Crisil
Intelligence

Assessment of ESG Advisory Services and Carbon Markets

May 2025

Crisil Intelligence

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Global macroeconomic assessment

Global economy shows resilience amid uncertainty

The global economy continues to demonstrate resilience in the face of evolving challenges. Global growth, which hovered around 3% in recent years, is projected to moderate slightly to 2.8% in 2025 before recovering to 3.0% in 2026, as per the IMF's April 2025 outlook. Despite persistent geopolitical tensions, trade disruptions, and elevated policy uncertainty, steady disinflation, normalizing labour markets, and firm domestic demand in several large emerging and developing economies have supported overall momentum. While advanced economies are expected to experience a modest slowdown, emerging markets are likely to remain the primary drivers of global expansion. The risk of a hard landing has eased, financial systems have remained broadly stable, and labour markets have returned to pre-pandemic norms—though rising tariffs and weaker consumption in advanced economies may weigh on the outlook.

Global GDP is estimated to grow at 2.8% in CY25 and 3.0% in CY26

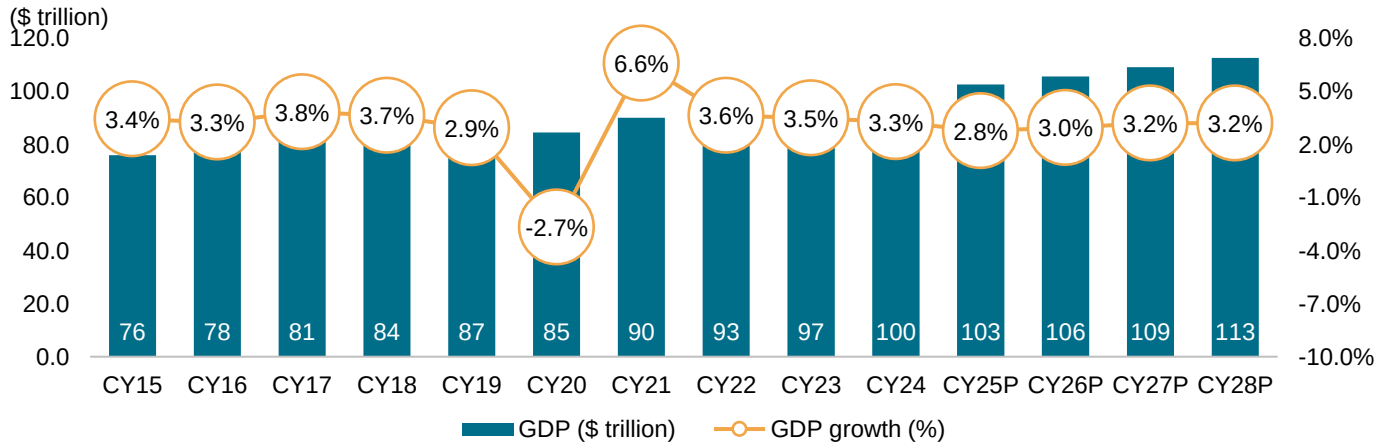
As per the International Monetary Fund's (IMF) April 2025 update, global gross domestic product (GDP) growth is projected at 2.8% in 2025 and 3.0% in 2026. This growth going forward is majorly propelled by the emerging and developing economies with regional differences on account of global economic tensions.

Signs of stabilization were emerging through much of 2024, after a prolonged and challenging period of unprecedented shocks. Inflation, down from multidecade highs, followed a gradual decline toward central bank targets, whereas labour markets normalized, with unemployment and vacancy rates returning to pre pandemic levels. Overall, the growth hovered around 3% in the past few years.

However, the swift escalation of trade tensions and extremely high levels of policy uncertainty are expected to have a significant impact on global economic activity. Overall, in the near term, the global growth is projected to grow at 2.8% in 2025, before recovering to 3% in 2026.

Global GDP trend and outlook (CY18-28P, $ trillion)

Figure 1 Global GDP Trend and Outlook



Note: E: Estimated, P: Projection; Source: IMF economic database, Crisil Intelligence

India among fastest-growing major economies

India became the fourth largest in the world by fiscal 2024 and has grown at a faster growth rate compared to top key economies. Additionally, India's expanding economy along with growing per capita income, could positively impact the consumer purchasing power, which in turn will influence the demand for discretionary spends like entertainment, leisure, tourism, etc.

United States: For the United States, growth is projected to decrease in 2025 to 1.8%, 1% lower than the rate for 2024 as a result of greater policy uncertainty, trade tensions, and a softer demand outlook, given slower-than-anticipated consumption growth. Tariffs are also expected to weigh on growth in 2026, which is projected at 1.7% amid moderate private consumption.

Euro area: Growth in the euro area is expected to decline slightly to 0.8% in 2025, before picking up modestly to 1.2% in 2026. Rising uncertainty and tariffs are key drivers of the subdued growth in 2025. Offsetting forces that support the modest pickup in 2026 include stronger consumption on the back of rising real wages and a projected fiscal easing in Germany.

For advanced economies, growth under the reference forecast is projected to drop from an estimated 1.8% in 2024 to 1.4 percent in 2025 and 1.5 percent in 2026. The forecasts for 2025 include significant downward revisions for Canada, Japan, the United Kingdom, and the United States and an upward revision for Spain.

Emerging market and developing economies: For emerging market and developing economies, growth is projected to drop to 3.7% in 2025 and 3.9% in 2026, following an estimated 4.3% in 2024.

Real GDP growth comparison between India and advanced and emerging economies

Table 1 Real GDP growth comparison between India and advanced and emerging economies

Real GDP growth (Annual percent change)	2019	2020	2021	2022	2023	2024	2025P	2026P
Advanced economies	1.9	-4.0	6.0	2.9	1.7	1.8	1.4	1.5
Canada	1.9	-5.0	6.0	4.2	1.5	1.5	1.4	1.6
China	6.1	2.3	8.6	3.1	5.4	5.0	4.0	4.0
Emerging market and developing economies	3.7	-1.7	7.0	4.1	4.7	4.3	3.7	3.9
Euro area	1.6	-6.0	6.3	3.5	0.4	0.9	0.8	1.2
India*	3.9	-5.8	9.7	7.6	9.2	6.5	6.5**	6.3
United Kingdom	1.6	-10.3	8.6	4.8	0.4	1.1	1.1	1.4
United States	2.6	-2.2	6.1	2.5	2.9	2.8	1.8	1.7
World	**2.9**	**-2.7**	**6.6**	**3.6**	**3.5**	**3.3**	**2.8**	**3.0**

Notes: P- projected
** Numbers for India are for financial year from April to March (2020 is FY21 and so on) and as per MoSPI.*
^India GDP estimate for the FY24 is 9.2% according to Second Advance Estimates from MoSPI.
***Projection is as per the CRISIL forecast*
Source: IMF economic database, MoSPI, Crisil Intelligence

Real GDP growth comparison between India and advanced and emerging economies | All numbers as per IMF|

Table 2 Real GDP growth comparison between India and advanced and emerging economies | All numbers as per IMF|

Real GDP growth (Annual percent change)	2019	2020	2021	2022	2023	2024	2025P	2026P
Advanced economies	1.9	-4.0	6.0	2.9	1.7	1.8	1.4	1.5
Canada	1.9	-5.0	6.0	4.2	1.5	1.5	1.4	1.6
China, People's Republic of	6.1	2.3	8.6	3.1	5.4	5.0	4.0	4.0
Emerging market and developing economies	3.7	-1.7	7.0	4.1	4.7	4.3	3.7	3.9
Euro area	1.6	-6.0	6.3	3.5	0.4	0.9	0.8	1.2
India	3.9	-5.8	9.7	7.6	9.2	6.5	6.2	6.3
United Kingdom	1.6	-10.3	8.6	4.8	0.4	1.1	1.1	1.4
United States	2.6	-2.2	6.1	2.5	2.9	2.8	1.8	1.7
World	2.9	-2.7	6.6	3.6	3.5	3.3	2.8	3.0

Notes: P- projected
Source: IMF economic database, Crisil Intelligence

Growth Drivers of global economy

Next-generation trade agreements: Ongoing uncertainty in global trade policies may lead to a renewed push for regional, multilateral, and plurilateral agreements, which could help reduce risks and increase policy stability. Comprehensive and non-discriminatory agreements that encompass a wide range of areas, including digital trade, services, and investment, could promote widespread benefits without creating new trade distortions. Furthermore, strengthening international cooperation and regional integration, such as the European Union's single market, could have a positive impact on investment, productivity, and economic growth, while also enhancing countries' ability to withstand external economic shocks by expanding their market reach and diversifying their trade relationships.

Structural reform momentum: A generalized acceleration of structural reforms, driven in part by peer benchmarking and challenging global economic conditions, could have a substantial impact on growth. Simplifying regulatory frameworks and reducing bureaucratic hurdles would facilitate market access, increase competition, and foster a more dynamic business environment, leading to more efficient allocation of resources. Greater integration of financial, labour, and product markets could provide the necessary scale and depth to drive innovation and accelerate productivity growth. In Europe, addressing remaining internal barriers would enable companies to expand and grow. By accelerating European integration through the reduction of regulatory obstacles and strengthening the Capital Markets Union, investment could be increased, productivity lifted, and potential growth enhanced. This approach would also help to develop the European capital market, which is currently underdeveloped, and contribute to a reduction in global economic imbalances.

Growth engine powered by artificial intelligence: The growing enthusiasm for Artificial Intelligence (AI), combined with anticipated yearly reduction in AI implementation costs and future technological breakthroughs, could lead to considerable gains in productivity and consumption. As AI technologies become more widespread, they are likely to generate knowledge spillovers across various sectors and geographic regions, driving innovation and reducing costs on

a global scale. These benefits can be realized without significant negative impacts on employment, provided that AI adoption is complemented by policies that modernize regulatory frameworks and facilitate the reallocation of labour. Furthermore, these gains can be achieved without leading to increased electricity prices and environmental costs, if policymakers and businesses collaborate to capitalize on the opportunity by promoting and incentivizing the use of renewable energy sources and innovative production methods.

Mitigation of conflicts: A peaceful resolution or reduction in ongoing conflicts could have a profound impact on the global economy, potentially leading to a decline in commodity prices and a more efficient allocation of resources. The end of hostilities, followed by reconstruction efforts, would not only stimulate economic growth in countries directly affected by conflicts but also have a positive ripple effect on neighbouring countries. For example, a ceasefire in Ukraine could lead to a surge in regional growth, driven by a resurgence in consumer confidence and a decrease in energy prices, particularly in Europe. A similar dynamic can be observed with the recent India-Pakistan ceasefire. The truce has already led to a rebound in regional markets and improved investor sentiment, offering a temporary boost to economic stability. However, countries that have invested in alternative infrastructure or energy sources as a response to conflict-related shortages may face temporary negative consequences if a reversal of circumstances prevents them from realizing the expected returns on their investments

Challenges impacting global economy

Rising long-term interest rates: Additional upward pressure on already elevated US bond yields, combined with ongoing exchange rate fluctuations driven by further policy changes and uncertainty, could potentially trigger capital and foreign direct investment (FDI) outflows from emerging market and developing economies. The increasing concentration of capital in safe-haven countries and assets could worsen capital imbalances and misallocation, leading to a more unstable global financial environment. Furthermore, the structural pressure on long-term yields could limit the already constrained fiscal space needed to address the economic damage caused by the pandemic or meet new spending needs, and could also exacerbate concerns about fiscal sustainability, particularly in countries with high levels of debt. This could create a vicious cycle of debt, where borrowing costs rise as fiscal adjustments become increasingly difficult to achieve, ultimately leading to a debt spiral.

Rising social discontent: The ongoing cost-of-living crisis, coupled with diminished growth prospects, may intensify polarization and social unrest, ultimately hindering the implementation of necessary reforms to stimulate economic growth. Certain regions, such as Africa, are particularly vulnerable to instability due to the devastating impact of conflicts, soaring food and energy costs, and limited fiscal resources. Similarly, some Asian countries face challenges related to restricted democratic participation and rising inequality, which may exacerbate social tensions. While emerging and developing economies have shown remarkable resilience in recent years, their ability to navigate domestic challenges, including high debt levels, may be tested in a deteriorating global economic landscape. A potential resurgence in food and energy price inflation, triggered by market disruptions or climate-related disasters, could further erode living standards and exacerbate food insecurity, particularly in low-income nations. A common thread among instances of social unrest is widespread discontent with governance and representation, which may undermine efforts to implement structural reforms and address the root causes of instability.

Labour supply gaps: The reliance on international labour has been a common strategy for many countries to mitigate workforce shortages, especially in the aftermath of the COVID-19 pandemic. However, a reduction in the influx of foreign workers to developed economies could have a double-edged effect. On one hand, it might alleviate pressure on local amenities and infrastructure and potentially lead to a modest increase in domestic incomes. On the other hand, the long-term consequences would likely be detrimental, with a decline in economic output both in the countries that receive these workers and globally. Furthermore, the subsequent decrease in the labour force could pose significant risks to fiscal stability and hinder economic growth, particularly in nations where immigrant workers are well-assimilated and their skills meet and complement labour market needs.

Increasing challenges to international cooperation: The rising incidence and economic cost of natural disasters, as well as the escalating intensity of conflicts, necessitate sustained and collaborative global efforts. Reducing investments in climate adaptation and international assistance would not only render previous efforts ineffective but also hinder progress towards creating a more sustainable and robust economy, ultimately depleting human capital in regions where it is most crucial. A sudden withdrawal of financial support would have devastating consequences, including a decline in living standards and health outcomes in vulnerable countries, potentially leading to social instability and forcing these nations to rely on public funding, which would further exacerbate their debt burdens. The macroeconomic implications for countries reliant on aid would be significant, featuring deteriorating trade balances, depletion of foreign exchange reserves, pressure on exchange rates and prices, and decreased consumer and investment spending

Climate change to significantly shape the global economy

Climate change has potential to do significant economic harm and poses worrying tail risks. It is a global externality—one country's emissions affect all countries by adding to the stock of heat-warming gases in the earth's atmosphere from which warming arises. Recent studies suggest that the amount of planetary heating already in the pipeline because of a century of pumping greenhouse gases into the atmosphere will make global income 19% lower[1] by 2049 than it would have been without global warming. This income loss will be driven mainly by rising temperatures, which will affect agriculture, public health, productivity and more.

The process of climate change is set to have a significant economic impact on many countries, with many lower income countries being particularly at risk. Macroeconomic policies in these countries will need to be calibrated to accommodate more frequent weather shocks, including by building policy space to respond to shocks. Infrastructure will need to be upgraded to enhance economic resilience. Elsewhere, climate change can entail significant risks to macro financial stability.

[1] 38 trillion dollars in damages each year: World economy already committed to income reduction of 19 % due to climate change — Potsdam Institute for Climate Impact Research

Macroeconomic overview of India

Review of India's GDP growth

India GDP logged 6.1% CAGR between FY12 and FY25

India's GDP grew at 6.1% compounded annual growth rate (CAGR) between FY12 and FY25 to Rs. 188 trillion in FY25 from Rs. 87 trillion in FY12 . During this period, the surge in the non-agricultural economy has driven growth. The government's investment push, along with easing input cost pressures for industry, has also played a major role in shoring up growth. However, services have been slowing owing to waning pent-up demand (post the pandemic), with the exception of financial, real estate and professional services, which have powered ahead on the back of a robust growth in banking and real estate sectors.

Additionally, as per the Second advance estimates of GDP for FY25, India's GDP grew 6.5% in FY25 to Rs. 188 trillion. Moving forward, Crisil expects GDP growth to be steady in FY26 at 6.5% despite uncertainties stemming from geopolitical turns and trade-related issues led by US tariff actions. Additionally, cooling food inflation, the tax benefits announced in the Union Budget 2025-2026, and lower borrowing costs are expected to drive discretionary consumption. However, India's current account deficit (CAD) is expected to rise mildly in fiscal 2026. Given the tariff related issues, and the subdued global growth environment, India's goods exports are expected to face further headwinds in fiscal 2026. However, a healthy services trade balance and robust remittances growth will limit the widening. At an overall level, India's real GDP is expected to be 6.5% in FY26.

Going forward, the US tariff hikes are a key risk to Crisil's GDP growth forecast for fiscal 2026. Slower global growth, along with anticipated reciprocal tariffs on India, is likely to hit exports. Uncertainty about the duration and frequent changes in tariffs could hinder investments

India real GDP growth at constant prices (new series)

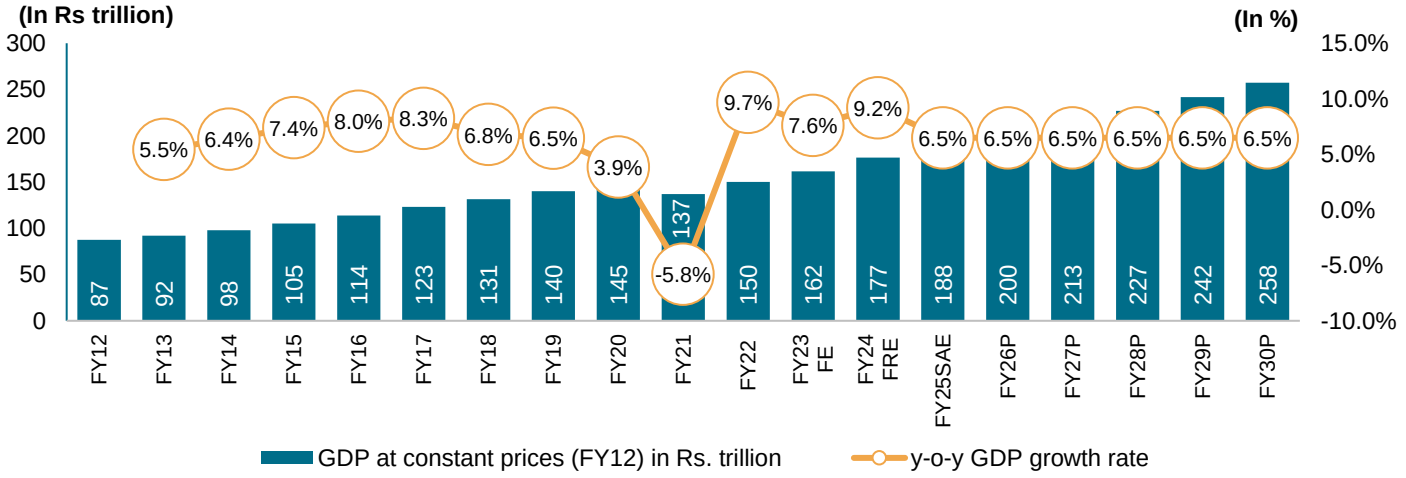


Figure 2 India real GDP growth at constant prices (new series)

Note: FE: Final Estimates, FRE: First Revised Estimates, SAE: Second Advance Estimates, P: Projected
These values are reported by the government under various stages of estimates

Only actuals and estimates of GDP are provided in the bar graph
Source: Second Advance Estimates of annual GDP for 2024-25, Ministry of Statistics and Program Implementation (MoSPI), Crisil Intelligence
Source of Projections for FY26P is Crisil Intelligence. Further projections till FY30P is basis IMF.

CRISIL forecasts India's economy to grow 6.5% in fiscal 2026, pace to sustain till fiscal 2030

Crisil expects India's GDP to grow at 6.5% this fiscal, same as estimated for fiscal 2025, driven by a relatively balanced set of domestic drivers. However, the ongoing & trade-related uncertainties pose some downside risks the forecast. India's economic growth rate is normalising towards its medium-term trend and, in fiscal 2026, will be supported by factors such as lower food inflation, lower borrowing costs & higher disposable income of the middle class.

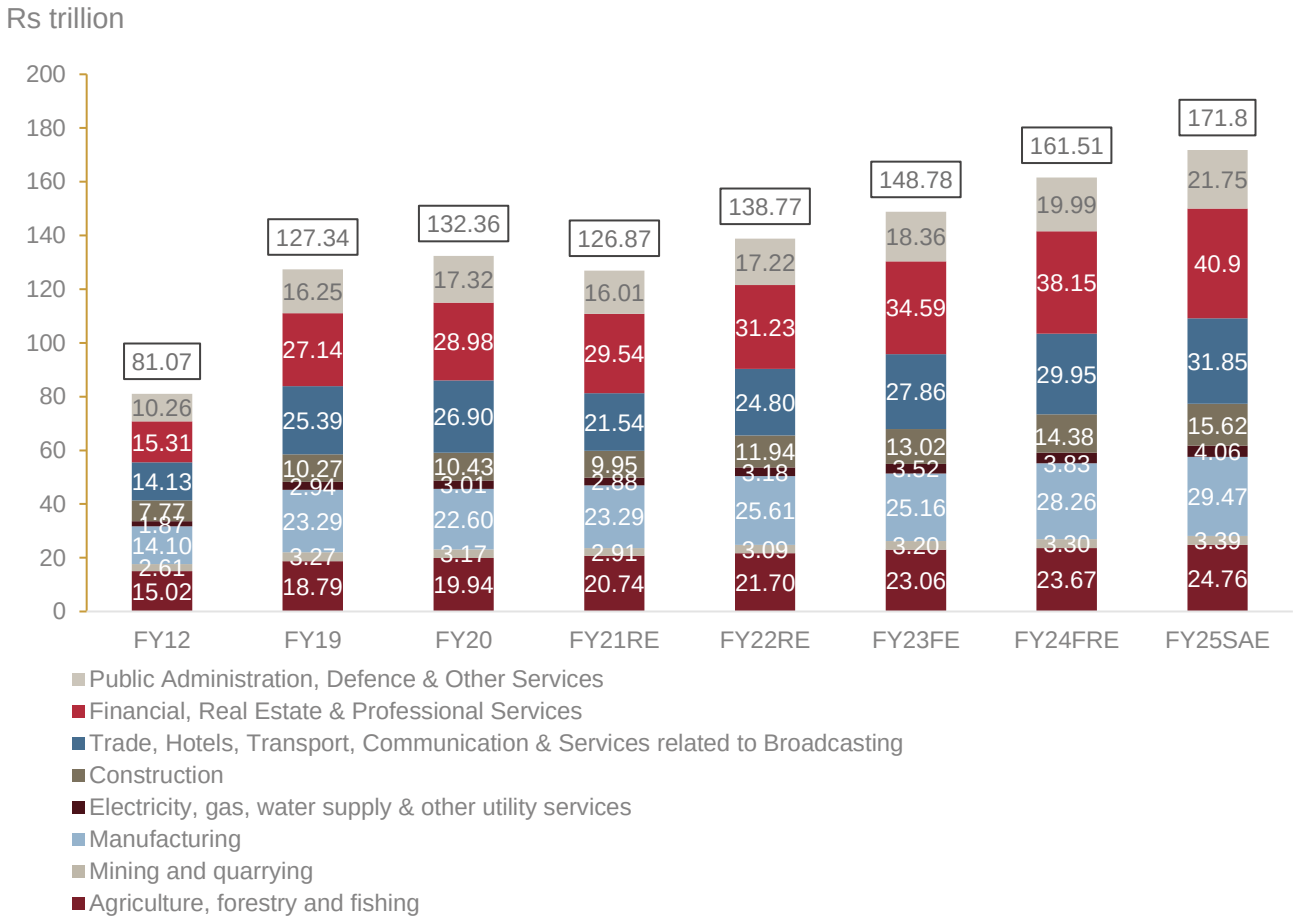
Over fiscal 2025 to 2030, Crisil expects the pace of GDP growth to sustain, averaging 6.5%, thereby making India the third-largest economy in the world.

A large part of this growth will be because of capital investments. Within this space, the share of private sector in capital investments is expected to increase as the government continues to focus on fiscal consolidation. The manufacturing and service sectors are expected to grow at 9.0% and 6.8% CAGR, respectively, over the period, with the service sector remaining the dominant growth driver, thereby contributing to ~55.0% share in GDP by fiscal 2031 vs. ~20.0% share in the case of the manufacturing sector.

That said, the manufacturing sector is expected to grow at a faster pace between fiscals 2025-2031 vs. years between fiscal 2011 and 2020. Over the next seven years, as global growth is expected to be relatively tepid and the trade environment restrictive, domestic demand will play an important role in supporting the growth of the manufacturing sector.

Healthy growth of gross value added in fiscal 2025 in line with GDP growth

As of FY25SAE, GVA has reached to INR 171.8 trillion, up from INR 161.51 trillion, registering a y-o-y growth of ~6.37%. Financial, Real Estate & Professional Services had the highest contribution to GVA at ~23.80%, whereas Public Administration, Defence & Other Services and construction GVA had the registered the highest annual growth at ~8.81% & ~8.64% respectively.



Note: FE: Final Estimates, FRE: First Revised Estimates, SAE: Second Advance Estimates
Source: MoSPI, Crisil Intelligence
The value represented in boxes in the above bar graph indicates the overall GVA for the corresponding period

India's transition tightrope and managing trade-offs

It is widely acknowledged that energy security and its affordability are vital for growth and development of any economy. This is particularly true of low-income economies that need to grow faster to improve living standards. The other reality that confronts all of us is climate change, which has begun manifesting in rising incidents of heat waves, changing rainfall patterns, physical damage from natural disasters and so on. Incidentally, South Asian region has been identified as highly vulnerable to climate change and associated risks. According to an S&P Global study (2022), in the moderate emissions scenario, South Asia is likely to face water stress and extreme heat, and about 15% of annual gross domestic product (GDP) could be at risk by 2050.

To be sure, India is the fifth largest economy in the world, but in per capita terms, it ranks 143. Hence, its need to grow fast cannot be over-emphasised. For India, the pursuit of higher growth is bound to raise the carbon footprint as fossil fuels remain the key component of energy supply. In addition to raising its growth rate, India is also attempting to change its composition in favour of industry and infrastructure, which are traditionally more carbon intensive than services. Services sector has been India's leading growth engine in the past few decades.

