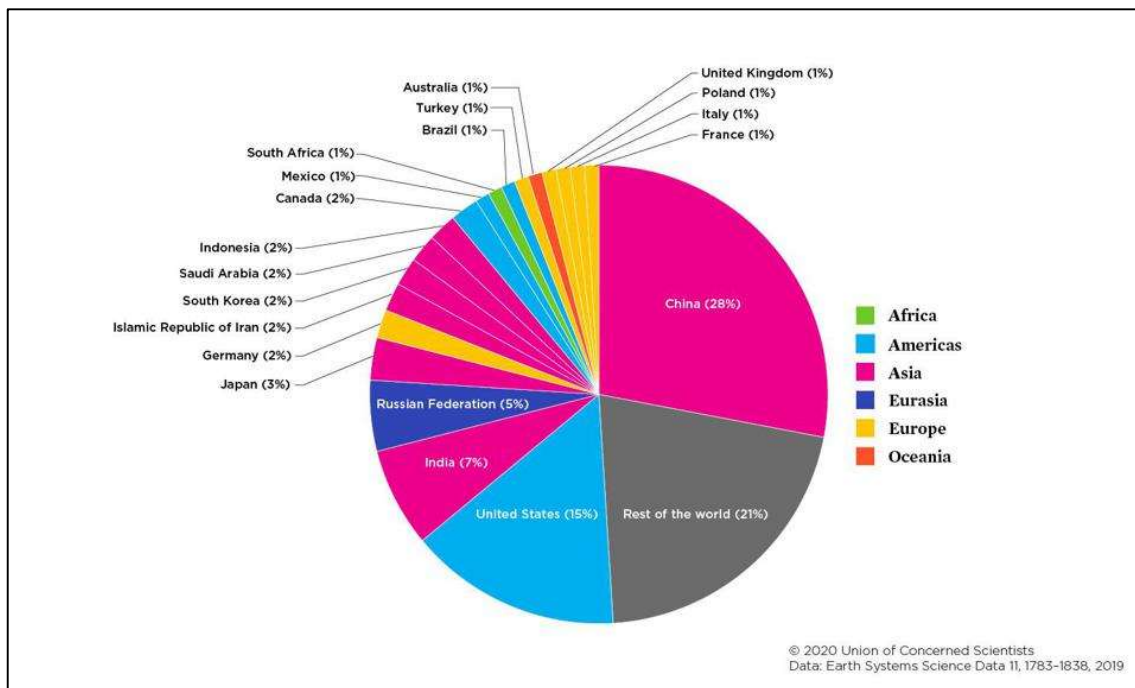
The European Union, for example, has unveiled a carbon border-adjustment mechanism (CBAM), an ambitious proposal put forward in July 2021, to tackle the global climate crisis. To achieve the EU's goal of cutting net GHG emissions by 55 percent by 2030, the CBAM will impose an extra charge on imports manufactured abroad from 2026, under decarbonization standards that fall below the EU's; in other words, exporters are held accountable for the direct and embedded emissions of their goods as they enter the EU.²⁴

²⁴ "EU Must Rethink its Carbon Border Tax to Sidestep Potential Legal Problems," Jaemin Lee, South China Morning Post, September 11, 2021. Retrieved on July 4, 2022, <https://www.scmp.com/comment/opinion/article/3148252/eu-must-rethink-its-carbon-border-tax-sidestep-potential-legal>

Bo Bai, Executive Chairman and Co-Founder of MetaVerse Green Exchange (MVGX), noted in the *South China Morning Post* Opinion page on July 3, 2022: “Though a tool to encourage climate action, the CBAM raises critical questions about emissions accountability. Crucially, it points to growing trade and climate protectionism that will critically disadvantage emerging economies in the Global South. Developing nations, in Asia especially, should take note.”²⁵

For the world to achieve net-zero state, it demands the cooperation of the world’s respective stakeholders.

Figure 5: The Share of CO₂ Emissions by Country, 2019



Source: Union of Concerned Scientists, <https://www.forbes.com/sites/davidrvetter/2020/09/25/china-just-promised-to-go-carbon-neutral-by-2060-how-important-is-that/?sh=307ae276190c>

In 2019, the world’s biggest single GHG emitter was China (28%), followed by the United States (15%) and India (7%)²⁶, the EU ranked fourth, accounting for 6.4 percent of global GHG emissions²⁷.

While each country or region has its own climate commitment and schedule to achieve its respective commitment, concerted actions instead of unilateral action are

²⁵ “Emerging Asia at Risk from EU’s Protectionist Carbon Border Tax,” Bo Bai, *South China Morning Post*, July 3, 2022. Retrieved on July 4, 2022, https://www.scmp.com/comment/opinion/article/3183711/emerging-asia-risk-eus-protectionist-carbon-border-tax?module=perpetual_scroll_0&pgtype=article&campaign=3183711

²⁶ “China Just Promised To Go Carbon Neutral By 2060. How Important Is That?” David Vetter, *Forbes*, September 23, 2020. Retrieved on July 4, 2022, <https://www.forbes.com/sites/davidrvetter/2020/09/25/china-just-promised-to-go-carbon-neutral-by-2060-how-important-is-that/?sh=307ae276190c>

²⁷ “Here's What's in the New Climate Change Plans From the EU and China,” Matthew Johnston, *Investopedia*, July 15, 2021. Retrieved on July 4, 2022, <https://www.investopedia.com/eu-china-climate-deal-5192650>

called for. If the CBAM is passed into law, it will result in reshuffling of the global supply chain, individual countries' industrial structure, tax and pricing systems, at the least. Action of foremost importance in this climate quest is to support all partners to move toward their climate goals, particularly having China, the United States and India committing to goals and achieving them.