Thus, India's ability to manage the trade-off between high growth/energy security and energy transition is being tested, the success of which strongly depends on the deftness of policy makers

India's development-decarbonisation balance

India's development-decarbonisation balance points to a gradual progress to net zero. There is no single road to decarbonisation. Given the spiralling economic and social costs of climate change, multiple energy transition pathways are emerging globally. Each country looks at energy transition from the vantage point of its economy, its strengths and weaknesses. Energy transition refers to the global energy sector's shift from fossil fuel-based systems of producing and consuming energy - including oil, coal and natural gas - to renewable energy sources such as wind, solar and nuclear. The key aim is to reduce energy-related greenhouse gas emissions through various approaches to decarbonisation.

India is the third largest emitter, but 136th in per capita emission

India has the unwelcome distinction of being the third largest emitter of GHG globally, after China and the United States (US). Its aggregate GHG emissions more than doubled between 2000 and 2023, when it emitted ~4,100 million tonne of carbon dioxide equivalent (CO2e), as per the European Commission's EDGAR (Emissions Database for Global Atmospheric Research). Emissions from China and the US were 3.8 and 1.4 times, respectively, that of India's in the same year.

However, the story changes on per capita basis, where India is one of the least polluting major country, trailing many advanced and emerging market economies. According to EDGAR data, India ranked 136th out of 208 countries in terms of per capita GHG emissions in 2023. It emitted ~2.9 tonne CO2e per capita while the corresponding number for the US and the European Union (EU) was ~18 and ~7, respectively.

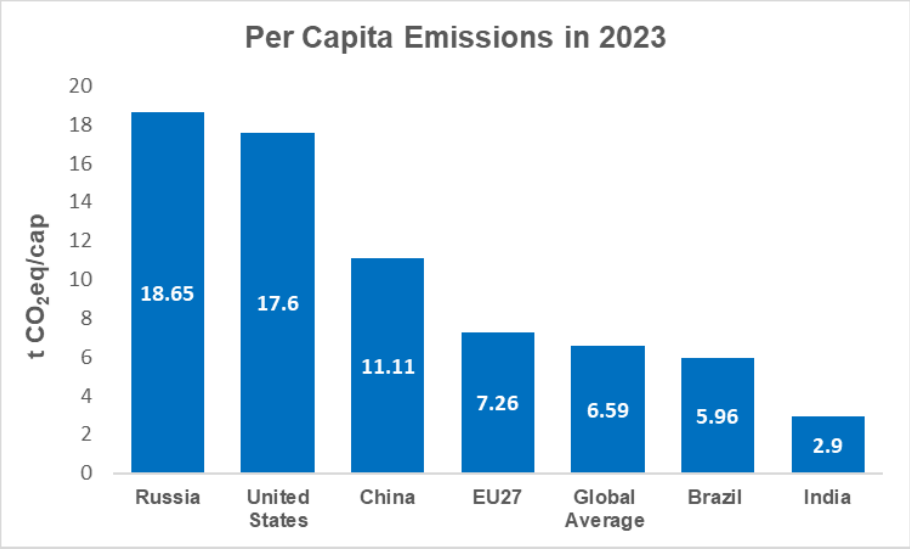


Figure 3 India's per capita emissions are among the lowest

Source: EDGAR (Emissions Database for Global Atmospheric Research) Community GHG Database (a collaboration between the European Commission, Joint Research Centre (JRC), the International Energy Agency (IEA), and comprising IEA-EDGAR CO2, EDGAR CH4, EDGAR N2O, EDGAR F-GASES version EDGAR_2024_GHG (2024) European Commission; Crisil

Furthermore, since its industrialisation began later, India's contribution to global historical CO2 emissions in the 1850-2021 period is only ~4%, according to the United Nations Environment Programme, compared with 19% and 13% from the US and EU27, respectively. That said, per capita emissions in advanced countries such as the US and the EU27 are now declining, while India's are continuing to rise. To put this in perspective, United States had figures close to India's current level of per capita emissions in the late 1860s-early 1870s. In China, the corresponding figures were in the late 1980s/ 1990s, just before its economic growth accelerated upon accession to the World Trade Organisation.

India's Emissions Profile: Energy and Industrial sectors Lead, Agriculture follows

The energy sector continues to be the dominant contributor to India's greenhouse gas (GHG) emissions, accounting for 34% of total emissions in 2023. India's total GHG emissions rose by 6.1% in 2023 compared to 2022, reaching nearly three times their 1990 levels. The rise was primarily driven by increasing CO_2 emissions from the power industry, industrial processes, and transport, which in 2023 were six and five times higher respectively than in 1990.

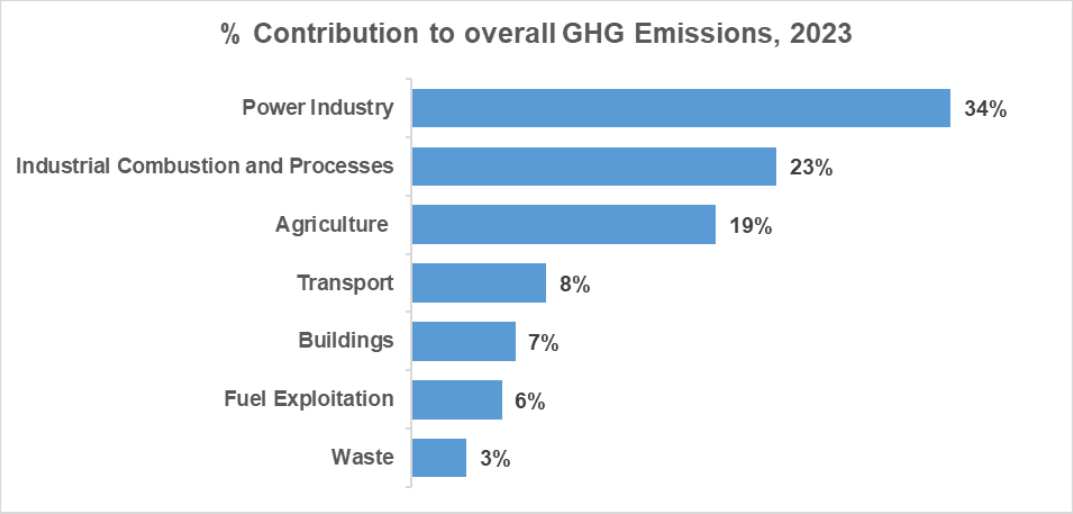


Figure 4 Sectoral Contribution to overall GHG Emissions

Source: EDGAR (Emissions Database for Global Atmospheric Research) Community GHG Database (a collaboration between the European Commission, Joint Research Centre (JRC), the International Energy Agency (IEA), and comprising IEA-EDGAR CO2, EDGAR CH4, EDGAR N2O, EDGAR F-GASES version EDGAR_2024_GHG (2024) European Commission

By gas type, CO_2 remains the dominant greenhouse gas, contributing 72% of total emissions, followed by methane (CH_4) at 20%, nitrous oxide (N_2O) at 7%, and fluorinated gases (F-gases) at 2%

Agricultural emissions, accounting for 19% of the national total, continue to be dominated by enteric fermentation and other land-based sources. Meanwhile, industrial emissions—stemming from both combustion and process emissions—now represent nearly a quarter of India's GHG profile. The growing contribution of transport and buildings also underscores the expanding role of urbanization and economic development in shaping India's emissions trajectory

The Path Towards Net-Zero and the Financing Gap: Tracking India's Energy Transition

India has made notable progress on its clean energy transition journey since articulating its Panchamrit action plan at COP26. The five-pronged targets—ranging from non-fossil capacity goals to emissions intensity reduction—remain

central to India's Nationally Determined Contributions (NDCs). Building on these, the past few years have seen accelerated investments, key policy measures, and initial market responses to the net-zero imperative.

Policy Action and Sectoral Push

India continues to pursue a multi-pronged strategy to meet its 2070 net-zero target. This includes scaling up renewable energy, enhancing energy efficiency across sectors, and supporting green hydrogen development. The Production Linked Incentive (PLI) scheme, announced in 2020, is helping develop domestic manufacturing capacity for solar modules, batteries, and electrolysers. Furthermore, the government introduced a dedicated hydrogen policy to promote the production and deployment of low-carbon hydrogen.

India's long-standing energy efficiency programme also remains a key component in moderating energy demand growth—especially significant given the country's high GDP growth (7.8% in 2023) and its rapidly expanding economy, urbanisation, and infrastructure requirements.

Clean Energy Financing: Positive Momentum, Yet a Gap

A significant shift has been observed in clean energy investments. India's clean energy spending reached USD 68 billion in 2023, marking a ~40% increase from the 2016–2020 average. Nearly half of this was channelled into low-emissions power generation such as solar PV. At the same time, fossil fuel investment also rose (6% YoY) to USD 33 billion, reflecting the rising domestic energy demand and continued reliance on coal and oil, particularly for power generation and transport.

India also made its sovereign green bond debut in January 2023, issuing USD 1 billion (INR 80 billion) across two tranches. The proceeds were earmarked for renewable energy, metro rail expansion, and hydrogen infrastructure. The issuance was more than four times oversubscribed—indicating growing investor interest in India's green finance instruments.

Still Short of the Net-Zero Finance Requirement

Despite this progress, the current trajectory still falls short of the required pace. The International Energy Agency (2022) had estimated that India would need USD 160 billion annually until 2030 to stay on track for net-zero by 2070. Although clean energy investments are on track to double by 2030 under current policy settings, they would still need to increase by an additional 20% to fully align with India's climate and energy goals.

Key constraints to scaling up finance include the high cost of capital, particularly for emerging technologies like hydrogen and storage, and the need for de-risking mechanisms to attract private and international capital.

India's transition path will be slower than other large economies. According to S&P Global, while emissions in the US have peaked around 2020 and have been declining since, emissions in China are likely to peak around 2025 and then decline rapidly.

India's absolute greenhouse emissions to increase at least till 2050

The latest available data (as of early 2025) shows that India's absolute greenhouse gas emissions were estimated at 4.2 billion metric tons of CO_2 equivalent ($GtCO_2e$) in 2024. Under a business-as-usual scenario, emissions are projected to

rise to 7.4 $GtCO_2e$ by 2050 if there are no major advancements in technology or policy. However, if India aligns with a 1.5°C pathway, emissions could fall to about 1 $GtCO_2e$ by 2050

Overview of the Global Carbon Market:

Understanding Green House Gases (GHGs), Climate Change and the 1.5-degree concern

The earth receives heat from the Sun in form of Solar radiation. While a portion of this solar radiation reflects into the space, some is absorbed by the planet, maintaining a comfortable temperature range for lives on the planet to thrive. This heat is absorbed by the gases present in the atmosphere. These gases that absorb heat are termed Green House Gases (GHGs) and the phenomenon of trapping heat is called the greenhouse gas effect. These gases include carbon dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O) and fluorinated gases like Hydrofluorocarbons (HFCs), perfluorinated chemicals (PFCs), and Sulphur hexafluoride (SF_6). These gases act like blankets, trapping heat. Different greenhouse gases have varying capacities to absorb and emit radiation which contributes to global warming. Global Warming Potential (GWP) is a metric used to compare the ability of different greenhouse gases to trap heat in the atmosphere.

Human activities, particularly the burning of fossil fuels for energy, have significantly increased the concentration of these greenhouse gases in the atmosphere. This disruption in the balance of greenhouse gas effect causes more heat to be trapped in the atmosphere leading to rising global temperatures and climate change. This has focused the attention of the stakeholders on atmospheric concentrations of greenhouse gases.

The international body, Intergovernmental Panel on Climate Change (IPCC), established by United Nations Environment Program (UNEP) and World Meteorological Organization (WMO), plays a key role in assessing the science related to climate change. The IPCC, in its assessment, began exploring the mitigation and stabilization scenarios. These scenarios look at the atmospheric CO_2 concentration needed to stabilize the temperature at various levels above pre-industrial times. Emissions scenarios have always been a crucial part of IPCC reports.

The scientific community, through the Intergovernmental Panel on Climate Change (IPCC), has identified in the IPCC sixth assessment report, that limiting global warming to 1.5 degree Celsius above pre-industrial levels as critical to avoiding the most devastating consequences of climate change. These consequences may include intensified weather extremes like severe heatwaves, droughts, floods, etc., sea level rise, mass extinction and bio-diversity loss, food, and water security risk, etc.

Researchers have established a correlation between atmospheric CO_2 concentration and the temperature changes. Carbon budget is a concept used by climate policymakers to help set emissions reduction targets in a fair and effective way. Carbon budgets link the rate of emissions to the additional rise in temperature and can offer a stepped approach to reaching climate targets. It examines the maximum amount of cumulative net global anthropogenic carbon dioxide (CO_2) emissions that would result in limiting global warming to a given level.

As the research from scientific community revealed a limited window for global CO_2 emission to stay within safer level of temperature increase, policymakers sought ways to incentivize the significant reductions in greenhouse gas emissions. One of the pathways identified to stay within carbon budget is pricing carbon emissions.

The concept of Carbon pricing, and consequently carbon markets, emerged in response to the growing scientific consensus on the dangers of climate change. One of the tools for combating climate change is putting a price on carbon

emissions. By putting a price on carbon emissions to account for the negative externalities, it creates an incentive for market forces to move economies away from burning fossil fuels.

Kyoto Protocol and Emissions Trading

The Kyoto Protocol, adopted in 1997 and entering into force in 2005, operationalizes the United Nations Framework Convention on Climate Change (UNFCCC) by committing industrialized countries and economies in transition to legally binding targets for limiting and reducing greenhouse gas (GHG) emissions. It distinguishes between developed countries, which have emissions reduction obligations, and developing countries, which do not.

A key feature of the Protocol is its flexible market-based mechanisms, designed to support cost-effective emissions reductions. Among these, the Clean Development Mechanism (CDM), established under Article 12, allows emission-reduction or removal projects in developing countries to earn Certified Emission Reduction (CER) units. These CERs, each equivalent to one tonne of CO_2, can be traded and used by industrialized countries to meet part of their Kyoto targets. Article 17 further enabled emissions trading among countries with surplus emission units.

To ensure environmental integrity, the CDM included a structured governance system involving national authorities, third-party validators (Designated Operational Entities), and oversight by the Executive Board under the UNFCCC. In India, the National Clean Development Mechanism Authority under the Ministry of Environment, Forest and Climate Change is responsible for reviewing and approving CDM proposals at the national level.

With the adoption of the Paris Agreement, the focus has now shifted to a new set of cooperative approaches under Article 6.4, which is intended to build on and eventually replace the CDM framework. While the transition of eligible CDM projects is currently underway, the full operationalization of Article 6.4 — including registration of new projects — is still in progress.

Paris Agreement Crediting Mechanism

Article 6 of the Paris Agreement** can be seen as a successor to the Kyoto Protocol's Clean Development Mechanism (CDM), with a broader scope of international cooperation, improved governance, and enhanced transparency. It outlines how countries can voluntarily cooperate to achieve their climate targets, while also mobilizing climate finance and encouraging sustainable development.

The Article provides for two core mechanisms of international collaboration. First, it enables the transfer of internationally transferred mitigation outcomes (ITMOs) between countries, which can be used towards achieving their respective Nationally Determined Contributions (NDCs). Second, it establishes a centralized crediting mechanism under Article 6.4 that allows both public and private entities to implement mitigation activities that generate transferable emission reductions.

Through this mechanism, emission reductions achieved in one country can be credited and transferred for use by another country or entity, whether to meet regulatory obligations, corporate net-zero targets, or contribute to global climate goals. This system helps identify and incentivize verifiable emissions reductions and attract investment in mitigation activities.

The Paris Agreement also includes provisions to ensure environmental integrity and avoid double counting of emission reductions. A portion of the proceeds from the crediting mechanism is allocated to support adaptation efforts in developing countries, making it an important source of climate finance and resilience building.

Each country under the Paris Agreement submits its own NDC, which outlines its climate action plans—typically including emissions targets, adaptation strategies, and sustainable development goals. These NDCs are to be updated every five years, reflecting increased ambition and progression.

Further, the Agreement includes a Global Stocktake every five years, beginning in 2023, to assess collective progress toward long-term climate goals. This is complemented by a robust framework for transparency and expert review of countries' implementation efforts.

Carbon pricing Instruments

Carbon pricing seeks to align the costs of consuming carbon-intensive fuels or using carbon-intensive processes with the social costs of those activities. It is implemented to reduce GHG emissions by providing a price signal closely linked to actual emissions. It provides economic incentive for the changes needed in investment, production, and consumption patterns, and to induce technological advancements. Policymakers use carbon pricing as a policy tool to decarbonize economies. The carbon pricing instruments are categorized as “compliance/regulatory” instruments or “voluntary carbon crediting” mechanisms. Entities regulated by Cap-and-Trade (CaT) or Carbon Taxes are mandated to financially account for the emissions produced from business activities. Participation in voluntary carbon crediting on the other hand is optional, with participants earning “credits” in recognition of quantified and verified emissions reductions or removals.

Carbon tax is a tax levied on the carbon emissions from producing goods and services. Carbon taxes are intended to make visible the hidden social costs of carbon emissions. They are designed to reduce greenhouse gas emissions by essentially increasing the price of producing goods hence incentivizing to reduce GHG emissions.

In some regulatory carbon markets, governments or regions set a cap on total emissions and distribute tradable permits (allowances) within that limit. These permits represent the right to emit one ton of CO_2 or equivalent GHGs. This mechanism of pricing carbon is referred to as **Cap-and-Trade mechanism**. Several Emission trading schemes (ETSs) and other national and sub-national government trading mechanisms employ this method to incentivize the entities to reduce their emissions. Globally, there are currently 75 carbon pricing instruments in operation, comprising 36 emission trading systems and 39 carbon taxes. Furthermore, an additional 22 emission trading system (ETS) are in various stages of consideration and development. This proliferation is particularly noticeable in parts of the world which are home to key emerging economies, like Mexico and Brazil in Latin America and China, India and Indonesia in the Asia-Pacific region. Entities covered by the scheme must hold enough allowances to cover their emissions or acquire them through trading.

An instrument is considered "under development" when a government has officially confirmed that it is actively working on implementing a crediting mechanism, even if no credits have been issued yet. This can include situations where a mandate has been established, but the process is still ongoing. On the other hand, if a government has publicly stated its intention to explore the implementation of a crediting mechanism, and this intention is formally confirmed by official government sources, the instrument is considered "under consideration”.

Carbon Offsets are a specific type of carbon allowances/ credits used for voluntary emissions compensation. These credits are generated through projects that reduce, avoid, or remove emissions. The projects can range from renewable energy installations to afforestation programs. Individuals or organizations can purchase these credits to neutralize/ offset their carbon footprint by supporting emission reduction projects elsewhere. Carbon offsets can help companies achieve carbon neutrality, demonstrate environmental responsibility, and meet sustainability goals. They can also provide financial support for climate projects in developing countries.

Carbon Markets – Tool for combating climate Change

Carbon markets enable governments and non-state actors to trade greenhouse gas emission credits. The aim is to achieve climate targets and implement climate actions cost effectively. A carbon market is a system that allows entities to trade carbon emissions. It provides a platform for buying and selling carbon credits, which represent the right to emit a specific amount of carbon dioxide or other greenhouse gases. These markets function as platforms for trading units representing verified greenhouse gas (GHG) emissions reductions or removals, typically measured in tons of CO_2 equivalent (CO_2e). Carbon credits are traded on specialized exchanges and over-the-counter markets, allowing companies to acquire the credits they need to meet their emissions targets. Emerging Carbon pricing regulations in the carbon market incentivize companies to reduce their environmental footprint and invest in carbon-neutral or low-carbon technologies.

Regulatory and Voluntary Carbon Market

As carbon pricing gained momentum, a clear distinction emerged between two main types of carbon markets:

Regulatory Carbon Markets: Governments establish regulatory carbon markets to control emissions within their jurisdiction. They typically employ cap-and-trade systems, where a limit (cap) is set on total emissions, and companies can buy and sell permits (credits) to stay under the cap. This system allows for flexibility in achieving emissions reduction goals while providing a market-based solution.

Voluntary Carbon Markets: Voluntary carbon markets operate outside government regulations. They allow companies and individuals to offset their carbon footprint by purchasing carbon credits from verified projects. These markets provide a platform for corporations and individuals to take climate action beyond regulatory requirements. These operate outside of government regulations. Companies participating in these markets choose to voluntarily compensate for their emission footprint by purchasing equivalent offset credits.

Understanding Carbon Credit markets

Companies worldwide are facing growing pressure to reduce their emissions and set their Net-Zero targets. This pressure is pushing them to invest in offsetting the emissions and therefore relying on high-quality, independently verified carbon credits.

Carbon credits are units that are generated through implemented mitigation activities that result in reducing the GHG emissions over and above the baseline. Carbon credits can also represent emission removals from the atmosphere, such as sequestering carbon through afforestation or directly capturing carbon from the air and storing it. Each carbon credit represents one ton of carbon dioxide equivalents (CO_2e) reduced or removed.

As the demand for carbon credits soars, so does the demand for rigorous verification and certification.

Supply of carbon credits is delivered by three main categories of crediting mechanisms:

International crediting mechanisms – International crediting mechanisms are those administered or managed by an international organization like the United Nations Framework Convention on Climate Change (UNFCCC). This category includes, for example, mechanisms established under the Kyoto Protocol (including CDM) and Article 6 of the Paris Agreement.

Governmental crediting mechanisms – Governmental crediting mechanisms, under the Regulatory Carbon Market (RCM),are those programs established and administered by an individual national and sub-national governments. They operate within a specific county or region and may cater to domestic emission reduction goals or compliance with local

regulations such as the European Union Emission Trading Scheme (EU ETS), China's national ETS, Californian Compliance Offset Program and the Australian Carbon Credit Unit (ACCU) Scheme.

Independent crediting mechanisms – Independent crediting mechanisms, under the Voluntary Carbon Market (VCM), include those that are not directly affiliated with any specific government or international treaty. They are administered by independent, nongovernmental organizations that develop their own methodologies and standards for verifying emission reductions, such as Verra and Gold Standard.

Carbon credits are retired once the benefit has been claimed for voluntary or compliance purposes. Demand for credits can stem from a range of drivers:

1. **International compliance:** This primarily consists of (i) countries purchasing/utilizing credits or "mitigation outcomes" recognized under international treaties to help meet their GHG mitigation commitments; and (ii) airlines purchasing credits eligible for meeting their obligations under CORSIA.
2. **Domestic compliance:** This includes companies purchasing credits that are eligible for meeting their obligations under domestic law, usually an Emission trading scheme (ETS) or a carbon tax. These may include credits issued under international, governmental, or independent crediting mechanisms, depending on the rules established by respective governments.
3. **Voluntary:** This consists of (mostly private) entities purchasing carbon credits for the purpose of complying with voluntary mitigation commitments. This buyer group primarily sources credits issued under independent crediting standards, though some entities also purchase those issued under international or governmental crediting mechanisms.

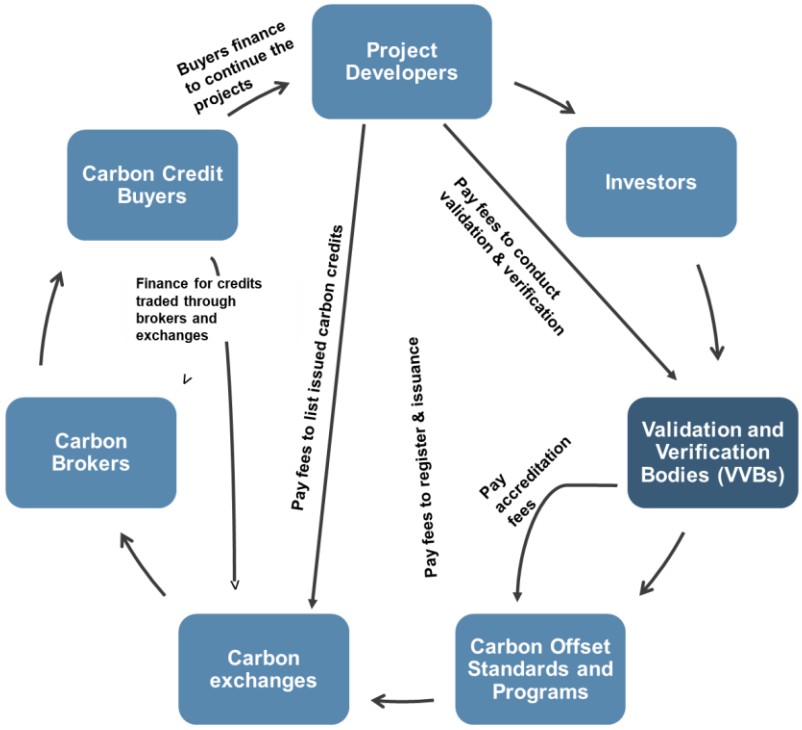
Table 3 Comparing Different Carbon Market

Market Elements	Governmental Crediting Mechanism (RCM)	Independent Crediting Mechanism (VCM)	International Crediting Mechanism
Established by	National and Sub-national governments	Independent organizations	International Treaties (e.g., Kyoto Protocol, Paris Agreement)
Oversight	National and Sub-national governments	Independent non-governmental organization	International Organizations (UNFCCC)
Geographic Scope	National and regional	International	International
Examples	EU ETS, California cap and trade program	Verified Carbon Standards (VCS), Gold Standard (GS)	CDM and Article 6 from Paris agreement
Regulation	Highly regulated, with robust monitoring, reporting, and verification (MRV)	Low to no regulation, different accounting methodologies with varying degrees of rigor	UN-recognized accounting methodologies

Key players of Carbon Credit Ecosystem

The carbon market is a complex ecosystem with a diverse range of actors contributing to the financing, development, verification and trading of carbon credits by the end users. Each player in this value chain plays a crucial role in ensuring the integrity, growth, and effectiveness of the market. Voluntary Carbon Market (VCM) starts the moment a project developer (e.g., company, farm, individual or organization) plans, implements, registers carbon credits, and obtains certification of carbon dioxide avoidance, reduction, or removal. To obtain a verification, a project developer is required to apply and comply with standards, methodologies, processes, and rules, approved by standards, and verify and validate their project through third-party auditors or Validation and Verification Bodies (VVBs). Projects can be developed in different areas such as Community based (improved cookstoves, water purifiers and solar lights), Nature based (Forestry, Agriculture, and Wetlands), Energy, Construction, Waste, Livestock and manure management, Industrial Processing, Transport and Mining etc.

Figure 5 Carbon Credit Ecosystem



Source: Crisil Intelligence

Project Developers:

Project developers identify, design, and implement emissions reduction projects that generate carbon credits. They are responsible for developing the concept, securing necessary permits and approvals, and managing the project's implementation. Project developers ensure that their projects meet the requirements of recognized carbon standards, comply with relevant regulations, and deliver verifiable emissions reductions. They also secure funding for project development and implementation, often through partnerships with investors.

Renewable energy developers, sustainable forestry initiatives, carbon capture and storage (CCS) projects, energy efficiency projects, and waste management facilities are some key examples of Project Developers.

Investors:

Investors provide funding for project development and the issuance of carbon credits. They play a critical role in enabling the implementation of emissions reduction projects. Investors are seeking projects that offer a strong return on investment, along with a positive environmental impact. They assess the project's technical feasibility, financial viability, and the quality of the carbon credits generated. Emerging trends in sustainable investing are driving increased interest in carbon credit projects. Investors include Venture capitalists, private equity firms, impact investors, pension funds, and institutional investors.

Validation and Verification Bodies (VVBs):

Independent third-party validation and verification bodies (VVBs) are crucial for ensuring the credibility and integrity of carbon markets. They verify the emissions reductions achieved by projects, in accordance with the carbon offset standards, ensuring that the carbon credits issued represent real and measurable emissions reductions.

VVBs adhere to strict standards and protocols to maintain the credibility of the verification process. They are responsible for conducting rigorous assessments, collecting data, and evaluating project performance against established criteria. Accreditation of VVBs by organizations like ANSI – ANAB, GAB, VCS, CCBA, etc. further enhances the credibility of the verification process.

Carbon Exchanges & Brokers:

Carbon exchanges and brokers facilitate trading and market liquidity. They provide a platform for buying and selling carbon credits, connecting buyers and sellers, and creating a liquid market for emissions reduction efforts. Exchanges and brokers ensure transparency, fair pricing, and efficient trading processes. They play a crucial role in ensuring the smooth functioning of the market and facilitating the allocation of emissions reduction efforts. Specialized exchanges like the Carbon Trade Exchange (CTX) and the AirCarbon Exchange (ACX), as well as independent brokers, are some key players.

Credit Buyers:

Companies, individuals, and organizations purchase carbon credits to offset their emissions. These buyers can range from large multinational corporations to small businesses in various industries, including energy, transportation, manufacturing, and finance, and also individuals who seek to reduce their carbon footprint.

Regulatory Carbon Market (RCM)

Policymakers around the world consider regulatory an essential tool combating climate change. The regulatory market, also known as compliance carbon markets, aims to establish a carbon price by laws or regulations which control the supply of allowances that are then distributed by national, regional, and global regimes. This can be accomplished through either a carbon tax or a cap-and-trade scheme, shifting economic incentives by making it more expensive to pollute. Carbon pricing shifts investment towards greener alternatives and encourages technological innovation; and revenues from auctioning can be used to fund research, development, and deployment of emerging technologies, to help decarbonize sectors across the economy. There are several instruments functional in the form of either Carbon Tax or Emission Trading Systems (ETSs) or other governmental crediting mechanisms that price carbon.

Regulatory carbon markets rely heavily on government leadership and action to function effectively. Governments determine which sectors or activities fall under the market's purview. The cornerstone of a regulatory market is the overall cap on total emissions. This cap establishes a clear target for collective emission reduction within the covered sectors. The stringency of the cap directly influences the market price of carbon and the level of emission reduction achieved.

Governments also decide how emissions permits (allowances) are initially distributed to companies. Some allocation methods include Free allocation, Auctioning, and Output-based allocations (emission allowances according to their historical emissions in a base year or base period or according to performance indicators).

Global Trends in Emissions Trading Systems (ETS)

The number of emissions trading systems (ETSs) worldwide continues to grow. As of January 2025, 38 systems are operational—two more than the previous year—with around 20 others in various stages of development or consideration. Emerging and middle-income economies such as Brazil, India, Chile, Colombia, Türkiye, and Vietnam are accelerating efforts to establish emissions trading frameworks. These developments reflect a broader trend of expanding carbon pricing coverage beyond traditional sectors to include maritime transport, fuel use in road transport and buildings, and waste management.

The share of global GHG emissions covered by ETSs alone has risen slightly to 19%, up from 18% last year. This reflects the balance between additional coverage from new systems and reductions in emissions caps in existing ones. Carbon pricing instruments—both ETSs and carbon taxes—remain a key policy tool for driving decarbonization.

Governments are increasingly integrating crediting frameworks into national policies, supporting both compliance and voluntary carbon markets. In some countries, such as Japan and India, voluntary market initiatives are being implemented as precursors to future compliance ETSs. India, for instance, has launched the Indian Carbon Market (ICM) initiative to facilitate emissions trading and align with its climate goals. This has led to the emergence of hybrid models such as Indonesia's "cap-tax-and-trade" system, showcasing innovative adaptations tailored to national contexts.

ETS Revenues and Market Dynamics

After several years of record-breaking revenues, 2024 marked the first annual decline in global auctioning revenues. Total revenues from carbon taxes and ETSs stood at approximately USD 70 billion, down from USD 74 billion in 2023.

This decline was primarily due to falling allowance prices in major systems, driven by market recalibrations, economic uncertainty, and regulatory adjustments.

Notably, the EU ETS, UK ETS, and California's cap-and-invest program all recorded price drops. However, other systems, such as China's national ETS and Korea's ETS, experienced either stable or rising prices. Jurisdictions with fixed price pathways, including Germany and Canada, continued to demonstrate price resilience.

Despite reduced revenues, the shift toward auctioning remains a key trend. Many systems—such as those in the EU, California, Québec, Korea, New Zealand, and the UK—are implementing reforms to reduce or phase out free allocations in favor of full auctioning. Newer systems, including those in Germany and Austria, and the upcoming EU ETS 2, are designed to require the purchase of all allowances, reinforcing this trend.

Increasingly, jurisdictions are prioritizing strategic reinvestment of auction revenues. Initiatives such as the EU's Social Climate Fund and reinvestment strategies in California, Québec, and New Zealand emphasize the role of carbon pricing proceeds in promoting equity, supporting vulnerable populations, and funding climate mitigation and innovation.

Equity and Just Transition in ETS Design

Public acceptability remains central to the success of carbon pricing policies. As carbon prices rise and emissions caps tighten, governments are increasingly adopting mechanisms to support a just transition. These include using auction revenues for direct compensation, community-level programs, and investments in sustainable technologies.

In both established and emerging systems, the framing of carbon pricing as a tool for just transition is gaining traction. This reflects a growing recognition of the need to balance decarbonization efforts with competitiveness and equity concerns to maintain long-term public and political support

Voluntary Carbon Market (VCM)

The voluntary carbon market (VCM) allows companies, individuals, or institutions to purchase carbon offsets optionally at their own will, without government-mandated regulations. Entities may choose to invest in a variety of projects and programs aimed at reducing or removing GHG or obtain offset credits to voluntarily offset emissions and demonstrate commitment to the environment, to help mitigate climate change, or to reach climate goals. Each offset credit traded in the voluntary market represents one ton of carbon dioxide equivalents (CO_2e) and is generated by projects, public policies, or programs that are monitored and validated at each stage before being verified by carbon standards in a jurisdiction for certification.

As both markets continue to evolve, stronger Voluntary Carbon Markets today can set the stage for robust compliance markets tomorrow. Trustworthy Voluntary Carbon Markets provides companies with the opportunity to use them to meet their voluntary climate commitments. These markets serve as a bridge to further decarbonization as companies make the transitions to low-carbon energy sources, greening supply chains and transportation fleets and investing in energy efficiency. Voluntary Carbon Markets also provide a platform space for innovation and testing of approaches that can guide design and implementation of future programs in compliance markets.

The voluntary carbon markets function alongside compliance schemes and enable companies, governments, non-profit organizations, universities, municipalities, and individuals to purchase carbon credits (offsets) on a voluntary basis. Currently, the majority of VCCs are purchased by the private sector, where corporate social responsibility goals and sustainability goals are typically the key drivers.

Carbon Registries and Standards, enabling voluntary credit trade

Carbon offset registries and standards play a pivotal role in the fight against global warming by providing a structured framework for tracking, verifying, and trading carbon credits. Carbon market accountability, credibility, and transparency are all ensured through carbon offset registries and standards. They enable trade, standardize measurements, confirm emissions reductions, and stop double counting.

Carbon offset registries and standards are platforms or databases that keep track of and verify the carbon credits produced by projects that reduce emissions. They maintain the validity and transparency of these credits, avoiding double counting, and facilitating effective trading in the carbon market. A trustworthy mechanism for tracking and confirming emissions reductions is provided through registries, which are essential in tracking the lifecycle of carbon credits from their creation to retirement.

These registries monitor credit ownership, assigning each credit a unique serial number. This information is made publicly accessible through a ledger. When a credit is purchased by an entity to offset their emissions, the registry takes swift action by retiring that credit on the ledger, ensuring it cannot be acquired by another party.

Major Registries in the Voluntary Carbon Offset Market

Verified Carbon Standard (VCS) by Verra

The Verified Carbon Standard (VCS) Program run by the non-profit Verra registry. VCS projects implement a wide variety of activities that reduce or remove greenhouse gas emissions, improve livelihoods, and protect nature. Projects are categorized by their sectoral scope, ranging from waste handling and disposal projects (such as biochar projects) to land use projects (such as improved forest management projects). All projects developed in the Program undergo a mandatory, rigorous assessment process. Certified projects issue Verified Carbon Units (VCUs), where one VCU is equal to one metric ton of carbon dioxide reduced or removed from the atmosphere. Up until the end of 2024, Verra maintains a portfolio with over 2,457 certified projects (VCUs issued: 1,314,629,380, VCUs retired: 816,600,532). This standard emphasizes projects which not only contribute to GHG reduction but also demonstrate commitments regarding social and environmental sustainability.

Gold Standard (GS)

The Gold Standard (GS) is a voluntary carbon offset program focused on progressing the United Nation's Sustainable Development Goals (SDGs) and ensuring that projects benefit their neighboring communities. The GS can be applied to voluntary offset projects and to Clean Development Mechanism (CDM) projects. It was developed under the leadership of the World Wildlife Fund (WWF), HELIO International, and SouthSouthNorth, with a focus on offset projects that provide lasting social, economic, and environmental benefits. Not only does this standard indicate carbon emission reductions; but it also emphasizes UN Sustainable Development Goals (SDGs). So far, a total of 419,167,911credits have been issued and 209,020,229 credits have been retired under this standard.

Carbon Action Reserve (CAR)

The Climate Action Reserve was launched in 2008. It is a USA based voluntary offsets program whose projects are implemented within North America. The Climate Action Reserve (CAR) establishes standards for quantifying and verifying GHG emissions reduction projects, provides oversight to independent third-party verification bodies, and issues and tracks carbon credits, called Climate Reserve Tonnes (CRTs).

American Carbon Registry (ACR)

The American Carbon Registry (ACR), a nonprofit enterprise of Winrock International, was founded in 1996 as the first private voluntary greenhouse gas registry in the world. The American Carbon Registry Standard outlines the eligibility requirements for registration of project-based carbon offsets and includes requirements for methodology approval, project validation and verification, and other procedural requirements and information on the general use of the American Carbon Registry. So far, a total of 330,430,475 credits have been issued and 44,750,543 credits have been retired under this standard.

Global Carbon Council (GCC)

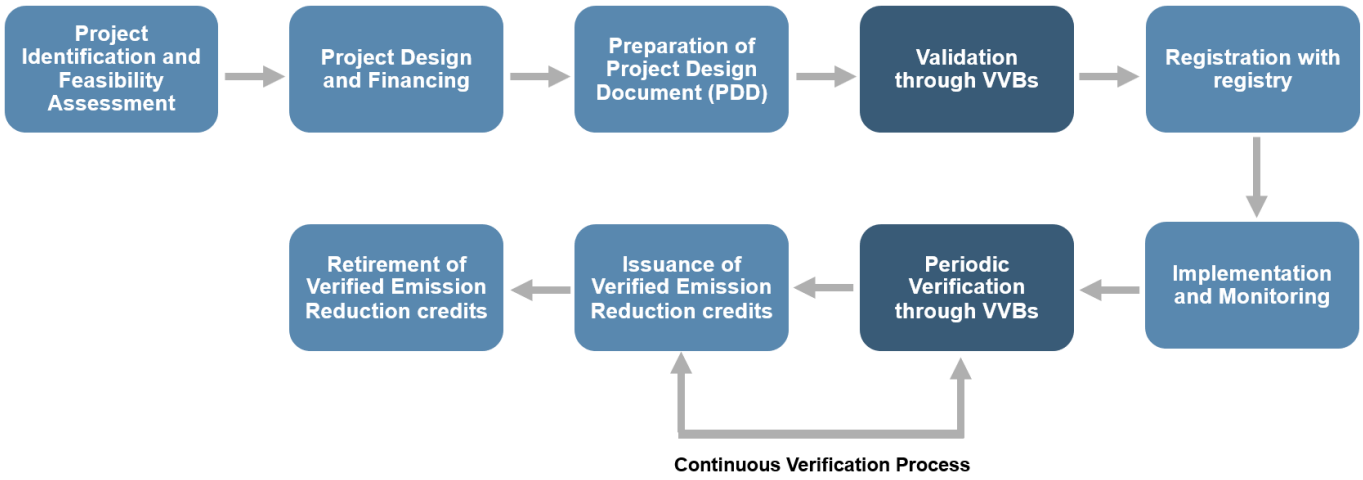
The Global Carbon Council (GCC) is the first international carbon credit and sustainable development program, based in the Global South. It was established (as Global Carbon Trust) by the Gulf Organization for Research and Development (GORD) in 2016. The GCC Program claims to contribute to a more sustainable and low-carbon future, by registering high-quality projects from around the world that have demonstrated their additionality in the reduction or removal of

greenhouse gases (GHG) emissions, while ensuring that project construction and operations do not cause any net-harm to the environment and society.

Project Identification, Verification, and Certification

The lifecycle of a carbon offset is a crucial process with each step playing a vital role in ensuring the integrity and credibility of the offset program. It ensures that the project has the potential to generate real, measurable, and additional emission reductions. Carbon offset programs create a robust system with checks and balances. This discourages greenwashing and fosters trust in the market. This also enhances buyers' confidence that the offset they purchase represents legitimate and verifiable emission reductions, contributing to real climate action.

Figure 6 Carbon Offset Lifecycle



Source: CRISIL MI&A

Project Identification and Feasibility Assessment

Project developers identify projects that reduce, avoid, or remove emissions. These developers conduct in-depth research, collect data, and analyze the project's potential to meet carbon standards. This involves assessing the project's potential for emissions reductions, its environmental impact, and its feasibility in terms of technical, financial, and regulatory requirements. These projects can range from renewable energy projects to sustainable forestry initiatives. The projects must adhere to specific methodologies and standards to ensure the environmental integrity and credibility of the generated carbon credits.

Project design, financing, and preparation of PDD

Project developers prepare a PDD that comprehensively describes the project, its activities, emissions reduction methodology, monitoring and verification procedures, and anticipated outcomes. This document serves as the foundation for validating the project's carbon credit generation potential. They also develop a financial plan to secure funding from investors or other sources.

Validation through VVBs:

Independent third-party bodies or validation and verification bodies (VVBs) verify the project's emission reductions or removals according to established standards. They review the PDD and assess the project's design, methodology, and

monitoring plan. They confirm the project's potential for generating verified emissions reductions. This validation process ensures the accuracy and legitimacy of the carbon credits.

Project Registration with Carbon Registries:

Project developers submit the validated PDD to a carbon registry, such as Verra, Gold Standard, or the American Carbon Registry (ACR). The registry reviews the project's documentation and, if approved, assigns a unique project identifier. These standards set rigorous criteria for project eligibility and verification for ensuring the project's adherence to quality standards and facilitating the issuance of carbon credits.

Implementation and Monitoring:

Project developers implement the project according to the validated design document, collect data on project activities and emissions reductions, and maintain records to ensure compliance with the carbon standard's monitoring requirements.

Periodic Verification through VVBs:

Independent auditors or VVBs conduct on-site audits to verify the project's activities, monitor data, and evaluate its performance against the defined methodology. This process ensures the ongoing integrity of the project and the legitimacy of the generated carbon credits.

Issuance and Trading of Carbon Credits:

Once verified, the project generates carbon credits, representing the quantified emissions impact of the project activities. The number of credits issued corresponds to the verified amount of CO2 reduced or removed. Certified carbon credits are issued and traded on carbon markets. These markets provide liquidity and facilitate the transfer of credits between buyers and sellers.

Retirement or Trading:

Credits can be retired by the project developer, essentially removing them from circulation and permanently offsetting emissions. Alternatively, credits can be sold on a carbon market platform. Registries like Verra, Gold Standards, American Carbon Registry, and Carbon Action Reserve facilitate the trading of credits by enhancing confidence and trust of buyers through their established standards and methodologies and by maintaining registry to track all the projects operating under respective standards, including number of credits issued, who bought and retired them, and other relevant information. This transparency helps buyers and sellers to understand the market and makes it easier to trade credits.

India's Engagement with pricing carbon and environmental markets

India has demonstrated its commitment to addressing climate change by implementing ambitious Nationally Determined Contributions (NDCs) to achieve global climate targets. As part of its efforts to reduce greenhouse gas emissions, India has explored the establishment of carbon markets through various initiatives.

Early Initiatives

The Renewable Energy Certificate (REC) scheme, launched in 2010, and the Perform, Achieve, and Trade (PAT) scheme, introduced in 2012, were among the first attempts to establish carbon markets in India.

Obligation to Purchase Renewable Energy

India has set a target to reduce the carbon intensity of the nation's economy by less than 45% by the end of the decade and to achieve 50 percent cumulative electric power installed by 2030 from renewables and achieve net-zero carbon emissions by 2070. India also aims for 500 GW of renewable energy installed capacity by 2030.

Policy support and regulatory measures to incentivize both demand and supply have been a key driver of the rapid growth in the renewable energy sector. One such regulatory measure is in the form of renewable purchase obligation. Renewable Purchase Obligations (RPO) require obligated entities to purchase a minimum percentage of electricity from renewable energy (RE) sources. Obligations under RPO are mandated by the Electricity Act (2003).

Due to the variable nature of renewables, it becomes difficult for some entities to meet these requirements set by RPO. It is here that the concept of renewable energy certificates (RECs) assumes significance.

RECs are 'green tradeable certificates' that represent the environmental attributes of power generated from RE but not the actual power itself. RECs allow the obligated entities to meet their RPO without actual procurement of RE-generated power. They can be purchased on the national energy exchanges such as Indian Energy Exchange (IEX) and Power Exchange of India Limited (PXIL) by the obligated entities like discoms to meet their RPO targets. Purchase of RECs for voluntary reasons also takes place, but volumes are negligible.

Perform, Achieve and Trade

In July 2012, the Government of India launched the PAT scheme under the National Mission on Enhanced Energy Efficiency (NMEEE) to promote energy efficiency in large industries. The scheme, administered by the Bureau of Energy Efficiency (BEE), sets energy conservation targets for designated consumers (DCs) across various industries. These targets are notified for a three-year period, during which DCs are required to implement measures to reduce their energy consumption.

Key Features of the PAT Scheme

The PAT scheme covers 1,212 DCs from 13 energy-intensive industries, with energy savings measured in terms of per-tonne-of-oil-equivalent. This measurement is equivalent to one Energy Savings Certificate (ESCert). DCs that achieve their targets are issued ESCerts, which can be traded on power exchanges, providing a financial incentive for exceeding their targets. Conversely, DCs that fail to meet their targets must purchase ESCerts from overachieving DCs to remain compliant, or face penalties for non-compliance. The PAT scheme is currently in its sixth cycle, with targets for the seventh

cycle (PAT VII) already notified for fiscal year 2025. This ongoing initiative aims to drive energy efficiency and reduce energy consumption in India's industrial sector.

While these schemes showed promise, they faced challenges that limited their potential impact. Key issues included:

- **Compliance and enforcement challenges:** Ensuring adherence to scheme requirements and enforcing regulations proved difficult.
- **Low certificate prices:** The market value of certificates was lower than expected, reducing the financial incentive for participation.
- **Unambitious target-setting:** The targets set under these schemes were not sufficiently challenging, limiting their potential to drive significant emissions reductions.

Clean Development Mechanism

India also has vast experience in the international carbon trading platform, the Clean Development Mechanism (CDM), which has been implemented by the Ministry of Environment, Forest, and Climate Change (MoEFCC). Going forward, India is building on these experiences to develop its domestic carbon market

Indian Carbon Market (ICM)

The Government of India is advancing the creation of the Indian Carbon Market (ICM) as part of the broader Carbon Credit Trading Scheme (CCTS), aimed at mobilizing mitigation efforts to achieve the country's enhanced Nationally Determined Contributions (NDCs). In July 2024, the government adopted detailed regulations for the compliance carbon market under the CCTS, marking a major milestone in India's carbon pricing architecture. These regulations were finalized by the Bureau of Energy Efficiency (BEE) following an extensive stakeholder consultation process initiated with a draft in November 2023.

Regulatory and Institutional Framework

The amended Energy Conservation Act, 2022, authorizes the establishment of a domestic carbon market and empowers designated agencies to issue Carbon Credit Certificates (CCCs), each representing one tonne of CO_2 equivalent (tCO_2e) reduced or removed. The Ministry of Power (MoP) oversees the overall regulatory framework, while the BEE functions as the scheme administrator. The Central Electricity Regulatory Commission (CERC) regulates trading, and the Grid Controller of India operates the national registry. A National Steering Committee for Indian Carbon Market (NSCICM), chaired by the Secretary of MoP and co-chaired by the Secretary of the Ministry of Environment, Forest and Climate Change (MoEFCC), provides guidance to BEE.

Design and Scope of the Compliance Mechanism

The compliance mechanism under the CCTS adopts an intensity-based baseline-and-credit approach. It mandates annual GHG emissions intensity targets—defined as tonnes of CO_2 equivalent per unit of output—for entities notified as "obligated entities." Initially, the mechanism will cover nine energy-intensive industrial sectors currently under the Perform, Achieve and Trade (PAT) scheme: Aluminium, chlor-alkali, cement, fertilizers, iron and steel, pulp and paper, petrochemicals, petroleum refining, and textiles. Expansion to other sectors, including coal-based power generation, is planned for subsequent phases.

The CCTS will initially target carbon dioxide (CO_2) and perfluorocarbons (PFCs), with provisions for expanding to other greenhouse gases. It will account for both direct (Scope 1) and indirect (Scope 2) emissions. Sectoral GHG emissions intensity trajectories will be developed up to 2030, factoring in India's NDC commitments, technological feasibility, and marginal abatement cost considerations

Introduction of GEI Targets (April 2025 Update)

As of April 2025, the Indian government launched a formal consultation on Greenhouse Gas Emission Intensity (GEI) Target Rules, 2025 for obligated entities under the CCTS. These targets are expected to contribute directly to India's NDCs through emissions reduction, removal, or avoidance. A total of 282 companies from four sectors have been identified under the draft notification

The draft outlines two compliance periods: 2025–26 and 2026–27. Obligated entities must meet the GEI targets either by reducing emissions or by purchasing CCCs. Entities outperforming their targets will be awarded CCCs, which can be banked for future compliance or sold to underperforming firms.

Failure to comply will result in a financial penalty: entities must surrender double the average carbon credit price for the relevant compliance cycle, calculated by the BEE. Public comments on the GEI targets are invited until mid-June 2025, or 60 days from publication in the official gazette dated 16 April 2025.

The introduction of GEI targets is the latest milestone in the phased development of India's domestic carbon market, following the Energy Conservation (Amendment) Act, 2022, the CCTS framework in 2023, and the Detailed Procedure for Compliance Mechanism published in July 2024

Compliance, Credit Issuance, and Trading

Each obligated entity will receive annual emissions intensity targets. Entities that outperform these targets will be awarded CCCs, while those underperforming must purchase and surrender CCCs equivalent to their shortfall. Surplus CCCs may be banked or traded through designated power exchanges. Registration on the national registry is mandatory for obligated entities and optional for non-obligated participants. Initially, the scheme does not permit over-the-counter (OTC) trading.

Linkages to the Voluntary Market

To complement the compliance mechanism, a voluntary offset component will be introduced, allowing non-obligated entities to register eligible GHG mitigation projects for CCC issuance. This is intended to mobilize decarbonization in sectors beyond the compliance market and enhance overall liquidity. BEE plans to issue the detailed framework for the voluntary mechanism by the end of 2024, with voluntary CCC trading expected to commence in 2025.

Way Forward

The ICM is scheduled to be fully operational by 2026. By unifying existing schemes like PAT and Renewable Energy Certificates (REC) under a single carbon market framework, the CCTS aims to streamline verification, reduce transaction costs, improve liquidity, and provide a strong foundation for price discovery. This consolidated approach is expected to

accelerate decarbonization, facilitate resource mobilization, and enable broader private sector participation in India's low-carbon transition.

Green Credit Program

The Green Credit Programme (GCP), notified by the Government of India on 12th October 2023 under the Environment Protection Act, 1986, is a market-based mechanism to incentivize voluntary afforestation. It aims to build an inventory of degraded forest land, accessible via a central web portal, where Forest Departments can register plantation blocks. Entities—including public institutions, private organizations, NGOs, and individuals—can select these blocks for afforestation and earn Green Credits (GCs) as environmental rewards for their efforts. The programme is supported by a digital registry, ensuring transparent registration, verification, and monitoring of plantation activities.

Governed by a structured framework comprising a Steering Committee, Programme Administrator, and Technical Committees, the GCP enables the issuance of Green Credits based on defined methodologies. While distinct from tradable carbon credits, GCs represent measurable pro-planet actions and reinforce India's commitment to ecosystem restoration and climate goals. Through this initiative, the government seeks to expand forest cover, mobilize stakeholder participation, and enhance readiness for environmental markets

State and Trends of Carbon Markets and ESG Advisory services

Climate change poses a significant global threat, driven by the gradual warming of the Earth due to increased greenhouse gas (GHG) concentrations, primarily from human activities. The United Nations Framework Convention on Climate Change (UNFCCC), established in 1992, aimed to stabilize atmospheric GHG concentrations to prevent dangerous anthropogenic interference with the climate system. Intergovernmental Panel on Climate Change (IPCC), in its Sixth Assessment Report (AR6) released in 2021 underscored the urgent need for action, emphasizing that human influence has unequivocally warmed the planet and urging immediate reductions in GHG emissions to limit global warming to 1.5 degrees Celsius. Given the longevity of CO_2 in the atmosphere, mitigation efforts require detailed planning to reduce while also exploring the best ways to achieve a net reduction of GHGs from the atmosphere. Carbon Markets is one such approach advocated as a means to reduce GHG emissions.

Article 6 of the Paris Agreement

Article 6 of the Paris Agreement establishes the foundation for international cooperation on climate action, allowing countries to achieve their Nationally Determined Contributions (NDCs) through market and non-market mechanisms. The primary goal is to raise global climate ambition while ensuring environmental integrity and supporting sustainable development.

At COP29 held in Baku in 2024, parties finalized the rules for Article 6, marking a major milestone after years of negotiation. These decisions provide the operational clarity needed for countries to trade emission reductions and removals internationally, paving the way for the practical implementation of carbon markets under the Paris Agreement.

Article 6.2 enables bilateral transfers of mitigation outcomes—known as Internationally Transferred Mitigation Outcomes (ITMOs)—between countries. The finalized rules include detailed guidance on reporting, accounting, and transparency to prevent double counting of emission reductions. Countries shall now ensure that transferred mitigation outcomes are accurately tracked and correspondingly adjusted in their national inventories.

Article 6.4 introduces a centralized mechanism supervised by the UN to validate, verify, and issue high-integrity carbon credits. This mechanism is open to both public and private entities and is designed to replace and improve upon the Clean Development Mechanism (CDM) of the Kyoto Protocol. Transition rules for eligible CDM projects have been defined, and host countries must submit activities for registration under the new mechanism by December 31, 2025. Enhanced requirements for baseline setting, monitoring, and host country authorization now apply to all new projects.

Article 6.8 focuses on non-market approaches to climate cooperation. This component, now fully operational following COP27, supports collaborative efforts that do not involve carbon trading. Subsequent developments at COP28 and COP29 have advanced the creation of a web-based platform to document and share such initiatives.

The finalization of Article 6 rules has significant implications for voluntary carbon markets. With all countries now having NDCs, voluntary projects must align with national targets to avoid double claiming. Credits used for voluntary offsetting must not also be counted towards a country's NDC. This shift is expected to result in tighter standards, improved transparency, and a gradual movement of voluntary markets toward greater integration with compliance regimes.

Implementation is underway, with the Article 6.4 Supervisory Body beginning project registrations and issuances. Parties are progressing on transitioning CDM activities and operationalizing non-market approaches. Institutions such as the UNEP Copenhagen Climate Centre are supporting transparency by tracking Article 6 activities and their alignment with NDCs and Sustainable Development Goals.

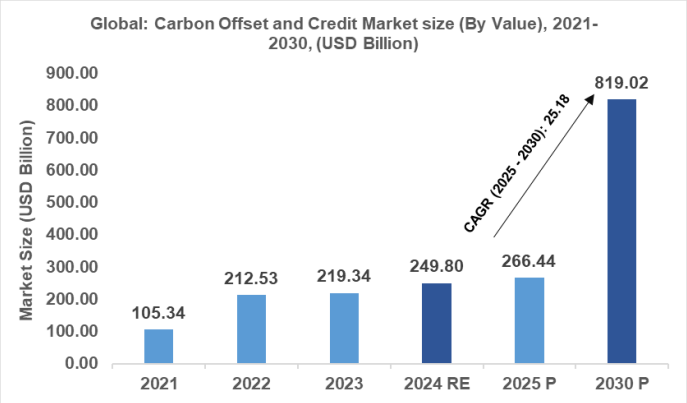
With the rules now in place, Article 6 provides a credible, structured pathway for international carbon cooperation. It is expected to shape the future of both compliance and voluntary markets, reinforcing climate ambition through clearer standards, regulatory oversight, and global alignment.

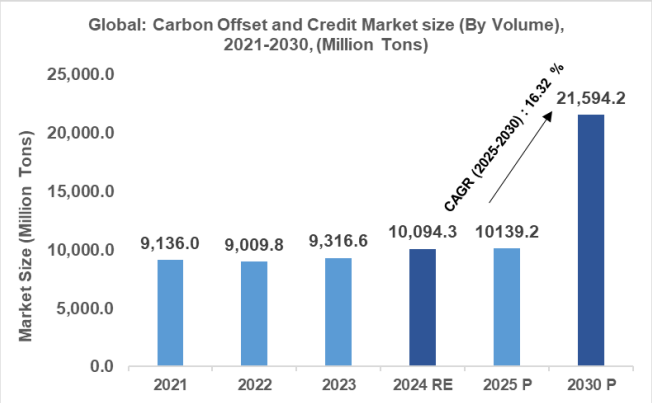
While existing CDM projects are in the process of being transitioned to the Article 6.4 mechanism, registration for new projects under Article 6.4 is yet to come. The mechanism is still under development, with procedures, methodologies, and eligibility criteria for new projects yet to be finalized. The current focus remains on operationalizing the transition of eligible CDM projects, with key deadlines such as host country approvals and transition requests set for December 31, 2025. Full registration for new activities under Article 6.4 is expected to begin after the remaining governance and technical elements are established.

State and trends of Carbon Offset and Credit Market

While positive progress on carbon pricing continues on many levels, more is required to meet the goals of the Paris Agreement. The adoption of carbon pricing has been limited over the last year, but there are promising signs of future uptake in middle-income countries. Flexible policy designs and approaches continue to emerge, reflecting the adaptability of carbon pricing to national circumstances. Governments, particularly in middle-income countries, are increasingly including crediting frameworks in their policy mix, with a view to supporting both compliance and voluntary markets.

The global carbon offsets and credit market is projected to grow from USD 219 billion in 2023 to more than USD 800 billion by 2030 and it is estimated to grow at a CAGR of 25.18% from 2025 to 2030.





Source: Markets and Markets, Crisil Research
Note: Data labels indicate Carbon offset and credit market size in term of Value (USD Billion) and in terms of Volume (Million Tons)
RE: Revised Estimates; P: Projected

Figure 7 Global Carbon Offset and Credit Market Size

Based on type, the carbon offsets and credit market has been categorized into the regulatory/compliance market and the voluntary market. The global compliance market accounted for the majority of the market share in Global Carbon offset and credit market in 2024 and it is expected to record a CAGR of 25.18% from 2025 to 2030. Global voluntary market is expected to witness a CAGR of 25.80% from 2025 to 2030. These growth trends are attributed to the rising demand for decarbonization to manage the environmental and financial risks of climate change.

Table 4 Global Carbon Offset and Credit Market Size (Voluntary and Compliance)

Global: Carbon Offset and Credit Market size, By Type, 2021-2030, (USD Billion)							
By Type	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
Voluntary	1.07	1.64	0.59	0.70	0.86	2.71	25.80%
Compliance	104.28	210.89	218.74	249.10	265.58	816.31	25.18%

Global: Carbon Offset and Credit Market size, By Type, 2021-2030, (Million Tons)						
By Type	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**
Voluntary	253.5	205.9	89.9	94.3	104.5	203.4
Compliance	8,882.6	8,803.8	9,226.7	10,000.0	10,034.7	21,390.8

Source: Markets and Markets, Crisil Research
Note: Data labels indicates Carbon offset and credit market size (USD billion)
RE: Revised Estimates; P: Projected

Trend (2021-2024) and outlook (2025-2030) of Regulatory & Voluntary Carbon Market by Key Regions

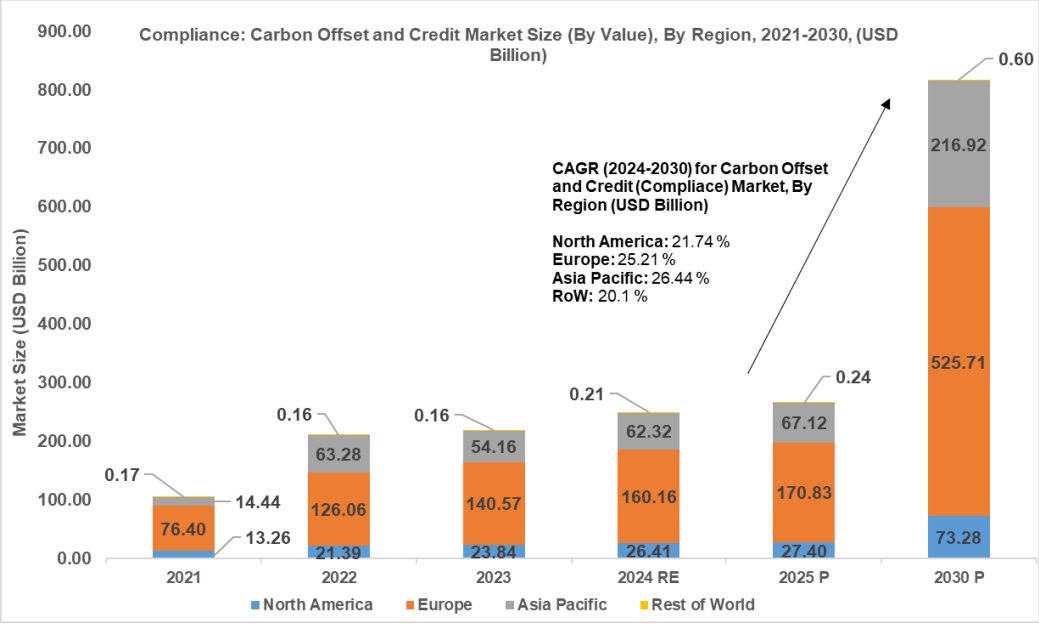
This study covers the market forecast for key regions like Asia Pacific, Europe, North America, and RoW (Rest of the World). Rest of the World include South America and Middle East & Africa region.

Europe is estimated to account for the largest share (64.29%) of the global compliance carbon offset and credit market in 2024. The region is also expected to grow further in the global market during the forecast period. The market dominance and the growth are attributed to the largest EU emission trading system (ETS) that operates in the region. Europe's market development is anticipated to be fuelled by the government's implementation of strict rules and measures to tackle climate change. The introduction and the current transitional period for the Carbon Border Adjustment Mechanism (CBAM) introduces several new compliance and reporting requirements for importers into the European Union (EU).

Table 5 Carbon Offset and Credit (Compliance) Market Size

Compliance: Carbon Offset and Credit Market Size, By Region, 2021-2030, (USD Billion)							
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
North America	13.26	21.39	23.84	26.41	27.40	73.28	21.74%
Europe	76.40	126.06	140.57	160.16	170.83	525.71	25.21%
Asia Pacific	14.44	63.28	54.16	62.32	67.12	216.92	26.44%
Rest of World	0.17	0.16	0.16	0.21	0.24	0.60	20.11%

Compliance: Carbon offset Market Size, By Region, 2021-2030, (Million Tons)						
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**
North America	783.4	819.5	879.6	957.1	964.8	2,036.1
Europe	1,673.9	1,636.6	1,671.4	1,777.7	1,739.7	3,508.8
Asia Pacific	6,280.6	6,199.6	6,527.1	7,085.1	7,132.0	15,494.5
Rest of World	144.7	148.1	148.6	180.0	198.1	351.4



Source: Markets and Markets, Crisil Research
Note: Rest of the World include South America and Middle East & Africa region; Data labels indicates market size (USD billion)
RE: Revised Estimates; P: Projected

Figure 8 Carbon Offset and Credit (Compliance) Market, by region

Asia Pacific (APAC) accounts for the second largest share in the market. The market growth is attributed to the APAC countries' pledge to curb their carbon emissions. Achieving these commitments will require substantial investments over the next decade. According to the report 'Unlocking Climate Finance in Asia-Pacific' released in January 2024 by International Monetary Fund (IMF), emerging and developing Asia will need at least $1.1 trillion annually for climate mitigation and adaptation investments and currently actual investment falls short by $800 billion.

Various types of carbon markets and policy measures are currently in force across APAC. Furthermore, there are several propositions under development. The regulatory carbon market by volume in Mainland China is expected to expand its scope. New regulatory carbon markets are either launched to trade or are due to launch in India, Indonesia, Japan, and Malaysia.

Government-regulated compliance carbon markets are created and overseen by mandatory national, regional, or jurisdictional carbon reduction regimes. It is not optional, every facility or company covered is obliged to take part in the market. Usually operating in the form of a cap-and-trade (CaT) system, installations or bodies must hold or purchase enough credits to cover their emissions. The compliance carbon market imposes a gradually declining cap, which serves to gradually reduce a company's total emissions over time. The compliance market has been sub segmented into EU ETS, China ETS, Korea ETS, California Cap and Trade, and others. The European Union's Emissions Trading System (EU ETS) is the oldest and largest mandatory carbon market, and as such, has become a point of reference for global climate policy.

Table 6 Carbon Credit (Compliance) Market Size

Compliance: Carbon Credit Market size, By Type, 2021-2030, (USD Billion)						
Market Mechanism	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**
EU ETS	67.36	114.51	127.75	143.09	150.04	424.48
Korea ETS	10.01	11.60	7.00	7.97	8.50	26.12
China ETS	0.00	43.65	38.94	45.46	49.69	173.06
Others	26.90	41.12	45.06	52.58	57.35	192.65

Source: Markets and Markets, Crisil Research
RE: Revised Estimates; P: Projected

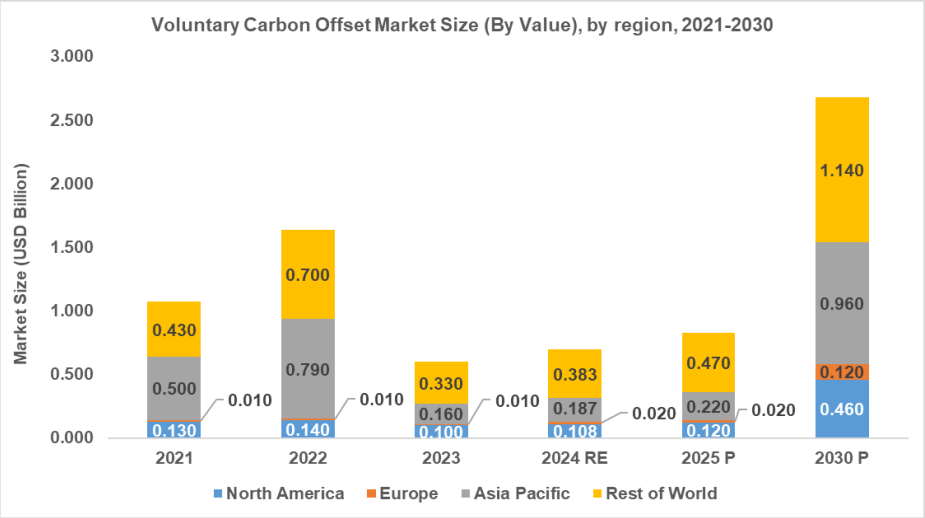
While the primary focus rests on countries' commitments, the voluntary carbon markets has also gained prominence. The volume and value of the voluntary carbon market (VCM) contracted for the second year in a row in 2023 from its 2021 peak, with year-on-year decline in the volume of transactions. This decline was mainly driven by negative press questioning the additionality and governance of carbon credit projects resulting in reduced issuances from the VCS and the American Carbon Registry. This trend also reflects a range of factors, including project developers delaying credit issuance applications due to high associated costs, pending the improvement of market demand and prices, as well as a potential shift in investment and demand away from traditional projects. However, initiatives such as the Integrity Council for the Voluntary Carbon Market (ICVCM) Core Carbon Principles and the Voluntary Carbon Markets Integrity Initiative (VCMI) Claims Code have been launched to enhance transparency, standardization, and trust in high-integrity

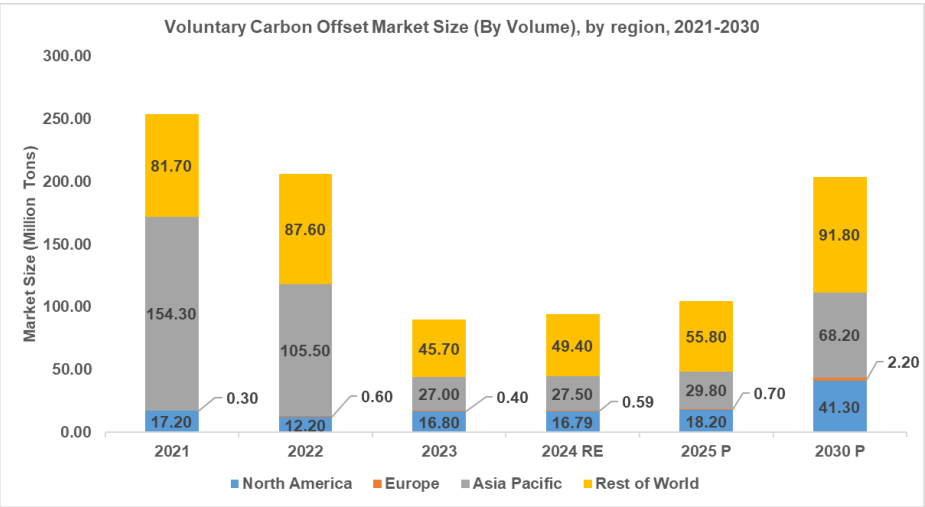
carbon credits. These efforts are expected to restore buyer confidence, improve credit quality, and ultimately drive renewed growth in the voluntary carbon market.

Table 7 Carbon Offset (Voluntary) Market Size

Voluntary: Carbon offset Market Size, By Region, 2021-2030, (USD Billion)							
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
North America	0.130	0.140	0.100	0.108	0.120	0.460	30.84%
Europe	0.010	0.010	0.010	0.020	0.020	0.120	43.10%
Asia Pacific	0.500	0.790	0.160	0.187	0.220	0.960	34.27%
Rest of World	0.430	0.700	0.330	0.383	0.470	1.140	19.40%

Voluntary: Carbon Offset and Credit Market Size, By Region, 2021-2030, (Million Tons)						
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**
North America	17.20	12.20	16.80	16.79	18.20	41.30
Europe	0.30	0.60	0.40	0.59	0.70	2.20
Asia Pacific	154.30	105.50	27.00	27.50	29.80	68.20
Rest of World	81.70	87.60	45.70	49.40	55.80	91.80



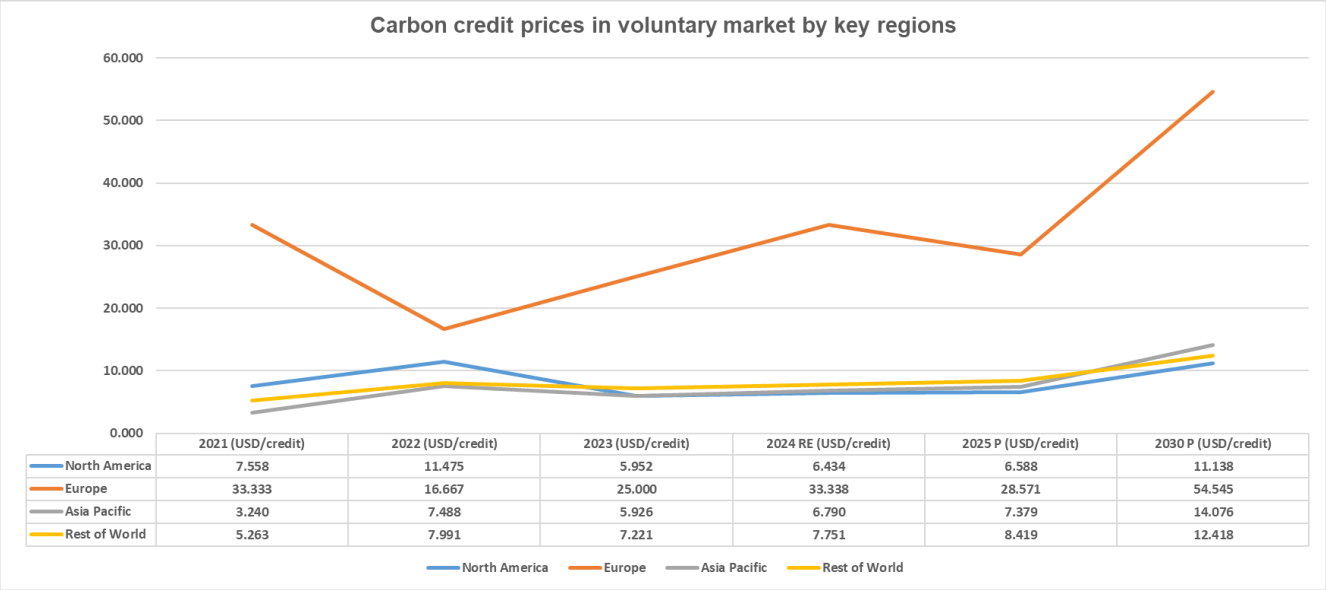


Source: Markets and Markets, Crisil Research

Note: Rest of the World include South America and Middle East & Africa region.

RE: Revised Estimates; P: Projected

Figure 9 Carbon Offset and Credit (Voluntary) Market, by region



	2021 (USD/credit)	2022 (USD/credit)	2023 (USD/credit)	2024 RE (USD/credit)	2025 P (USD/credit)	2030 P (USD/credit)
North America	7.558	11.475	5.952	6.434	6.588	11.138
Europe	33.333	16.667	25.000	33.338	28.571	54.545
Asia Pacific	3.240	7.488	5.926	6.790	7.379	14.076
Rest of World	5.263	7.991	7.221	7.751	8.419	12.418

Source: Markets and Markets, Crisil Research
Note: Rest of the World include South America and Middle East & Africa region.
RE: Revised Estimates; P: Projected

Figure 10 Carbon Offset and credit prices in voluntary market (key regions)

The transaction volumes declined for credits from all regions in 2023, except North America. The decline in transaction volumes was attributed to pullback from REDD+ projects due to rising concerns towards, additionality and governance of carbon credit projects.

The carbon credit market has exhibited significant regional price fluctuations, driven by varying supply-demand dynamics and regulatory factors. Research suggests that in North America, prices have fallen sharply due to an influx of inexpensive industrial process emission reduction credits, leading to oversupply. In contrast, regions such as Europe and Oceania saw price increases, driven by stricter regulations and ambitious climate targets. These regional disparities highlight the absence of a unified global market and standardized pricing, contributing to variability across markets. To enhance market stability and encourage broader participation, it is essential to address these factors and create a more stable and consistent market environment.

Despite the backlash faced by the voluntary carbon offset and credit market in the past couple of years, it has emerged as a flexible mechanism for both private and public sector entities seeking to voluntarily offset emissions. Their potential to drive additional emission cuts, foster innovation, and foster collaborations among governments, corporations, and civil society has increasingly garnered acknowledgment as a pivotal force in the global climate agenda. With the urgent need to limit global temperature rise, countries are turning to ambitious NDCs, where the engagement of the private sector through VCMs becomes crucial for mobilizing mitigation finance, technology transfer, and innovation, thus contributing

to multiple Sustainable Development Goals (SDGs) and aiding in meeting emissions reduction targets committed through NDCs.

Trend (2021-2024) and outlook (2025-2030) of Voluntary Carbon Market by Project type

The voluntary market includes forestry and land use, renewable energy, chemical processes/industrial manufacturing, energy efficiency/fuel switching, and others.

Forestry and land use, includes afforestation, reforestation, revegetation, and forest management. Renewable energy can take a number of forms and the most familiar are wind, hydro, and solar.

Energy efficiency projects use less energy and less fuel than a business-as-usual scenario. Examples of this type of project include converting a fleet of vehicles to a fleet of more fuel-efficient vehicles, replacing inefficient HVAC mechanical or water heating systems, renovating buildings to make them more efficient at retaining thermal energy, or replacing incandescent light bulbs with LED light bulbs.

Fuel-switching projects reduce the consumption of fossil fuels by switching to cleaner or renewable fuel sources for the same activity, thereby producing legitimate offsets. Examples of this include switching from oil to natural gas to power an on-campus electricity generating plant or powering a fleet of vehicles with ethanol instead of gasoline or biodiesel instead of fossil diesel.

Other voluntary markets include household/community devices, waste disposal, transportation, and agriculture. Enhancing waste-to-energy practices can avert the release of potent GHG, such as methane. New technologies are also used to avoid pollution or to produce biogas from organic matter, which also adds an element of circularity to the economy. Avoidance efforts can range from livestock and manure management to transport electrification and methane capture in mines. Regardless of the sector, they all aim to save GHG emissions by switching, modernizing, and improving technologies and industrial processes, thus making responsible production choices and bolstering companies' climate commitments.

Voluntary markets have the potential to channel finance into carbon removal projects and address the residual emissions of firms, but they are held back by issues of market integrity. This includes a lack of consensus on how the market credits align with science-based decarbonization pathways, the overall quality of the credits available, as well as fragmented reporting standards.

For voluntary markets to fulfill their potential, standard-setting bodies are providing guidance on the accounting and disclosure for the credits and how they relate to net-zero/carbon-neutral claims. This guidance helps remove ambiguity from the market and avoid greenwashing. Standard-setting bodies and validation and verification bodies (VVBs) assess the quality of offsets to ensure that they meet the required standards and are of high quality. By providing transparency and clarity surrounding the quality of credits, participants can actively participate in the market with reliability. Additionally, development of global registries will reduce the fragmentation of the voluntary credit market across regions. A unified registry will enable more seamless transactions and enable authorities to track global progress toward the Paris Agreement goals. This would also allow them to identify the necessary steps to accelerate the global transition.

Despite market headwinds, the total number of newly registered projects grew and is expected to grow further. This trend is underpinned by increasing investor confidence driven by ongoing efforts to strengthen the integrity of the market

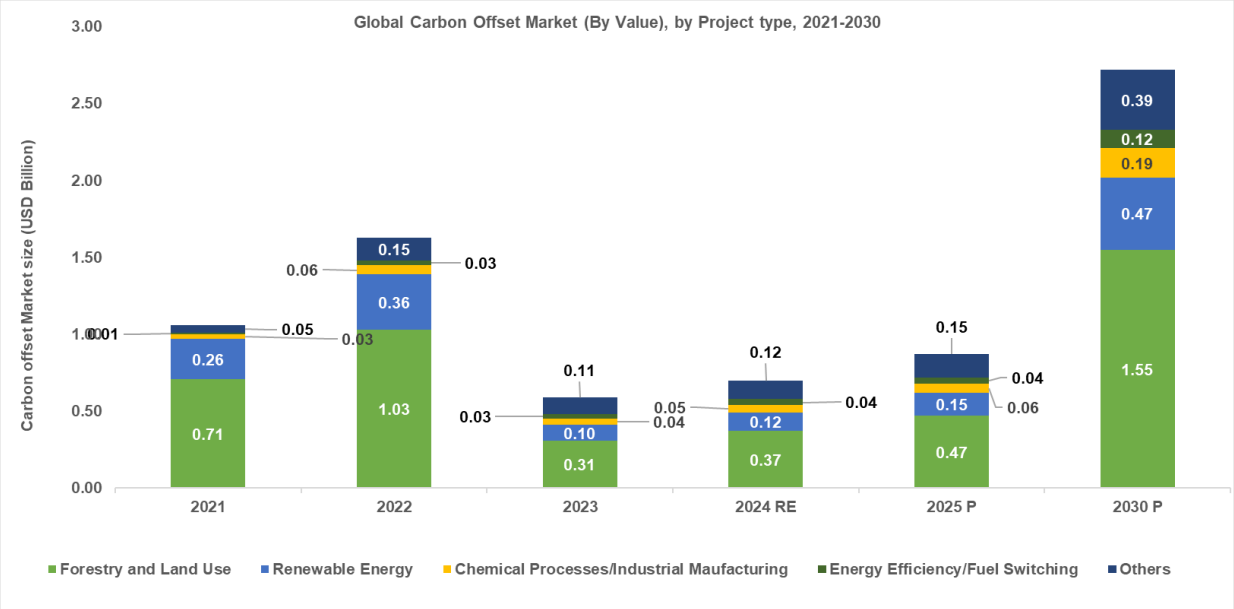
through clearer standards, improved governance, and enhanced transparency. As high-integrity frameworks gain traction, market participants are anticipating a more stable and credible environment for project development and investment.

Table 8 Global Carbon Offset and Credit Market Size by project type

Global: Carbon offset Market size, By Type, 2021-2030, (USD Billion)							
Voluntary Market Type	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
Forestry and Land Use	0.71	1.03	0.31	0.37	0.47	1.55	26.95%
Renewable Energy	0.26	0.36	0.10	0.12	0.15	0.47	25.66%
Chemical Processes/Industrial Maufacturing	0.03	0.06	0.04	0.05	0.06	0.19	25.93%
Energy Efficiency/Fuel Switching	0.01	0.03	0.03	0.04	0.04	0.12	24.57%
Others	0.05	0.15	0.11	0.12	0.15	0.39	21.06%

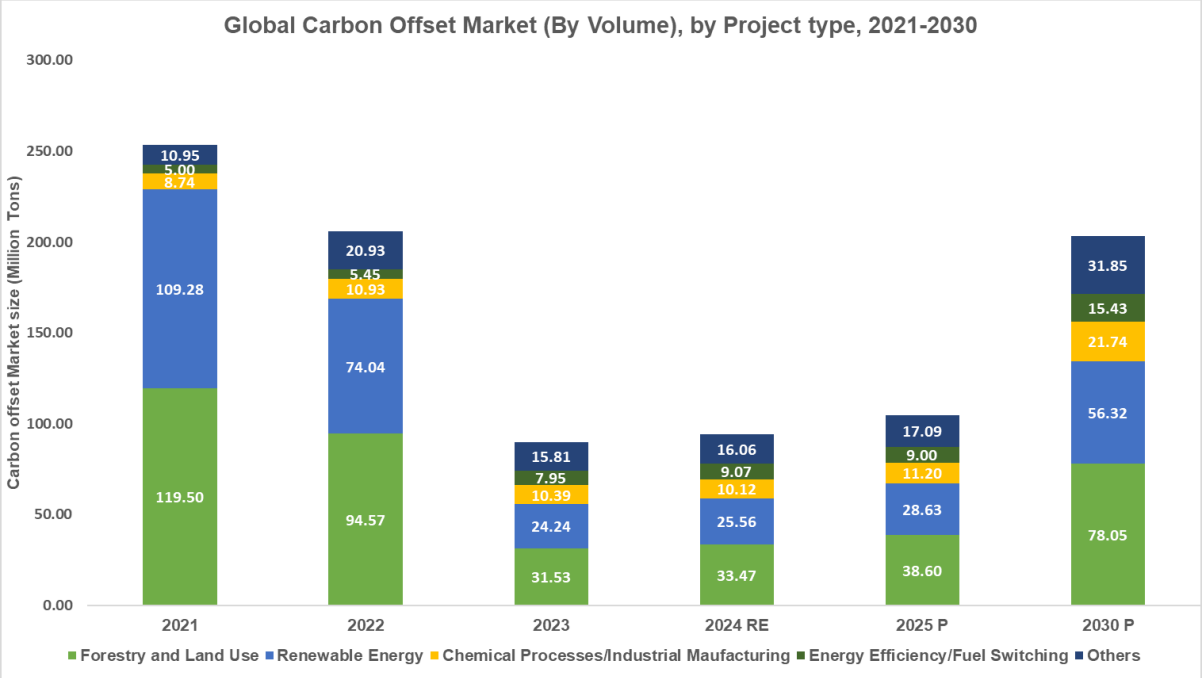
Global: Carbon offset Market size, By Type, 2021-2030, (Million Tons)							
Voluntary Market Type	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030**	**CAGR (2025-2030)**
Forestry and Land Use	119.50	94.57	31.53	33.47	38.60	78.05	15.12%
Renewable Energy	109.28	74.04	24.24	25.56	28.63	56.32	14.49%
Chemical Processes/Industrial Maufacturing	8.74	10.93	10.39	10.12	11.20	21.74	14.18%
Energy Efficiency/Fuel Switching	5.00	5.45	7.95	9.07	9.00	15.43	11.39%
Others	10.95	20.93	15.81	16.06	17.09	31.85	13.26%

Source: Markets and Markets, Crisil Research
Note: Other include household/community devices, waste disposal, transportation, and agriculture
RE: Revised Estimates; P: Projected



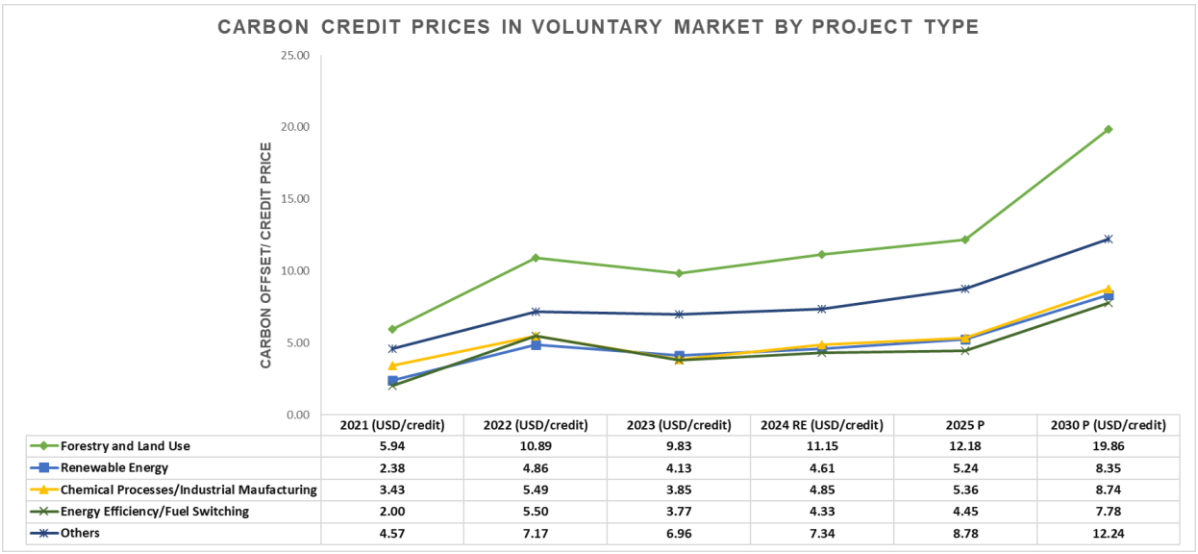
Source: Markets and Markets, Crisil Research
Note: Other include household/community devices, waste disposal, transportation, and agriculture
RE: Revised Estimates; P: Projected

Figure 11 Global Carbon Offset Market (by value), By Project type



Source: Markets and Markets, Crisil Research
Note: Other include household/community devices, waste disposal, transportation, and agriculture
RE: Revised Estimates; P: Projected

Figure 12 Global Carbon Offset Market (by volume), By Project type



	2021 (USD/credit)	2022 (USD/credit)	2023 (USD/credit)	2024 RE (USD/credit)	2025 P	2030 P (USD/credit)
Forestry and Land Use	5.94	10.89	9.83	11.15	12.18	19.86
Renewable Energy	2.38	4.86	4.13	4.61	5.24	8.35
Chemical Processes/Industrial Maufacturing	3.43	5.49	3.85	4.85	5.36	8.74
Energy Efficiency/Fuel Switching	2.00	5.50	3.77	4.33	4.45	7.78
Others	4.57	7.17	6.96	7.34	8.78	12.24

Source: Markets and Markets, Crisil Research
Note: Other include household/community devices, waste disposal, transportation, and agriculture
RE: Revised Estimates; P: Projected

Figure 13 Carbon Offset and credit prices in voluntary market (project type)

Although transaction volumes for forestry and land use projects have seen a dip, they continue to dominated the voluntary carbon credit market, underscoring demand for nature-based solutions (NbS). Renewable energy remains the second most popular, but expected rise in prices for credits in the forestry and land use reflect growing interest in carbon removal initiatives. Research suggests that categories such as energy efficiency and chemical processes/industrial manufacturing, experienced price declines in the past due to oversupply.

State and trends of Carbon Offset/Credit Validation, Verification and Certification Market

The carbon offset and credit market plays a crucial role in the global fight against climate change. It allows organizations to offset their emissions by investing in projects that demonstrably reduce greenhouse gases. However, ensuring the credibility and integrity of these offsets necessitates a robust validation, verification, and certification (VVC) process. Understanding these service segments is critical for stakeholders across the carbon credit market ecosystem.

Validation serves as the essential foundation upon which the entire carbon credit lifecycle is built. It acts as a rigorous pre-assessment for proposed carbon offset projects, ensuring their adherence to established standards and methodologies before they proceed to verification and certification. During validation, independent experts evaluate the project design document (PDD). PDD is assessed against established carbon credit standards like Verra's Verified Carbon Standard (VCS) or the Gold Standard. As governments implement stricter regulations to curb greenhouse gas emissions, companies are expected to be turning to carbon offsets to meet compliance requirements and sustainability goals. This rise in project development necessitates the implementation of thorough validation procedures to ensure the credibility and integrity of the carbon credits generated.

Verification acts as the cornerstone of trust and quality within the carbon offset and credit market. Following the initial validation step, verification involves a rigorous audit conducted by independent, third-party experts or VVBs. These bodies examine all project documentation, monitoring reports, and emissions reduction data. The primary objective is to ensure the project has been implemented as planned, delivering the promised emissions reductions. They verify that the claimed reductions are accurate, measurable, and directly attributable to the project's activities. Additionally, verifiers confirm the project's ongoing adherence to the chosen carbon credit standard's methodologies and requirements. Several key drivers are propelling the growth of the verification segment. Companies and investors increasingly prioritize high-quality carbon credits to achieve their sustainability objectives. Verification provides a critical layer of assurance that the offsets they purchase represent genuine emissions reductions, justifying their investment.

One of the key requirements for high-quality carbon credits is additionality - the emissions reductions or removals must not have occurred without the incentive provided by carbon credit revenues. An independent VVB plays a vital role in rigorously evaluating a project's additionality by assessing barriers, baseline scenarios, and legal surplus. High-quality carbon projects shall also deliver meaningful co-benefits beyond just emissions reductions, such as positive impacts on local communities and biodiversity. This provides confidence that the credits represent real, additional emissions reductions. As the demand for high-quality carbon offsets intensifies, VVBs will play a critical role in guaranteeing an offset/credit’s legitimacy and value.

Certification serves as the final checkpoint and official recognition within the carbon credit lifecycle. Following successful verification, certification bodies formally issue carbon credits, signifying that the project's verified emissions reductions meet the rigorous requirements of a specific carbon credit standard. These certified credits then become tradable assets on carbon credit exchanges or platforms, allowing project developers to monetize their environmental benefits. The certification segment is intricately linked to the overall health of the carbon credit market. As the demand for verified offsets and credits surges, robust validation, verification and certification processes become even more critical to ensure the credibility and legitimacy of these tradable instruments.

Despite the clear benefits, challenges remain. The cost of validation, verification and certification can be a barrier for some project developers, particularly those involved in smaller-scale projects. Additionally, finding qualified validators with expertise in specific project types and methodologies can be difficult, especially in emerging markets. Looking ahead, technological advancements in data analysis and remote monitoring hold promise for streamlining validation processes and potentially reducing costs.

Validation, Verification, and Certification in Regulatory and Voluntary Carbon Market

The global carbon offset and credit validation, verification, and certification (VV&C) market caters to two distinct market segments based on the type of carbon credits being traded: Voluntary and Compliance. Understanding these segments is crucial for stakeholders in the VV&C landscape. Companies and individuals can purchase voluntary carbon credits to offset their emissions and contribute to climate action projects. This market offers greater flexibility in terms of project types and methodologies, but also faces challenges with standardization and transparency. This market demands rigorous VV&C processes to ensure the credibility of traded credits.

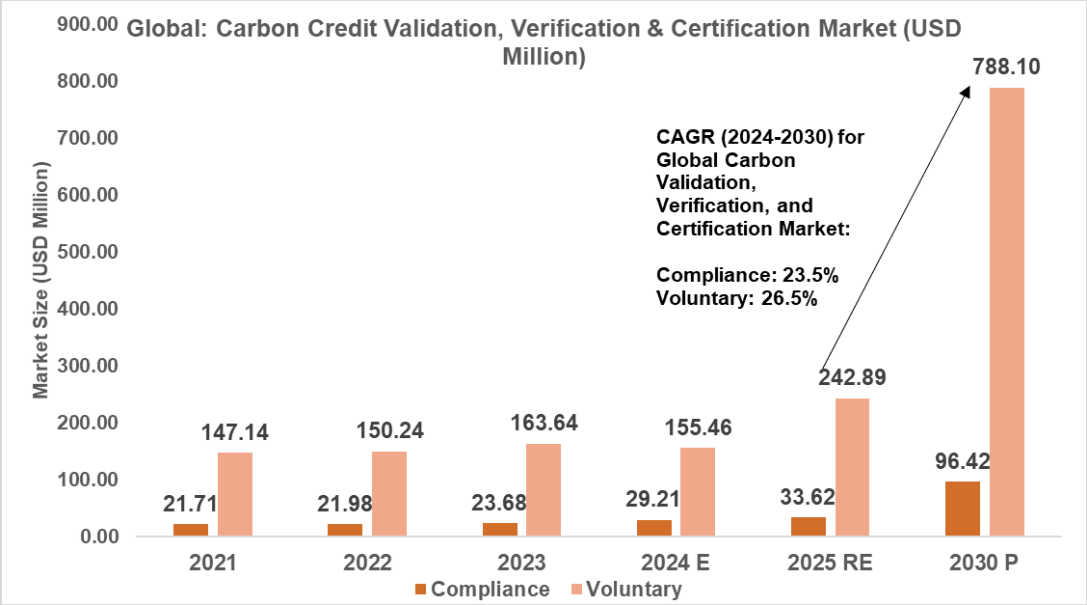
The voluntary carbon credit market continues to evolve, shaped by a combination of growing climate commitments and structural adjustments. The market value reached approximately USD 163.6 million in 2023, reflecting strong momentum built over recent years. In parallel, 2024 saw increased price variability across established Emissions Trading Systems (ETSs), with most systems, including the EU ETS, recording lower average prices compared to 2023. These shifts reflect ongoing adjustments to policy, market expectations, and climate investment strategies. As the market integrates new standards and methodologies aimed at enhancing credit integrity, it is expected to be positioned for more stable growth in the medium to long term.

Table 9 Global Carbon Offset/ Credit VVC Market Size

Global: Carbon Credit Validation, Verification & Certification Market size, By Type, 2021-2030, (USD Million)							
By Type	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
Compliance	21.71	21.98	23.68	29.21	33.62	96.42	23.5%
Voluntary	147.14	150.24	163.64	155.46	242.89	788.10	26.5%

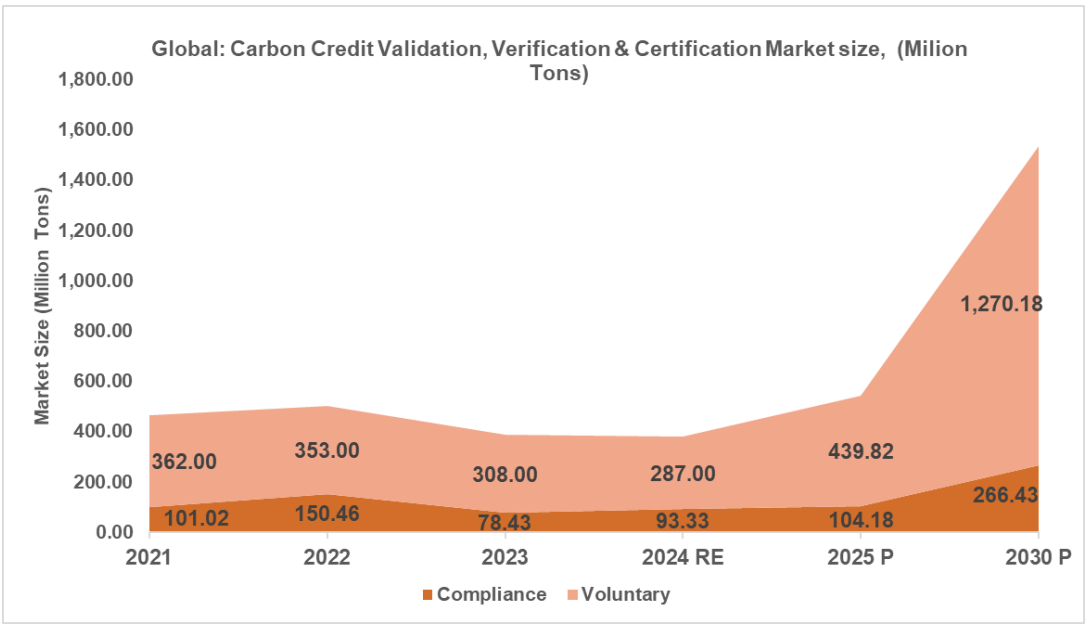
Global: Carbon Credit Validation, Verification & Certification Market size, By Type, 2021-2030, (Milion Tons)						
By Type	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**
Compliance	101.02	150.46	78.43	93.33	104.18	266.43
Voluntary	362.00	353.00	308.00	287.00	439.82	1,270.18

Source: Markets and Markets, Crisil Research
RE: Revised Estimates; P: Projected



Source: Markets and Markets, Crisil Research
RE: Revised Estimates; P: Projected

Figure 14 Global Carbon Offset/ Credit VVC Market Size (USD Million)



Source: Markets and Markets, Crisil Research
Note: Data labels indicate Carbon offset and credit market size in term of Value (USD Billion) and in terms of Volume (Million Tons)
RE: Revised Estimates; P: Projected

Figure 15 Global Carbon Offset/ Credit VVC Market Size (Million Tons)

The evolving voluntary carbon market (VCM) landscape is giving rise to new price drivers in 2024. Notably, credits from projects that achieve negative emissions by actively removing carbon from the atmosphere are expected to command a premium, as they are perceived as higher-value credits. This trend is consistent with 2023, when VCM buyers were willing to pay more for credits from projects that generated removals rather than just reductions.

The Voluntary market accounts for the majority of market share in the global carbon offset and credit validation, verification and certification market. VVC market in the voluntary market is expected to record a CAGR of 26.5% from 2025 to 2030. This growth is attributed to implementation of various initiatives to improve the functionality and integrity of the voluntary carbon credit market and several others under development.

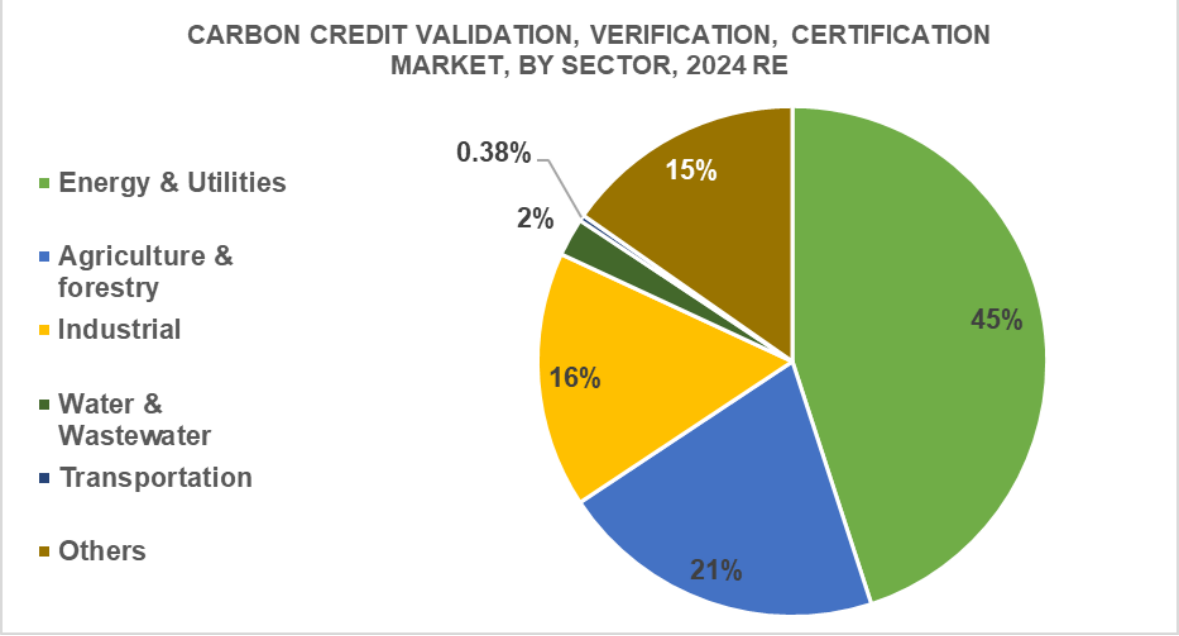
Initiatives like the EU Carbon Removal Certification Framework and the London Stock Exchange's Voluntary Carbon Market Designation aim to establish clear criteria for project qualification and credit verification. Governments are also playing an increasingly active role in shaping the landscape of voluntary carbon markets. This involvement takes various forms. Australia's Carbon Exchange and Japan's GX League exemplify efforts to drive market centralization by creating dedicated trading platforms. These efforts try to enhance the credibility of the market and provide companies with greater confidence in the emissions reductions they are financing. Evolving carbon credit standards and methodologies necessitate ongoing expertise from validation, verification, and certification bodies.

Trend (2021-2024) and outlook (2025-2030) of Global Carbon Offset/ Credit VVC Market by Key Sector

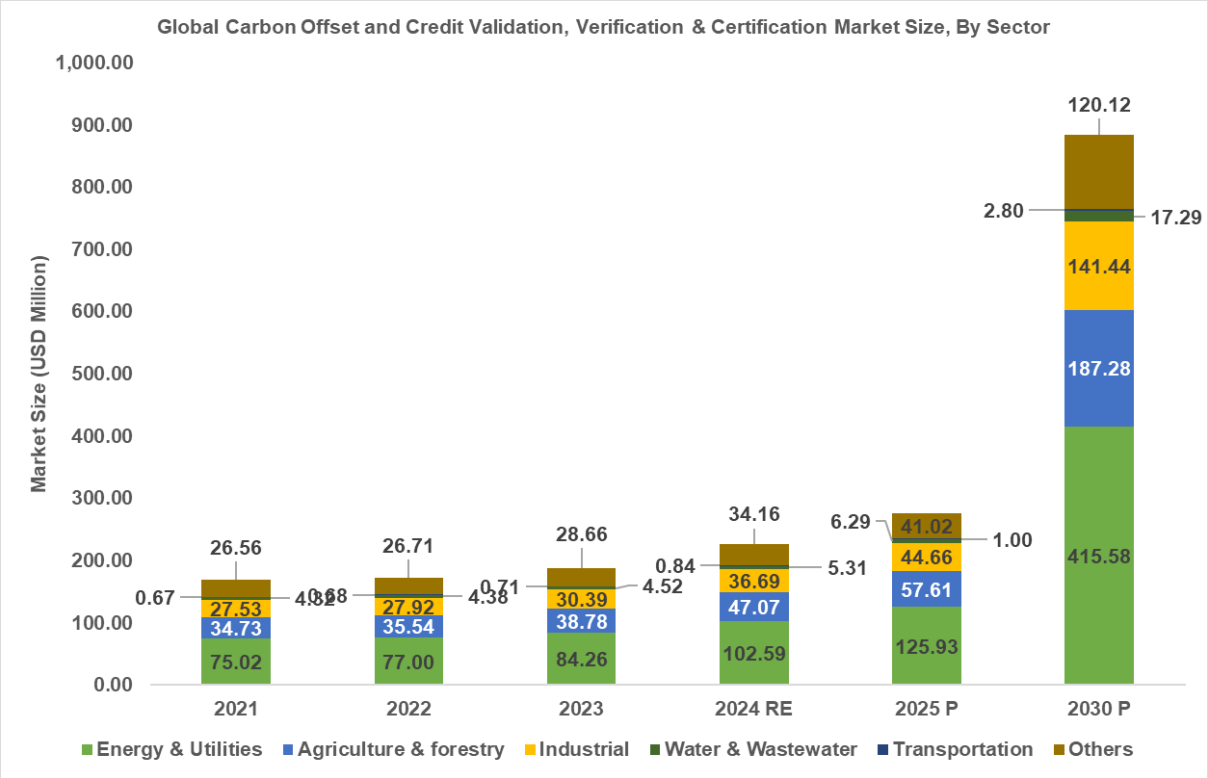
The By Sector segment in the global carbon credit validation, verification, and certification market categorizes initiatives based on various industries' contributions to carbon dioxide emissions and their potential for emissions reduction. This segmentation includes sectors such as Energy & Utilities, Transportation, Agriculture & Forestry, Water & Wastewater, Industrial, and Others (including Building & Construction, Aviation, and Waste Disposal). Each sector presents unique challenges and opportunities for implementing carbon reduction projects, ranging from renewable energy adoption and sustainable land management practices to energy efficiency improvements and the adoption of low-carbon technologies. Effective validation, verification, and certification processes ensure transparency and credibility in documenting emissions reductions across these diverse sectors.

Table 10 Global Carbon Offset/ Credit VVC Market Size, By Sector

Global: Carbon Credit Validation, Verification & Certification Market Size, By Sector, 2021-2030, (USD MIllion)							
By Sector	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
Energy & Utilities	75.02	77.00	84.26	83.59	125.93	415.58	27.0%
Agriculture & forestry	34.73	35.54	38.78	38.35	57.61	187.28	26.6%
Industrial	27.53	27.92	30.39	29.89	44.66	141.44	25.9%
Water & Wastewater	4.32	4.38	4.52	4.33	6.29	17.29	22.4%
Transportation	0.67	0.68	0.71	0.68	1.00	2.80	22.9%
Others	26.56	26.71	28.66	27.83	41.02	120.12	24.0%



Source: Markets and Markets, Crisil Research
Note: Other include Building & Construction, Aviation, and Waste Disposal; E: Estimated; P: Projected



Source: Markets and Markets, Crisil Research
Note: Other include Building & Construction, Aviation, and Waste Disposal; E: Estimated; P: Projected

Figure 16 Global Carbon Offset/ Credit VVC Market Size, By Sector

The Energy & Utilities sector has been a significant component of the global carbon credit market, driven by the urgent need to mitigate greenhouse gas (GHG) emissions from energy production and consumption. This sector encompasses a broad range of projects, including renewable energy generation, energy efficiency improvements, and waste-to-energy initiatives. Each project type undergoes rigorous validation, verification, and certification processes to ensure that the emissions reductions are real, measurable, and permanent. This category is expected to share the largest market share of 45.26% in 2024 in Global Carbon offset/credit validation, verification and certification market across different sectors and it is also expected to grow at a CAGR of 26.97% from 2025 to 2030. In 2024, the world added a record 585 GW of renewable power capacity, bringing the total to 4,448 GW (4.4 TW). Solar led the surge, accounting for over three-quarters of new additions. Renewables made up 92.5% of all new power capacity, reflecting the fastest annual growth rate on record. Despite this momentum, current growth remains insufficient to meet the COP28 goal of tripling global capacity to 11.2 TW by 2030. According to IRENA's 1.5°C Scenario, capacity must more than double from current levels, requiring accelerated deployment particularly by G20+ nations to stay on course.

The Agriculture and Forestry sector is also expected to hold a significant share in the voluntary carbon offset/credit VVC market. VVC market in this sector is expected to grow at a CAGR of 26.59% from 2025 to 2030, given its substantial potential for carbon sequestration and emissions reduction. This sector includes a diverse array of projects such as reforestation, afforestation, sustainable agricultural practices, and soil carbon sequestration. These initiatives not only contribute to mitigating climate change but also enhance biodiversity, improve soil health, and promote sustainable land

management practices. Forestry and Land Use remains the largest category of carbon credits by transaction volume, despite the overall volumes declining in 2023. The volume of Agriculture credit transactions also continued to grow in 2023 and is estimated to remain stable in 2024 as well. The sustained growth in this sector can be attributed to the rising demand of credits that offer co-benefits. In 2023, VCM buyers continued to place a premium on carbon credits from projects that offer “beyond carbon” environmental and social co-benefits, such as preserving and restoring biodiversity, contributing to water security, or supporting sustainable local economies. This indicates how much more buyers value removal credits over credits that represent emissions reductions only.

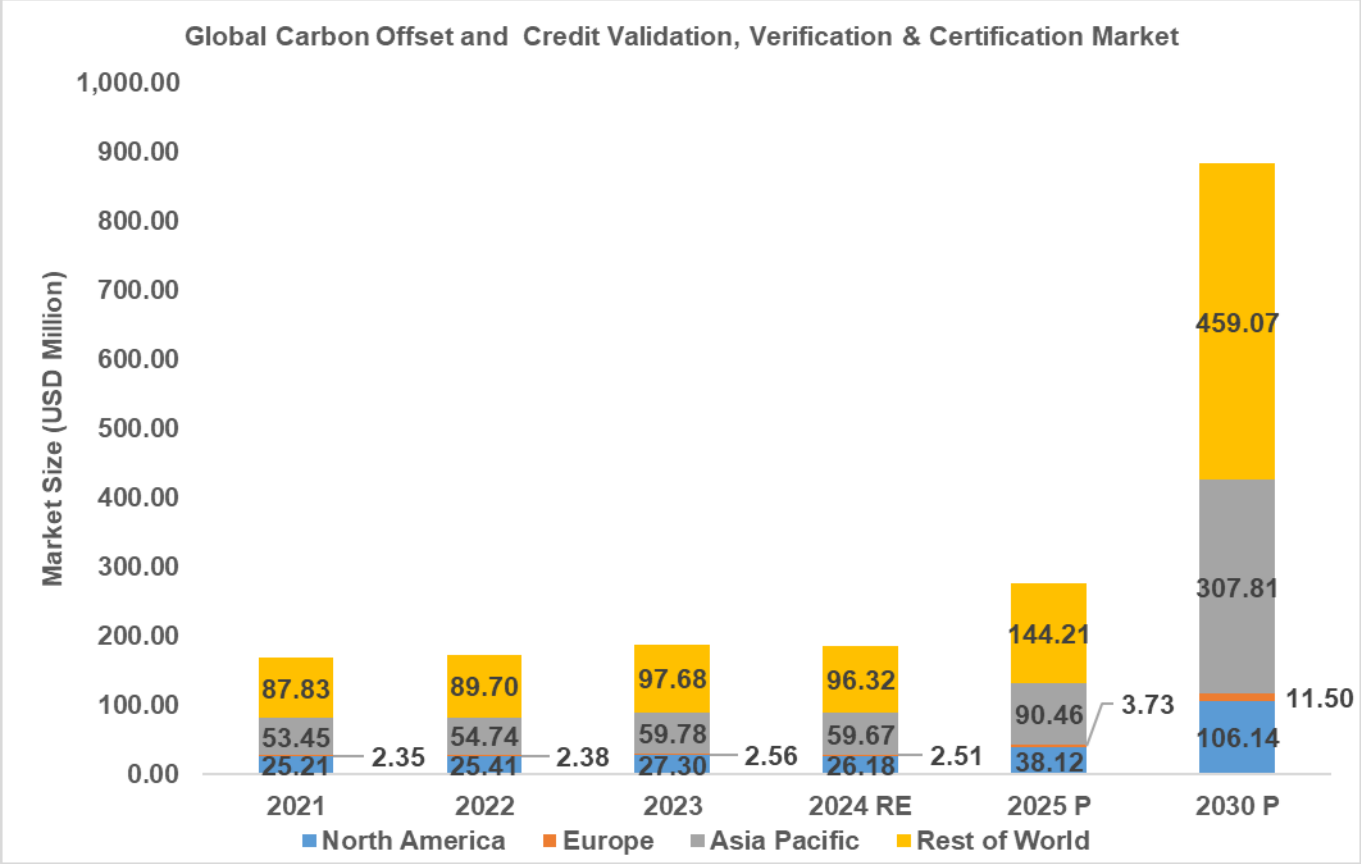
Despite its low share in the market, the transportation sector is expected to witness growing adoption of sustainable transportation solutions and expanding infrastructure for electric vehicles to curb emissions, supported by increasing policy incentives, rising EV investments, and global commitments to phase out internal combustion engine vehicles.

Trend (2021-2024) and outlook (2025-2030) of Global Carbon Offset/ Credit VVC Market by Key Regions

The Region segment in the global carbon credit validation includes North America, Europe, Asia Pacific, and RoW (Rest of the World). Rest of the World include South America and Middle East & Africa region.

Table 11 Global Carbon Offset/ Credit Market Size, By Region

Global: Carbon Credit Validation, Verification & Certification Market Size, 2021-2030, (USD Million)							
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
North America	25.21	25.41	27.30	26.18	38.12	106.14	22.7%
Europe	2.35	2.38	2.56	2.51	3.73	11.50	25.3%
Asia Pacific	53.45	54.74	59.78	59.67	90.46	307.81	27.8%
Rest of World	87.83	89.70	97.68	96.32	144.21	459.07	26.1%



Source: Markets and Markets, CRISIL Research
Note: Rest of the World include South America and Middle East & Africa region.
RE: Revised Estimate; P: Projected

Figure 17 Global Carbon Offset/ Credit Market Size, By Region

Asia-Pacific is expected to be the fastest growing region in the global economy. This presents the challenge of balancing economic growth with tackling climate change. The region is witnessing significant growth in carbon credit projects aimed at reducing greenhouse gas emissions and promoting sustainable development practices. APAC is currently the world's largest producer of carbon offsets. The region is expected to hold the largest market share of 32.7% in 2024 in Global

Carbon offset/credit validation, verification and certification market across different project types which shows how the region is prioritizing the growth of green economy. Stringent environmental regulations will further fuel the growth of the VVC market in this region.

North America region is also expected to hold a significant share in the market. The region encompasses the US and Canada, each contributing uniquely to carbon credit initiatives aimed at reducing greenhouse gas emissions and promoting environmental stewardship. Both the US and Canada have implemented comprehensive regulatory frameworks to address climate change and support carbon credit projects. In the United States, various states have implemented cap-and-trade programs, such as the Regional Greenhouse Gas Initiative (RGGI) in the Northeast and California's cap-and-trade program, aimed at reducing emissions from the energy sector.

The European Union (EU) and its member states have implemented comprehensive policies and initiatives to mitigate greenhouse gas emissions, drive sustainable development, and promote the transition to a low-carbon economy. The EU has established the world's largest emissions trading system (EU ETS). The EU ETS operates on a cap-and-trade principle, setting a limit on the total amount of greenhouse gases that can be emitted annually. In 2021, the EU introduced the Fit for 55 package, aiming to further reduce emissions by at least 55% by 2030 and achieve climate neutrality by 2050.

The Rest of World region encompasses countries outside North America, Europe, and Asia Pacific, each with unique challenges and opportunities in the global carbon credit validation, verification, and certification market. This diverse region includes emerging economies in Latin America, Africa, and the Middle East, as well as smaller economies in Oceania and other regions. While regulatory frameworks and market maturity vary widely across these countries, there is a growing recognition of the importance of mitigating greenhouse gas emissions and promoting sustainable development practices.

Validation, Verification, and Certification Market in Asia Pacific, By sector

Asia Pacific represents a dynamic and rapidly evolving region in the global carbon credit validation, verification, and certification market. Governments and industries are increasingly focusing on regulatory frameworks, renewable energy deployment, and carbon credit projects to mitigate climate change impacts and foster sustainable growth.

Table 12 Carbon Offset/ Credit VVC Market Size in APAC region

Asia Pacific: Carbon Credit Validation, Verification & Certification Market size, By Sector, 2021-2030, (USD Million)							
By Sector	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
Energy & Utilities	23.84	24.55	26.96	27.06	41.25	144.36	28.5%
Transportation	0.20	0.20	0.22	0.21	0.31	0.95	25.1%
Agriculture & forestry	10.75	11.04	12.09	12.09	18.39	63.41	28.1%
Water & Wastewater	1.47	1.47	1.57	1.52	2.26	6.77	24.5%
Industrial	8.89	9.12	9.97	9.96	15.11	51.71	27.9%
Others	8.30	8.36	8.98	8.82	13.13	40.60	25.3%

Source: Markets and Markets, CRISIL Research
Note: Other include Building & Construction, Aviation, and Waste Disposal
RE: Revised Estimates; P: Projected

The region is experiencing rapid growth in renewable energy investments and clean technology adoption. Countries like China, India, Japan, and South Korea are investing heavily in solar, wind, hydroelectric, and biomass energy projects to diversify their energy mix and reduce reliance on fossil fuels. According to the reports, 585 GW of renewables expansion was led by China with a 64% share. Majority of the REDD+ projects under the Forestry and Land Use Project category are located in this region.

Validation, Verification, and Certification Market in North America, By sector

North America hosts a diverse range of carbon credit projects across sectors including energy, agriculture, forestry, and industrial processes. These projects focus on emissions reductions through energy efficiency improvements, renewable energy deployment, sustainable agricultural practices, and forest conservation initiatives. Rigorous validation, verification, and certification processes ensure the credibility and transparency of these projects, attracting investments from businesses, financial institutions, and international markets.

Table 13 Carbon Offset/ Credit VVC Market Size in North-America region

North America: Carbon Credit Validation, Verification & Certification Market size, By Sector, 2021-2030, (USD Million)							
By Sector	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030**	**CAGR (2025-2030)**
Energy & Utilities	10.98	11.11	11.98	11.53	16.86	47.87	23.2%
Transportation	0.12	0.12	0.13	0.12	0.17	0.44	20.9%
Agriculture & forestry	5.01	5.06	5.44	5.23	7.63	21.44	23.0%
Water & Wastewater	0.73	0.75	0.76	0.71	1.01	2.45	19.4%
Industrial	4.05	4.05	4.32	4.11	5.94	15.92	21.8%
Others	4.32	4.32	4.67	4.47	6.51	18.02	22.6%

Source: Markets and Markets, CRISIL Research
Note: Other include Building & Construction, Aviation, and Waste Disposal
RE: Revised Estimates; P: Projected

Through innovative policies, technological advancements, and diverse carbon credit projects, the region continues to make strides in reducing greenhouse gas emissions, fostering clean energy adoption, and promoting environmental stewardship. Both the United States and Canada have made significant investments in renewable energy infrastructure, grid modernization, and energy storage solutions to facilitate the transition to a low-carbon economy. The United States is the second-largest producer of wind energy globally after China and continues to expand its solar photovoltaic capacity.

Validation, Verification, and Certification Market in Europe, By sector

Europe stands as a pioneering region, renowned for its ambitious climate targets, robust regulatory frameworks, and leadership in adopting policies and initiatives to mitigate greenhouse gas emissions, drive sustainable development, and promote the transition to a low-carbon economy.

Table 14 Carbon Offset/ Credit VVC Market Size in Europe region

Europe: Carbon Credit Validation, Verification & Certification Market size, By Sector, 2021-2030, (USD Million)							
By Sector	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030**	**CAGR (2025-2030)**
Energy & Utilities	1.02	1.04	1.13	1.11	1.66	5.29	26.1%
Transportation	0.01	0.01	0.01	0.01	0.01	0.04	32.0%
Agriculture & forestry	0.47	0.48	0.52	0.51	0.76	2.36	25.4%
Water & Wastewater	0.07	0.07	0.07	0.07	0.10	0.26	21.1%
Industrial	0.38	0.38	0.40	0.39	0.58	1.74	24.6%
Others	0.40	0.40	0.43	0.43	0.62	1.81	23.9%

Source: Markets and Markets, CRISIL Research
Note: Other include Building & Construction, Aviation, and Waste Disposal
RE: Revised Estimates; P: Projected

In 2022, the EU Commission published the RePower EU, which set out a series of measures to rapidly reduce the EU's dependence on fossil fuels well before 2030 by accelerating the clean energy transition. To further and accelerate the deployment of renewables, European Investment Bank (EIB) group committed to financing and supporting renewable projects for EU energy security and green economy.

Europe is driving significant emissions reductions, fostering innovation, and promoting environmental stewardship. The region's rigorous validation, verification, and certification mechanisms ensure transparency and accountability, making Europe a key player in shaping the future of global climate action and sustainable finance.

Validation, Verification, and Certification Market in RoW (Rest of the World), By sector

The Rest of World region encompasses countries outside North America, Europe, and Asia Pacific. This diverse region includes emerging economies in Latin America, Africa, and the Middle East, as well as smaller economies in Oceania and other regions.

While regulatory frameworks and market maturity vary widely across these countries, there is a growing recognition of the importance of mitigating greenhouse gas emissions and promoting sustainable development practices. Many countries in the region are in the process of developing or enhancing their regulatory frameworks to address climate change and support carbon credit initiatives. Some countries have implemented emissions trading schemes, carbon pricing mechanisms, and renewable energy targets to incentivize emissions reductions and promote clean energy investments. However, regulatory uncertainty and political stability issues in certain regions can pose challenges to the adoption and implementation of carbon credit projects.

Table 15 Carbon Offset/ Credit VVC Market Size in RoW region

Rest of World: Carbon Credit Validation, Verification & Certification Market size, By Sector, 2021-2030, (USD Million)							
By Sector	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030**	**CAGR (2025-2030)**
Energy & Utilities	39.19	40.30	44.19	43.88	66.16	218.06	26.9%
Transportation	0.34	0.34	0.36	0.34	0.50	1.38	22.5%
Agriculture & forestry	18.50	18.96	20.73	20.52	30.84	100.08	26.5%
Water & Wastewater	2.05	2.09	2.12	2.02	2.92	7.80	21.7%
Industrial	14.22	14.38	15.71	15.43	23.03	72.07	25.6%
Others	13.54	13.62	14.57	14.12	20.76	59.68	23.5%

Source: Markets and Markets, CRISIL Research
Note: Other include Building & Construction, Aviation, and Waste Disposal
RE: Revised Estimates; P: Projected

The Rest of World region presents significant opportunities for technological adoption and investment in clean energy technologies and carbon credit projects. There is increasing interest from international investors, development banks, and multilateral organizations in supporting renewable energy deployment, energy efficiency improvements, and sustainable development initiatives across these regions.

State and trends of ESG Advisory Services Landscape

The ESG Advisory market offers diverse services to address the multifaceted needs of companies aiming to enhance their environmental, social, and governance (ESG) performance. These services are crucial for organizations seeking to align with sustainability goals and regulatory requirements while also meeting the expectations of investors and other stakeholders. Comprehensive strategy and planning services lay the foundation of a company's ESG journey. ESG advisory service providers in this segment work collaboratively with organizations to develop clear, measurable, and ambitious ESG goals that align with the overall business strategy. They help integrate ESG considerations into core business operations, decision-making processes, and long-term planning. This integration ensures that ESG principles are not just add-ons but are embedded into the company's fabric.

Key services in this market includes creating detailed ESG roadmaps, outlining the steps necessary to achieve these goals. These roadmaps include timelines, resource allocation, and key milestones, providing a structured approach to ESG implementation. Objectively assessing a company's ESG performance is critical, and this is where testing, auditing, and verification services come into play. These services involve conducting comprehensive ESG performance assessments against established standards and frameworks, such as the Global Reporting Initiative (GRI) Standards. Service providers verify the accuracy and integrity of the ESG data reported by companies, ensuring transparency and accountability.

Effective communication of a company's ESG efforts is essential for attracting stakeholders and building trust. Sustainability marketing services focus on developing comprehensive sustainability communication strategies. These strategies are designed to clearly convey a company's ESG commitments, achievements, and impact to stakeholders. Service providers assist in preparing sustainability reports that are transparent, comprehensive, and aligned with relevant frameworks.

Addressing specific ESG issues often requires specialized expertise provided through technical support services. These services cover a range of technical aspects, including carbon footprint measurement and management. Service providers help companies measure their carbon footprint accurately and develop effective strategies to reduce greenhouse gas emissions. They also provide guidance on implementing sustainable waste management practices, promoting efficient resource use, and minimizing environmental impact. Additionally, technical support includes assisting companies in transitioning towards a circular economy model, which focuses on minimizing waste and maximizing resource reuse. This transition is critical for achieving long-term sustainability and resource efficiency.

Stricter regulations around ESG disclosure and reporting requirements are driving companies to seek advisory services to ensure compliance. Investors, customers and other stakeholders are placing grater emphasis on ESG performance, compelling companies to invest in ESG advisory services. Companies are setting ambitious sustainability goals and need expert guidance to develop and implement effective ESG strategies.

The rapid growth in the market due to changes in ESG-related regulations and standards comes with challenges including hurdle to access reliable and consistent ESG data, shortage of qualified sustainability professionals, and the

risk of green washing making misleading claims. ESG Advisory services are needed to help companies navigate through these challenges.

Table 16 Global ESG Advisory Market Size, By Region

Global: ESG Advisory Market Size, By Region 2021-2030, (USD Million)							
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
North America	3,081	3,603	4,374	5,171	5,310	16,391	25.3%
Europe	2,850	3,259	3,863	4,580	4,519	11,312	20.1%
Asia Pacific	1,947	2,482	3,266	3,921	4,376	20,887	36.7%
Middle East & Africa	638	782	994	1,200	1,298	5,255	32.3%
South America	1,227	1,420	1,704	2,028	2,150	5,743	21.7%

Source: Markets and Markets, CRISIL Research
Note: RE : Revised Estimates; P: Projected

The ESG and Sustainability consulting market has grown substantially, reaching USD 14 billion in 2023, expected to reach near to USD 17 billion and projected to reach around USD 60 billion by 2030. This growth indicates strong demand for ESG advisory services.

Strategic acquisitions fueling the growth and competitiveness in the market

The ESG advisory market has experienced a notable trend of acquisitions as firms seek to broaden their service offerings and expand their geographic reach. This trend is driven by the increasing demand for sustainability solutions and compliance with stringent environmental regulations from corporates. ERM's recent acquisitions of NINT, Point Advisory, and Stratos Inc. reflect a strategic focus on bolstering capabilities in, carbon management and ESG advisory, climate change consultancy, and other sustainability services. Similarly, other firms like TÜV SÜD and LRQA have made significant acquisitions to strengthen their positions in the carbon management and sustainability sectors. As the market is projected to grow, driven by heightened awareness of environmental issues and regulatory pressures, these strategic acquisitions will become essential for firms aiming to remain competitive. The mergers and acquisitions within the industry not only allow companies to diversify their expertise but also positions them to better address the complex challenges associated with environmental sustainability, ultimately enhancing their ability to serve clients effectively in an evolving landscape.

Trend (2021-2024) and outlook (2025-2030) of ESG Advisory Market by Service type and Key Regions

The ESG Advisory Service market offers various types of services. These services are segmented by service type into Strategy and Planning, Testing, Auditing & Verification, Sustainability Marketing, and Technical Support.

Table 17 Global ESG Advisory Market Size, By Service Type

Global: ESG Advisory Market size, By Service Type, 2021-2030, (USD Million)							
By Type	2021	2022	2023	2024 RE	2025 P	2030 P	CAGR (2025-2030)
Strategy & planning	2,743	3,323	4,175	5,025	5,323	20,370	30.8%
Testing	1,014	1,178	1,420	1,670	1,712	5,117	24.5%
Auditing & verificatior	2,265	2,693	3,323	3,957	4,145	14,216	28.0%
ustainability marketin	2,826	3,302	4,005	4,724	4,879	14,922	25.1%
Technical support	895	1,050	1,278	1,523	1,593	4,962	25.5%

Source: Markets and Markets, CRISIL Research
Note: RE : Revised Estimates; P: Projected

Strategy and Planning

Strategy & planning is projected to capture nearly 32% of the market in 2025. The strategy & planning segment is the cornerstone of the ESG Advisory market, serving as the foundation for a company's entire ESG journey. This segment is projected to hold the largest market share within the ESG Advisory market due to its fundamental nature, setting the direction for all other ESG activities. The high growth anticipated in this segment is driven by the increasing number of companies embarking on their ESG initiatives. Many companies lack the internal expertise required to develop a comprehensive ESG strategy, relying heavily on external advisory to fill this gap. The complexity of ESG considerations, encompassing a wide range of environmental, social, and governance factors, necessitates expert guidance to navigate and prioritize these issues effectively. Additionally, companies must ensure that their ESG strategies align with their overall business goals and risk management frameworks, making strategy and planning essential.

Key services offered within the strategy and planning segment include materiality assessments identifying the most significant ESG issues impacting the company, its stakeholders, and the environment. This process involves engaging with stakeholders, conducting industry analyses, and performing life cycle assessments to determine the critical focus areas. ESG goal setting is another vital service involving the development of SMART goals—Specific, Measurable, Achievable, Relevant, and Time-bound—for ESG performance. These goals must be ambitious yet achievable, considering the company's current baseline and industry benchmarks to ensure they are both challenging and realistic.

Crafting a comprehensive ESG strategy is central to the planning process. This strategy outlines the company’s approach to addressing material ESG issues, including defining long-term goals, outlining key initiatives, and assigning responsibilities. By integrating ESG considerations into core business operations and decision-making processes, companies can embed sustainability into their investment criteria, supply chain management practices, and product development processes. Scenario planning and risk assessment are also crucial components of the strategy and planning segment. These services involve identifying potential ESG risks and opportunities related to climate change, social unrest, resource scarcity, etc. Companies develop mitigation strategies for these risks and capitalize on opportunities to enhance their resilience and create competitive advantages. A well-developed stakeholder engagement

strategy is essential for effective communication and engagement with various stakeholders, including investors, employees, communities, and regulators, on ESG issues. This ensures the company maintains transparency and builds trust with its stakeholders, fostering stronger relationships and a better reputation.

Table 18 ESG Advisory (Strategy & Planning) Market, By Region

Strategy & planning: ESG Advisory Market, By Region, 2021–2030 (USD Million)							
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
North America	800	963	1,202	1,441	1,505	5,497	29.6%
Europe	822	957	1,155	1,387	1,380	3,878	22.9%
Asia Pacific	595	769	1,028	1,243	1,404	7,357	39.3%
Middle East & Africa	191	237	305	370	404	1,752	34.1%
South America	336	396	485	584	630	1,887	24.5%

Source: Markets and Markets, CRISIL Research
Note: RE : Revised Estimates; P: Projected

Testing

Testing is projected to capture nearly 10.0 % of the market in 2025. The testing segment within the ESG Advisory market plays a vital role in verifying the authenticity of a company's ESG claims and ensuring the credibility of its sustainability efforts. ESG testing involves independently verifying a company's ESG performance against specific standards or frameworks. This process includes validating the accuracy and completeness of reported ESG data, assessing the effectiveness of ESG management systems, and ensuring compliance with relevant ESG regulations and industry standards. There are several types of ESG testing. Third-party verification involves independent verification by accredited bodies to enhance a company's credibility and transparency. Internal audits are self-assessments conducted by companies to identify gaps and areas for improvement in their ESG practices. Gap analysis involves comparing a company's practices against best practices or specific ESG frameworks to identify areas needing enhancement.

The demand for ESG testing is growing significantly due to increasing scrutiny from investors, regulatory pressures, and stakeholder concerns about greenwashing. Despite this growing demand, the pool of qualified ESG auditors and verifiers is currently limited, which could impact service availability and pricing. The lack of universal ESG standards also presents challenges in establishing consistent testing methodologies across different sectors and regions. Key services offered in the ESG testing segment include ESG data verification, which ensures the accuracy and completeness of reported data across various metrics, such as environmental (emissions, waste), social (employee diversity, labour practices), and governance (board composition, anti-corruption measures). ESG management system verification assesses the effectiveness of a company's systems in identifying, managing, and mitigating ESG risks. Sustainability reporting verification ensures that sustainability reports comply with relevant frameworks like GRI Standards or SASB Standards. ESG gap analysis identifies discrepancies between a company's current practices and best practices or specific frameworks.

For companies, ESG testing offers several benefits. Independent verification enhances the credibility of their ESG claims, building trust with stakeholders. It also promotes transparency in sustainability reporting, demonstrating a company's commitment to ESG principles. By reducing the risk of greenwashing accusations, companies can protect themselves from potential reputational damage. Moreover, ESG testing helps identify areas for improvement, enabling companies

to enhance their overall ESG performance. Several challenges and considerations will shape the future of ESG testing. Developing universal ESG standards and harmonized verification methodologies is crucial for ensuring consistent and reliable testing. Ensuring a sufficient pool of qualified ESG auditors with industry-specific knowledge will be necessary to meet the growing demand for these services. Additionally, leveraging technological advancements for data collection, analysis, and reporting can improve the efficiency and transparency of the testing process, further strengthening the integrity of ESG verification efforts.

Table 19 ESG Advisory (Testing) Market, By Region

Testing: ESG Advisory Market, By Region, 2021–2030 (USD Million)							
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
North America	308	345	399	456	449	922	15.5%
Europe	334	384	458	545	539	1,397	21.0%
Asia Pacific	158	203	269	325	365	1,832	38.1%
Middle East & Africa	69	83	104	124	132	474	29.1%
South America	145	163	190	221	227	491	16.7%

Source: Markets and Markets, CRISIL Research
Note: RE : Revised Estimates; P: Projected

Auditing and Verification

Auditing & verification is projected to capture nearly 25% of the market in 2025. The auditing & verification segment within the ESG advisory market is integral to maintaining the credibility and transparency of corporate ESG performance. These services are essential for ensuring that a company's ESG claims are accurate and reliable, fostering stakeholder trust.

Auditing and verification in the ESG context encompass a range of services designed to scrutinize and authenticate a company’s ESG data and practices. One of the primary services offered is the independent verification of ESG reports, where a company’s ESG data and claims are assessed against established standards such as the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB). This ensures that the information disclosed is accurate and adheres to recognized guidelines. Moreover, verification can target specific ESG aspects, such as greenhouse gas emissions, social responsibility practices, or the sustainability of supply chains. This targeted approach helps companies address areas of concern and improve their overall ESG performance. Another critical service is assurance engagements, which provide a more rigorous examination compared to basic verification. Assurance engagements involve offering an expert opinion on the fairness and accuracy of a company’s ESG disclosures, thereby enhancing the credibility of the reported information.

Several factors are driving the demand for ESG auditing and verification services. A significant driver is the growing demand for verified ESG data from investors. Investors are increasingly using ESG data to inform their investment decisions, and verified data provides confidence that the information is reliable. Additionally, regulatory pressures are mounting, with directives like the EU Corporate Sustainability Reporting Directive (CSRD) mandating sustainability reporting and verification for certain companies. This regulatory landscape is compelling companies to adopt verified ESG reporting practices. Enhanced stakeholder trust is another crucial driver. Verified ESG reports help build trust with

various stakeholders, including customers, non-governmental organizations (NGOs), and employees, who are all increasingly concerned with corporate sustainability practices.

The ESG auditing and verification market is witnessing several notable trends. One such trend is the standardization of verification methodologies. Technological advancements are also playing a significant role in transforming the verification process. Innovations in data analytics and blockchain technology are being utilized to streamline verification processes, enhance data security, and reduce the potential for errors. These technologies enable more efficient handling and analysis of large datasets, which is crucial for accurate ESG verification. Additionally, there is an increased demand for third-party verification services. As greenwashing concerns grow, companies increasingly seek independent verification to substantiate their ESG claims and avoid reputational risks.

Table 20 ESG Advisory (Auditing and Verification) Market, By Region

Auditing and Verification: ESG Advisory Market, By Region, 2021–2030 (USD Million)							
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
North America	699	828	1,018	1,212	1,254	4,183	27.2%
Europe	631	717	845	996	980	2,346	19.1%
Asia Pacific	502	636	832	995	1,104	5,065	35.6%
Middle East & Africa	156	192	244	295	320	1,322	32.8%
South America	277	320	385	458	486	1,301	21.8%

Source: Markets and Markets, CRISIL Research
Note: RE : Revised Estimates; P: Projected

Sustainability Marketing

Sustainability marketing is projected to capture about 29% of the market in 2025. Sustainability marketing is an increasingly important facet of the ESG advisory market, assisting companies in effectively communicating their environmental, social, and governance initiatives to stakeholders. This type of marketing is crucial for building public trust and fostering strong relationships with consumers, investors, and other key audiences. Below, we explore the services provided, market drivers, regulatory landscape, trends, and challenges of sustainability marketing. Sustainability marketing offers a suite of services designed to enhance a company's communication about its ESG initiatives. One of the primary services is developing a comprehensive sustainability marketing strategy. This involves aligning the company's marketing goals with its broader ESG objectives and identifying target audiences most likely to value its sustainability efforts.

Another key service is creating compelling sustainability messaging. This entails crafting clear and impactful communications that effectively highlight the company's ESG initiatives and achievements. Well-crafted messaging ensures that the company's sustainability efforts resonate with stakeholders. In addition to strategy and messaging, sustainability marketing also involves developing sustainability-focused content. This can range from engaging website content and social media campaigns to detailed annual sustainability reports. These content forms are critical for keeping stakeholders informed and engaged with the company's ongoing ESG efforts. Moreover, sustainability marketing includes measures to avoid greenwashing. Companies must ensure that all marketing claims are accurate and supported by verifiable data. This helps prevent accusations of misleading stakeholders and maintains the company's credibility.

Several factors are fuelling the growth of sustainability marketing. One primary driver is the increasing consumer demand for sustainable products and services. Modern consumers are more likely to base their purchasing decisions on a company's environmental and social responsibility. Consequently, companies that effectively communicate their sustainability efforts can attract and retain more customers. Investors focusing on ESG factors is another significant driver. Investors are increasingly looking at companies with strong sustainability practices as more attractive investment opportunities. Effective sustainability marketing helps these companies stand out in the eyes of investors. Additionally, sustainability marketing provides a competitive advantage. Companies that successfully highlight their ESG efforts in a crowded marketplace can differentiate themselves from their competitors, thus gaining a market edge. The regulatory landscape for sustainability marketing includes several essential considerations. Regulations against greenwashing, for example, exist in various regions to prevent companies from making misleading claims about their environmental benefits. Understanding and complying with these regulations is crucial for effective and lawful sustainability marketing.

Consumer protection laws also play a significant role. Companies must ensure that their marketing claims are truthful and not deceptive, as any false claims can lead to legal consequences and damage the company's reputation. Consumers increasingly demand transparency and traceability. Solid data should back marketing messages and include traceable claims to meet these demands. Providing transparent information helps build trust and credibility with stakeholders. Data-driven marketing is another emerging trend. Companies are using data to measure the impact of their sustainability marketing campaigns. This data-driven approach allows companies to refine their strategies and demonstrate the effectiveness of their efforts. The integration with social media is also significant. Social media platforms offer powerful tools for companies to communicate their sustainability stories to a wide audience. These platforms enable real-time engagement and allow companies to foster a dialogue with their customers. A focus on customer engagement is becoming increasingly important. Sustainability marketing is evolving from one-way communication to fostering meaningful interactions with customers. Engaging customers in the company's sustainability journey helps build long-term loyalty and advocacy.

Table 21 ESG Advisory (Sustainability Marketing) Market, By Region

Sustainability Marketing: ESG Advisory Market, By Region, 2021–2030 (USD Million)							
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
North America	924	1,072	1,289	1,515	1,546	4,484	23.7%
Europe	836	940	1,096	1,282	1,253	2,779	17.3%
Asia Pacific	516	648	840	1,000	1,101	4,738	33.9%
Middle East & Africa	175	213	270	324	349	1,367	31.4%
South America	376	430	510	602	630	1,555	19.8%

Source: Markets and Markets, CRISIL Research
Note: RE : Revised Estimates; P: Projected

Technical Support

Technical support is projected to capture nearly 9.0 % of the market in 2025. The technical support segment within the ESG advisory market is vital for helping companies implement and sustain their ESG practices effectively. This segment provides essential services that facilitate the collection, analysis, and reporting of ESG data, ensuring that companies meet regulatory requirements and stakeholder expectations. Below, we delve into the services offered, market drivers, regulatory considerations, and key facts surrounding technical support in ESG. Technical support in the ESG realm

encompasses a variety of services that assist companies in managing their ESG initiatives. One critical service is ESG data management. This involves helping companies efficiently collect, analyze, and report ESG data. Technical support providers set up data management systems, define data collection protocols, and ensure data quality, allowing companies to maintain accurate and reliable ESG records. Another key service is ESG software implementation. Technical support teams assist companies in selecting and deploying software solutions tailored to managing ESG performance. These solutions might include tools for tracking carbon footprints, managing waste, or measuring social impact. Companies can streamline their ESG processes and enhance data accuracy by implementing these software solutions. Sustainability reporting assistance is also a significant component of technical support. This service guides companies through preparing and publishing ESG reports, ensuring compliance with established frameworks such as the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB). Technical support teams provide the expertise needed to navigate these complex reporting standards. Furthermore, technical training is an essential service provided by technical support teams. They offer training programs for employees on various aspects of ESG, including greenhouse gas accounting and social responsibility practices. This training ensures that employees are knowledgeable and competent in executing the company's ESG strategies.

Several factors drive the demand for technical support in the ESG advisory market. One significant driver is the growing complexity of ESG reporting. As ESG reporting frameworks evolve and become more intricate, companies face challenges in maintaining compliance without the expertise provided by technical support. Additionally, there is an increased focus on data-driven ESG management. Companies are recognizing the importance of collecting and analysing data to make informed ESG decisions. Technical support facilitates this process by providing the tools and expertise to handle vast amounts of ESG data. The need for efficient data management is another crucial driver. Large companies often generate extensive amounts of ESG data, requiring robust systems to manage and analyze this information. Technical support ensures these systems are in place, enabling companies to maintain high standards of data integrity and accessibility. In the realm of ESG technical support, several regulatory considerations must be considered. Data privacy regulations, such as the General Data Protection Regulation (GDPR), are paramount. Technical support providers must ensure that their data handling practices comply with these regulations to protect sensitive ESG data. Cybersecurity concerns are also significant. As companies store and manage large volumes of ESG data, they become targets for cyber threats. Technical support providers must implement robust security protocols to safeguard against data breaches and ensure the integrity of ESG information.

Table 22 ESG Advisory (Technical Support) Market, By Region

Technical Support: ESG Advisory Market, By Region, 2021–2030 (USD Million)							
Region	**2021**	**2022**	**2023**	**2024 RE**	**2025 P**	**2030 P**	**CAGR (2025-2030)**
North America	349	396	466	547	555	1,305	18.6%
Europe	228	261	309	370	367	912	20.0%
Asia Pacific	177	226	297	358	402	1,896	36.4%
Middle East & Africa	47	57	71	86	92	340	29.8%
South America	94	110	135	163	177	510	23.5%

Source: Markets and Markets, CRISIL Research
Note: RE : Revised Estimates; P: Projected

ESG is no longer seen as an add-on but as a fundamental component of business strategy. Several factors are driving the importance of ESG integration and strategy formulation. Regulatory pressure is increasing, with more regulations mandating sustainability reporting and disclosures, necessitating a well-defined ESG strategy for compliance. Additionally, there is a growing focus on stakeholder capitalism, where companies consider the interests of all stakeholders, not just shareholders. Investors are also placing greater emphasis on ESG performance, with many prioritizing companies that demonstrate a strong commitment to sustainability. This makes a robust ESG strategy essential for attracting capital. Furthermore, a well-defined ESG strategy can enhance a company's brand reputation and build trust with customers and stakeholders, providing a competitive edge in the market. Managing ESG-related risks is another critical driver, as these factors can pose significant threats to a company's operations and long-term sustainability. This necessitates the ESG Advisory services that addresses the concerns of diverse groups, promoting a more inclusive and sustainable approach to business.

A maturing Landscape amid Opportunities and Challenges

Opportunities amid regulatory shifts and increased stakeholder expectations

Regulatory Momentum Driving ESG Disclosure and Governance Frameworks

ESG-related regulations are transforming disclosure obligations from voluntary to mandatory across jurisdictions. Key regulatory developments—such as the EU's Corporate Sustainability Reporting Directive (CSRD), India's Business Responsibility and Sustainability Report (BRSR), the U.S. SEC's proposed climate disclosure rules, and ISSB standards—are expanding the scope and granularity of sustainability reporting requirements. For companies, this has escalated the need to overhaul internal systems, embed ESG into governance frameworks, and demonstrate compliance under scrutiny. Given the complexity and dynamism of these requirements, many companies lack in-house expertise or resources to manage compliance independently. ESG advisory firms are increasingly being called upon to fill this gap and help clients assess readiness, align disclosures with global frameworks and avoid potential reputational or regulatory risks. As regulatory timelines tighten and enforcement strengthen, demand for such specialized services is poised to rise.

Rising Stakeholder Expectations

Stakeholders—including investors, customers, employees, regulators—are increasingly holding companies accountable for their environmental and social impacts. ESG performance has become a key determinant of reputation, competitiveness, and long-term viability. Investor concerns, procurement policies, and employee activism are reshaping business priorities, prompting firms to embed ESG into core strategies. ESG advisory services help companies respond to this evolving environment by identifying stakeholder-specific materiality issues, developing communication strategies, and designing credible sustainability narratives. These services are especially critical for companies seeking to build stakeholder trust and maintain competitive advantage

Integration of ESG into Mainstream Investment Decisions

The increasing alignment of ESG with fiduciary duty is changing the way capital is allocated. Investors are embedding ESG considerations into portfolio construction, credit risk analysis, and investment stewardship processes. Regulatory requirements such as EU's SFDR and global voluntary initiatives like ISSB and SBTi are influencing both asset owners and asset managers to evaluate ESG risks and opportunities rigorously. As a result, companies are seeking third-party ESG assessments, ESG scorecards, and advisory support to meet investor expectations, secure access to sustainable finance, and benchmark their performance against global peers. This has unlocked a growing role for ESG consultants as enablers of investor-ready sustainability strategies

Digital ESG solutions and data platforms

Digitalization is revolutionizing ESG performance monitoring and reporting. The emergence of AI-enabled ESG data platforms, carbon accounting tools, digital scorecards, and automated disclosure systems is creating new channels for advisory firms to deliver data-driven, scalable, and high-quality solutions. These tools enhance the transparency and credibility of ESG disclosures while reducing manual effort. ESG consultants can leverage digital solutions to offer end-to-end services, including data mapping, gap analysis, KPI tracking, and assurance. The integration of digital ESG tools

is expected to boost the efficiency and impact of advisory engagements, particularly among mid-sized firms and across emerging markets.

Enablers fuelling potential growth and opportunities in the Carbon Market

Coordinated global climate actions are expected to boost the carbon market growth

More countries and regions are developing their own carbon pricing mechanisms, leading to an expansion of the global carbon market. According to the World Bank Carbon Pricing Dashboard and International Carbon Action Partnership, as of April 2025, 38 ETSs, 39 carbon taxes, and 35 governmental crediting mechanisms have been implemented globally, with another 20 under various stages of development or consideration. This growth is attributed to positive developments during COP26 around Article 6 of the Paris Agreement, whereby carbon credits can be traded to meet countries' Nationally Determined Contributions (NDCs), as well as growth in the self-regulated Voluntary Carbon Markets (VCM), driven by demand from companies to meet their voluntary climate commitments. Domestic compliance market instruments, namely Emission Trading Systems and carbon taxes, have also been growing.

Compliance and Article 6 markets are key to enhancing long-term goals. On the other hand, VCMs play a pivotal role in directing immediate climate finance. Well-designed Voluntary Carbon Markets will be instrumental in facilitating payments for emission reductions, offering a source of financing for climate actions. These also help build capacity to support compliance and Article 6 implementation.

Investor push and stringent regulations to drive corporate action

Demand for voluntary carbon offset is predominantly driven by companies with a sustainability infused corporate strategy as a core driver. When it comes to driving sustainability, investors worldwide have put corporations and regulators on notice. Consumer awareness and preferences is another factor influencing sustainable industrial practices. In that light, growing recognition of environmental responsibility and the commitments made by companies worldwide to achieve net-zero emission targets and invest in the decarbonization ecosystem will continue to drive growth of the voluntary markets.

CBAM expected to incentivize corporations to participate in the carbon markets

The EU’s Carbon Border Adjustment Mechanism (CBAM), introduced in 2023, is reshaping global carbon market dynamics and accelerating the adoption of carbon pricing. CBAM aims to prevent carbon leakage and promote cleaner industrial production abroad by leveling the carbon cost of domestic and imported goods. Currently in its transitional phase (October 2023–December 2025), CBAM requires importers of selected goods—including iron, steel, cement, fertilizers, aluminum, hydrogen, and electricity—to report quarterly on their embedded emissions, without incurring financial charges. From January 1, 2026, importers must begin purchasing and surrendering CBAM certificates that reflect the carbon content of their imports, aligning with the EU’s Emissions Trading System. Proposals under discussion include exemptions for importers with annual volumes below 50 tons to ease compliance for smaller businesses while still covering 99% of total emissions.

CBAM is influencing policy developments in other regions, with the UK confirming the launch of its own CBAM in 2027. While the initial scope remains unchanged, future expansion to sectors such as aviation, maritime transport, and

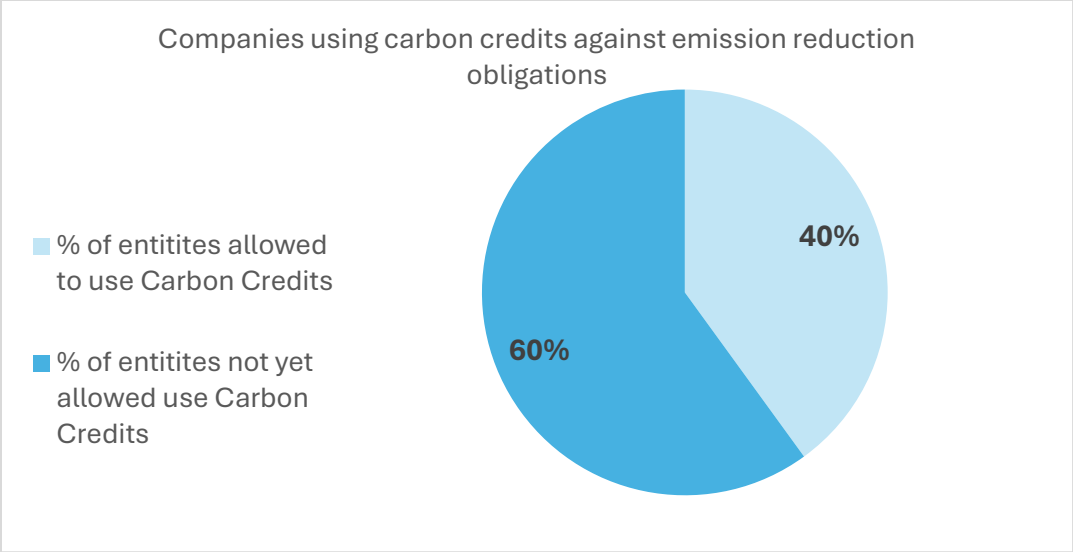
chemicals is likely to be considered after 2026 following a regulatory review. The mechanism is anticipated to boost demand for verified carbon credits and drive investments in low-emission technologies among exporters to the EU.

Allowing use of carbon credits generated outside the country against obligations to support growth in carbon markets

Governments allow regulated entities to use carbon credits toward their GHG obligations to increase flexibility, lower compliance costs, and extend the carbon price signal to uncovered sectors. As of January 2024, around 40% of carbon pricing instruments in operation (7 carbon taxes and 23 ETSs), allow for the use of carbon credits to offset liabilities. Almost all jurisdictions only permit the use of domestically generated carbon credits. Singapore began allowing businesses liable to pay the carbon tax to use international carbon credits that meet defined environmental integrity criteria to offset up to 5% of their taxable emissions in January 2024.

New developments are expanding international market access. Brazil has adopted a national cap-and-trade system that allows carbon credits to be transferred internationally, subject to approval by a designated national entity. Furthermore, at COP29 (November 2024), nearly 200 countries reached a landmark agreement on new UN standards for international carbon markets, paving the way for broader adoption of international credits toward national climate goals.

Carbon taxes permitting the use of domestically generated carbon credits to offset tax liabilities include Chile, Colombia, and South Africa. Among ETSs, California, Mexico, and the Republic of Korea, as well as others, allow for the limited use of carbon credits from specified crediting mechanisms. These developments signal a growing convergence between compliance and voluntary carbon markets globally.



Source: World Bank.

Note: As of April 2024, Carbon taxes that allow regulated entities to use carbon credits include: Chile CT, Mexico CT, Colombia CT, Queretaro CT, South Africa CT, Switzerland CT, and Singapore.
Emission trading schemes that allow regulated entities to use carbon credits against obligations include: Australia ETS, Indonesia ETS, Kazakhstan ETS, Saitama ETS, Tokyo ETS, Canada Federal ETS, Alberta ETS, British Colombia ETS, Shenzhen pilot ETS, Fujian pilot ETS, Guangdong pilot ETS, Hubei pilot ETS, Mexico pilot ETS, Tianjin pilot ETS, Chongqing pilot ETS, Washington ETS, Beijing pilot ETS, China national ETS, RGGI, Shanghai pilot ETS, Quebec ETS, California ETS, Rep. of Korea ETS.

COP29 finalizes Article 6, launches UN-Backed Carbon Credit Mechanism

At COP29 (November 2024, Baku), countries reached a landmark agreement by finalizing the rulebook for Article 6 of the Paris Agreement, establishing a comprehensive framework for international carbon markets. The decision marks a major milestone in climate diplomacy, providing clarity, oversight, and operational pathways for carbon credit trading.

Under Article 6.2, the finalized rules now allow for transparent country-to-country trading of Internationally Transferred Mitigation Outcomes (ITMOs), with defined processes for authorization, tracking, and review. These rules are set to be revisited in 2028, ensuring adaptability while maintaining environmental integrity.

More significantly, Article 6.4 has been operationalized through the creation of the Paris Agreement Crediting Mechanism (PACM)—a new UN-administered system that enables both public and private entities to generate and trade A6.4ERs (Article 6.4 Emission Reductions). The PACM is modeled on the former Clean Development Mechanism (CDM) but incorporates stronger transparency, environmental safeguards, and rigorous standards for baseline setting, additionality, permanence, and social impacts.

With the Article 6.4 Supervisory Body now having approved core methodologies and operational procedures, the first PACM credits are expected to be issued by late 2025 or early 2026. This development positions PACM as a trusted, high-integrity mechanism that can channel international finance toward mitigation projects—particularly in developing countries—and unlock new opportunities for credible participation from the private sector.

SEBI's includes Green Credit Program under BRSR Framework

As of March 2025, the Securities and Exchange Board of India (SEBI) has formally integrated the Green Credit Program (GCP) into the Business Responsibility and Sustainability Reporting (BRSR) framework, effective from FY 2024–25. Listed companies are now mandated to disclose Green Credits generated or procured by themselves and their top 10 value chain partners as a leadership indicator under Principle 6, which focuses on environmental protection and restoration.

Green Credits earned through activities such as tree plantations on degraded lands, river catchment rejuvenation, sustainable agriculture, air pollution reduction, and other notified actions must be reported. This marks the eighth leadership indicator under BRSR, emphasizing measurable, impact-based ESG disclosures. The move aligns with the Ministry of Environment's 2024 notification and India's broader strategy to promote market-based voluntary environmental action. With tradability under consideration, the integration is expected to catalyze verified environmental outcomes, enhance transparency, and incentivize companies to scale their sustainability initiatives across the value chain. Companies and their value chain partners seeking to demonstrate leadership will be incentivized to participate in generation or acquiring green credits through verified projects. This move from SEBI is expected to spur the need for independent verification of the environmental claims by the listed companies.

Net-Zero Standard from SBTi expected to boost demand for high quality carbon credit markets

In March 2025, the Science Based Targets initiative (SBTi) released Version 2.0, initial consultation draft, of its Corporate Net-Zero Standard, introducing pivotal changes that broaden the role of high-integrity carbon credits, particularly for Scope 3 emissions—while reinforcing the primacy of in-house decarbonization. Companies may now use carbon removal

credits for residual Scope 3 emissions after achieving at least 90% value chain emission reductions, under strict quality and transparency criteria, including permanence, mitigation hierarchy, and public disclosure aligned with the EU Green Claims Directive.

The revised standard mandates interim removal targets, encourages beyond value chain mitigation (BVCM) investments, and introduces dedicated pathways for SMEs and transitional alignment for companies with existing targets. This shift is expected to significantly increase demand for durable removals (e.g., biochar, DAC) over avoidance credits, boosting market credibility and scaling investments in high-quality climate solutions. With over 10,000 companies engaged and final rules expected by July 2025, the new framework is poised to catalyze growth in the voluntary carbon market, positioning it as an enabler for science-aligned net-zero transitions.

New Carbon Exchanges expected to enhance access to markets

Asia-Pacific is strengthening its carbon market infrastructure through the launch and expansion of national carbon exchanges. In India, PXIL's carbon trading platform under the Green Credit Trading Scheme (GCTS) is expected in Q2 FY25, offering a transparent market for activities like tree plantation and sustainable agriculture. The Indian Energy Exchange (IEX) is also preparing to enter the space, with regulatory approvals expected by late 2025.

Across Southeast Asia, platforms like Singapore's Climate Impact X (CIX), Malaysia's Bursa Carbon Exchange (BCX), Thailand's T-VER, and Indonesia's new carbon exchange are scaling up. These exchanges are broadening credit types, piloting cross-border transactions, and aligning with Article 6 of the Paris Agreement. Japan is also piloting a digital exchange to support its J-Credit system.

With growing integration of international standards and mechanisms such as Article 6, the Asia-pacific region is poised to become a major hub for high-integrity carbon trading in the years ahead.

Carbon Markets evolve across Sectors and Geographies

Carbon markets have expanded significantly in both sectoral and geographic scope over the past decade. Initially focused on power and heavy industry, compliance markets are now extending to harder-to-abate sectors such as maritime, aviation, buildings, and road transport. The EU ETS exemplifies this trend, having incorporated maritime transport in 2024 and progressing toward a parallel ETS II for buildings and road transport. With allowance prices consistently above EUR 70/ton, the EU is not only reducing emissions but also catalyzing innovation in clean technologies.

In Asia-Pacific, China's national ETS—now the largest globally by volume—expanded in 2024 to include cement and steel, with prices expected to rise as caps tighten. South Korea continues to operate a mature market covering nearly 90% of national emissions, while countries like Indonesia and Vietnam are entering pilot phases. New Zealand's long-standing ETS combines rising prices with nature-based and technology-driven offsetting mechanisms.

Latin America is also advancing. Mexico transitioned to a full ETS in 2024, and Chile and Colombia are developing complementary systems. Brazil launched its SBCE in December 2024, blending compliance with nature-based credits from REDD+ projects, positioning itself as a hybrid market leader. The region remains a major source of high-quality voluntary credits.

These developments highlight growing regulatory momentum and market confidence, reinforcing carbon pricing as a central tool in global climate policy across a broader set of sectors and economies.

VRE Program supports purchase of Voluntary credits for Cap-and-Trade Program

The Voluntary Renewable Electricity (VRE) Program allows purchasers of eligible voluntary renewable electricity to request retirement of allowances on their behalf under the Cap-and-Trade Program. The VRE Program supports purchases of renewable electricity and renewable energy credits (RECs) that are not mandated by the Renewables Portfolio Standard and provides a mechanism for the recognition of voluntary purchases of renewable electricity or RECS in the California Cap-and-Trade Program. This is expected to further boost demand for the RECs.

CORSIA to help boost growth in VCM

Aviation remains one of the hardest sectors to decarbonize due to limited alternatives to fossil-based jet fuel. While airlines are investing in sustainable aviation fuels and efficiency measures, in the near term, carbon offsetting is essential for managing aviation emissions.

The International Civil Aviation Organization (ICAO) launched CORSIA—the first sector-wide market-based mechanism requiring airlines to monitor, report, and offset emissions from international flights above 2019 levels. As of January 2025, 129 countries are participating voluntarily, covering the bulk of international aviation emissions.

CORSIA is being implemented in three phases: Pilot (2021–2023), First (2024–2026), and Second (2027–2035), with the baseline set at 85% of 2019 emissions for offsetting. During the second phase, demand for eligible carbon credits is projected to reach 502–1,299 million tonnes in the second phase. Airlines may need up to 150 million credits by 2026, given slow progress on scaling sustainable fuels.

Efforts have been initiated globally to build confidence around the VCMs and help avoid Greenwashing

Greenwashing—where organizations misrepresent their environmental actions—has raised concerns about the credibility of corporate climate claims, particularly in the context of carbon offsetting. In response, global efforts have been initiated to build confidence around Voluntary Carbon Markets (VCMs) and ensure their role in delivering real, measurable climate benefits.

A trustworthy Voluntary Carbon Market will increasingly provide companies with the opportunity to use them to meet their voluntary climate commitments. Recently, several initiatives in the Voluntary Carbon Markets (VCM) have aimed to enhance market integrity by establishing common frameworks and standardizing carbon credit verification and certification.

The Integrity Council for the Voluntary Carbon Market

The Integrity Council for the Voluntary Carbon Market (ICVCM) is an independent, multi-stakeholder body that sets global benchmarks for high-integrity carbon credits through its Core Carbon Principles (CCPs). These principles establish clear criteria for environmental effectiveness, transparency, and sustainable development, helping to restore confidence in the voluntary carbon market.

In 2023, ICVCM finalized the CCPs, Assessment Framework, and Assessment Procedure. Since then, carbon crediting programs have begun applying for CCP evaluations to certify their alignment with these standards. In 2024, ICVCM launched assessments of over 100 active methodologies, aiming to identify and promote high-quality carbon credits. By early 2025, the first CCP-labelled credits and methodologies—such as Verra's cookstove methodology (VM0050)—were approved, marking a significant milestone. These labels are gaining market traction as a reference for quality, with buyers, investors, and exchanges increasingly prioritizing CCP-approved credits.

Looking ahead, ICVCM's role is expected to remain central to building a trusted, high-integrity carbon market that channels finance toward projects with measurable climate and social benefits.

Voluntary Carbon Markets Integrity Initiative (VCMI)

The Voluntary Carbon Markets Integrity Initiative (VCMI) enables companies to make credible and transparent climate claims when using carbon credits. Its flagship Claims Code of Practice, now in Version 3.0 (April 2025), offers a structured framework aligned with the Paris Agreement to guide responsible corporate use of carbon credits.

Under the latest version, companies follow a four-step process: meeting foundational criteria (GHG disclosures, science-based targets, policy alignment), selecting a VCMI claim tier (Silver, Gold, Platinum), using high-quality credits that meet ICVCM's Core Carbon Principles (CCPs) or CORSIA eligibility, and securing third-party verification through the Monitoring, Reporting & Assurance (MRA) Framework.

In 2024, VCMI also introduced a Scope 3 Flexibility Claim (Beta) to support companies tackling complex value chain emissions, allowing up to 50% of Scope 3 emissions to be offset with CCP-aligned credits—phasing out within 10 years or by 2035.

Together with ICVCM, VCMI plays a vital role in strengthening both demand- and supply-side integrity, promoting greater transparency and trust in the voluntary carbon market.

World Bank's role in scaling High-Integrity Carbon Markets

The World Bank has significantly expanded its interventions to enhance both the supply and credibility of high-integrity carbon markets through its Forest Carbon Partnership Facility (FCPF). By the first quarter of 2025, the FCPF has facilitated payments for over 35 million verified emission reductions (carbon credits) across 15 participating countries, surpassing its earlier 2024 target of 24 million credits. These credits, which are generated through forest conservation and sustainable land-use practices, are expected to scale up to 80 million by the end of 2025 and reach 126 million by 2028. Under favourable market conditions, these credits could potentially generate up to USD 2.5 billion in revenue for participating countries.

To strengthen market confidence and address investment risks, the World Bank's Multilateral Investment Guarantee Agency (MIGA) launched a carbon market insurance mechanism during COP29 in November 2024. This tool is designed to de-risk private investment in carbon credit projects by offering dispute resolution processes and compensation for undelivered credits—two key concerns for buyers of carbon credits.

Looking ahead, the World Bank anticipates that carbon markets could channel up to USD 50 billion annually to developing countries by 2028. Forest carbon credits are expected to play a pivotal role in this expansion, aligning climate action with sustainable development goals and reinforcing the credibility of voluntary carbon markets worldwide.

U.K. and U.S backing high-integrity voluntary carbon markets

In an effort to strengthen trust and transparency in voluntary carbon markets, both the United Kingdom and the United States have taken significant steps toward promoting high-integrity practices. In April 2025, the UK government released six draft integrity principles for voluntary carbon and nature markets, now under public consultation, which emphasize the need for companies to prioritize ambitious internal emissions reductions before using carbon credits, rely on high-integrity credits aligned with standards like the ICVCM's Core Carbon Principles (CCPs), ensure transparent disclosure of credit use, integrate credits into credible net-zero transition plans, make accurate and non-misleading environmental claims, and collaborate to support robust carbon markets. These principles are designed to align with and reinforce international best practices, including those set out by the ICVCM and the Voluntary Carbon Markets Integrity Initiative (VCMI). Meanwhile, the US government has expressed strong support for high-integrity carbon markets. Federal agencies such as the Commodity Futures Trading Commission and key market actors have endorsed the ICVCM's CCPs as the baseline for credit quality and market governance, signaling alignment with global standards and a shared commitment to scaling credible, transparent, and environmentally sound voluntary carbon markets.

France's High-Integrity Carbon Credit Charter

As of April 2025, France introduced the Charter for Paris-Aligned and High-Integrity Use of Carbon Credits, setting a global precedent for the credible, responsible use of carbon credits by companies. The Charter outlines stringent expectations for corporate climate action aligned with the Paris Agreement. Companies are required to prioritize direct emissions reductions along a validated net-zero pathway, using carbon credits solely to address residual emissions. Only credits aligned with Article 6.4 of the Paris Agreement or those meeting the Integrity Council for the Voluntary Carbon Market's (ICVCM) Core Carbon Principles (CCPs) are permitted. Signatories must publicly report emissions across all three scopes, maintain transparent, time-bound transition plans, and clearly delineate credit use from gross emissions. Independent validation of net-zero targets is mandatory. Importantly, the Charter also calls for channeling a portion of carbon credit-related financing toward adaptation in least developed countries and small island developing states. This initiative, which builds on outcomes from COP29, closely aligns with global best practices including those from the ICVCM and the Voluntary Carbon Markets Integrity Initiative (VCMI), and reinforces the principle that carbon credits must not serve as a substitute for real decarbonization.

EU Carbon Removal Certification

The EU carbon removal certification framework aims to scale up carbon removal activities and fight greenwashing by empowering businesses to show their action in this field. This voluntary framework sets rules for the independent verification of carbon removals, as well as rules to recognize verification schemes that can be used to demonstrate compliance with the EU framework. As the framework only recognizes activities that remove carbon, reduction credits are unable to be certified under this framework.

In February 2024, the European Parliament and the Council of the EU reached a provisional agreement on the Carbon removals and carbon farming (CRCF) Regulation, establishing the first EU-wide voluntary framework for certifying carbon removals, carbon farming and carbon storage in products generated in Europe. The regulation establishes EU quality criteria and outlines monitoring and reporting processes to facilitate investment in innovative carbon removal technologies, as well as sustainable carbon farming solutions, while addressing greenwashing.

The following projects can be certified under the CRCF Regulation:

1. Permanent Carbon Removals
2. Carbon Farming and Carbon storage in products
3. Carbon storage in long-lasting products

The high-quality carbon removals should meet the EU quality criteria for: quantification, additionality, long-term storage, and environmental sustainability.

New Technologies & Innovation, transforming transparency & trust

One of the most pressing challenges in the voluntary carbon market is the lack of transparency. Carbon credits are often traded in a decentralized and non-standardized manner, making it difficult to trace the origin and history of these credits. This opacity can result in double-counting, where the same carbon credits are sold multiple times, undermining the environmental impact of these transactions.

The continuing growth of the VCM is attracting new technologies and innovation with traceability and quantification platforms. For example, the application of blockchain technology to the VCM is useful in providing auditable, traceable, and reproducible records that document the emissions process and life cycle of carbon credits. Each carbon credit is recorded as a transaction on the blockchain. This transaction includes detailed information about the credit's origin, the methods used for emission reductions, and its transfer history. Because the blockchain is immutable and decentralized, all participants can trust the information on it. This solves the problem of double counting as each credit's unique identifier prevents it from being duplicated or sold multiple times. Blockchain technology has the potential to revolutionize the voluntary carbon market by enhancing transparency and traceability. Key benefits of using blockchain include Enhanced Transparency, Reduced Fraud and Double-Counting, Improved Trust and Efficiency, Lower Transaction Costs, among others.

Challenges in the Advisory Market

Data Quality and Availability Issues

One of the foundational challenges in the ESG ecosystem is the lack of consistent, high-quality, and comparable data—particularly from small, unlisted, or emerging market companies. ESG disclosures are often fragmented, based on differing methodologies, or limited to qualitative narratives. This lack of standardization hampers the ability to perform meaningful assessments, conduct peer benchmarking, or meet the increasing demand for quantifiable metrics from investors and regulators. Bridging these data gaps through capacity-building and tool-based solutions remains a priority for advisory firms.

Complex and evolving regulatory landscapes

Navigating the rapidly shifting global ESG regulatory environment poses a structural challenge for both clients and advisory providers. Diverging standards (such as the CSRD in Europe, BRSR in India, and SEC disclosures in the U.S.) require tailored compliance strategies and constant adaptation. For multinational clients, ESG advisors must synthesize cross-border requirements into coherent reporting and governance models. This complexity requires deep technical expertise, continuous monitoring of regulatory developments, and the ability to interpret new rules across jurisdictions—making ESG advisory both resource-intensive and dynamic. Ensuring regulatory alignment while maintaining strategic clarity for clients remains a core operational challenge.

Challenges to Adoption of VCM

Despite the inherent promise and potential opportunities, associated with the VCM, fundamental challenges impede further development and adoption of the VCM which occur over the lifecycle of the carbon credit.

Asymmetry remains significant hurdle

Increased Scrutiny in recent years has spurred positive developments in the carbon credit market. Improved methodologies, redesigned processes, and stricter governance protocols are raising the bar for credit quality. However, despite these advances, asymmetry among the frameworks creates hurdles. The VCM relies on a complex interplay of standards developed by various organizations, including Verra, Gold Standard, and the American Carbon Registry (ACR). These standards are constantly evolving, with increased emphasis on comprehensive reporting requirements, data transparency, accuracy, and traceability. The voluntary carbon market currently lacks a single, universally accepted standard for verification methodologies. This can create confusion and inconsistencies in verification practices.

Independent organizations that set standards for projects that produce carbon offsets and certify carbon credits play a significant role in today's market. At COP28, six of the largest independent crediting programs, including Verra, Gold Standard, and the Global Carbon Council, agreed to collaborate and better coordinate their approaches to certification. Initiatives like the development of core carbon principles (CCP) by Integrity Council for Voluntary Carbon Market (ICVCM) and Voluntary Carbon Market Integrity Initiative (VCMII) are working to address this by providing standardized frameworks.

The integrity of carbon credits remains a critical area of concern, buyer-side risks

Studies show that market participants identified negative public perception and the quality of carbon credits as the primary obstacles confronting the voluntary carbon market. The VCM faces challenges in building trust and maintaining market confidence. Possibility of Greenwashing has raised concerns about the market's integrity and reliability, creating a negative perception that could hinder its growth. Corporations are under great public scrutiny and sometimes legal pressure. Civil society and the media are increasingly aware of misleading climate claims and are calling out corporate greenwashing that remains widespread. Buyers are exposed to reputational risks, where any shortcomings in project integrity can result in fines, penalties, and reputational damage. For example, funded projects fail to deliver on environmental promises or where a project causes social or ecological harm. The risk of double counting prevails alongside.

Financing and Verification Delay is a Barrier on the Supply Side

The carbon credit market continues to experience supply-side barriers, with verification delays and limited early-stage financing emerging as key bottlenecks. Small and mid-sized developers, particularly those working on nature-based and community-led projects in the Global South, struggle to access upfront capital. Rising compliance and verification costs, driven by new standards and heightened scrutiny, further strain resources.

Verification challenges persist, especially in Forestry and Land Use, due to updated methodologies, project complexity, and a shortage of accredited auditors. While Verra’s ongoing methodology revisions and the rollout of digital MRV tools show promise, these solutions have yet to scale. As a result, the issuance of high-quality credit remains constrained, with recovery expected to accelerate gradually from late 2025 onward as digital systems mature and financing options improve.

Establishing an effective policy

Carbon credit markets, established through Cap-and-Trade policies, hold immense potential for driving cost-effective emission reductions and mitigating climate change. However, these markets face several challenges that require careful consideration and innovative solutions.

One of the most critical hurdles lies in setting the right "cap" on emissions. A cap that is too high essentially renders the program ineffective as companies can meet compliance requirements without significant emission reductions. This can lead to a surplus of carbon credits, driving down prices and hindering investment in emission reduction projects. Conversely, a cap that is too low creates a situation of scarcity, where demand for credits outstrips supply. This scenario drives carbon prices up very quickly, potentially leading to economic disruption as industries struggle with high compliance costs. Ultimately, these costs might be passed on to consumers through higher prices for goods and services. Finding the optimal cap level requires a data-driven and collaborative approach. Governments can leverage scientific analysis to determine the level of emission reduction needed to achieve established climate goals. Economic modeling can further inform policy decisions by predicting the impact of different cap levels on industries and consumers, ensuring a balance between environmental ambition and economic feasibility.

Ensuring market stability and addressing concerns surrounding price volatility is also crucial for attracting long-term investments in emission reduction projects. Complexities in market design and administrative procedures can create

barriers to entry for new participants, hindering market efficiency. Streamlining Monitoring, Reporting, and Verification (MRV) processes through standardized methodologies and innovative technologies can reduce costs and improve data transparency.

Navigating U.S. policy shifts: Implications for Voluntary Carbon Markets

The U.S. withdrawals from the Paris Agreement in 2020 and 2025—both initiated under the Trump administration—introduced periods of uncertainty into climate policy and raised concerns over long-term international coordination. In accordance with the Paris Agreement's formal process, withdrawals become effective one year after official notification, which itself can only occur three years after the Agreement's entry into force. The first withdrawal became effective on November 4, 2020, while the 2025 withdrawal, initiated via executive order, is expected to take effect in January 2026 following the required cooling-off period.

Despite these reversals, voluntary carbon markets (VCMs) have shown resilience. While market sentiment experienced temporary caution, sustained private-sector commitments and broader international cooperation have helped maintain momentum. Although some project developers and investors remain cautious about U.S. policy stability, others continue to view the global low-carbon transition as a long-term structural trend. Overall, the impact on carbon markets has been mixed.

Geopolitical developments and their implications for regional engagement

Recent geopolitical tensions between India and Turkey pose emerging challenges for cross-border business operations, including potential disruptions in trade relations, regulatory uncertainties, and reputational considerations. These tensions may affect strategic partnerships, client perceptions, and future market access, requiring careful monitoring and risk management by businesses operating across both jurisdictions.

By recognizing and addressing these challenges, while simultaneously capitalizing on the existing growth of drivers, carbon offset, and credit markets can become a powerful tool in combating climate change and fostering a transition towards a more sustainable future.

Competitive scenario in the assurance and third-party verification and validation market

The carbon offset market is experiencing a period of dynamic growth, leading to a more dynamic environment for third party validation and verification bodies like Earthood. The market landscape consists of both established firms expanding their services and new entrants specializing in certifications and accreditations from various standard-setting bodies.

The role of third-party validation and verification body is likely to remain central to established carbon offset standards for the foreseeable future. These VVBs assess carbon offset projects, ensuring alignment with the standards and regulations. Validated and Verified projects fosters transparency and enhances buyers' confidence in the market. Established bodies verify VVB competence and allow them to validate and verify projects and therefore accreditation remains a cornerstone to the VVBs. Players (VVBs) need to compulsorily obtain accreditations from recognized bodies to be able to operate in the industry.

Several bodies provide accreditations for the validation and verification bodies in the carbon offset markets. Earthood holds accreditation from a diverse range of organizations including Global Accreditation Bureau (GAB), Verified Carbon Standards (VCS), Golds Standards, Climate Action Reserve (CAR), Global Carbon Council (GCC), International Carbon Registry (ICR), Social Carbon, CCBA, among others. All other major players, considered for peer benchmarking, are registered with these major standards.

Players in the market gains credibility in the market by aligning their operating practices with the highest standards in the industry. They position themselves within the evolving market by emphasizing their diverse accreditation portfolio, project-specific expertise, and commitment to implementing efficient processes. Earthood has outlined plans to actively invest in and developing technologies like Digital Monitoring, Reporting, and Verification (DMRV) system, which holds the potential to enhance operational efficiency and productivity in the future.

Growing public awareness against the greenwashing and integrity of the quality of the credits generated presents opportunities for growth for validation and verification services. While limited brand awareness can hinder penetration in new markets, developing a strong reputation for expertise in specific project types or geographic regions could be a key advantage. New entrants may emerge, however, established client relationships built on trust and history of delivering high quality services can help Earthood maintain a strong position.

Currently, the validation and verification of carbon projects in India is primarily served by privately held entities. As the country transition towards a more structured carbon trading framework, including the development of the national emission trading system and initiatives like the Carbon Credit Trading Scheme (CCTS), there is expected to be an increasing demand for accredited VVBs.

CRISIL has considered the following players for the purpose of benchmarking operational and financial parameters. Among the range of other services, these players offer third-party verification and validation services to project developers across various industries, helping to ensure accuracy and compliance with standards and regulations. These players either operate in the same line of business or have a service portfolio like that of Earthood Services Private Limited. Please note the peers set considered below is an indicative list and not an exhaustive list of players present in

the Validation and Verification industry. Also, kindly note that the revenue numbers for all entities considered except Earthood also account for other non-carbon market related services. Revenue Numbers for Earthood correspond to FY24 (April to March cycle).

Kindly note that the following competitors are considered for this section:

1. TÜV SÜD AG
2. TÜV NORD Group
3. TÜV Rheinland AG
4. Applus Services, S.A.
5. Bureau Veritas
6. DNV GL
7. 4K Earth Science Private Limited
8. Carbon Check India
9. Epic Sustainability Services

Note: Data in this section is obtained from publicly available sources, including annual reports of players, regulatory filings, and/or company websites. The financials used in the competitive section are re-classified by CRISIL based on the annual report and financial filings by the players.

Operational overview of the players under review

Sr. No.	Company Name	Year of Incorporation	No. of Employees	VVB Status	Services Offered
1	Earthood	2012	70 +	Active	Auditing, Validation, Verification, and Certification, Compliance, Sustainability Advisory and Reporting
2	TÜV SÜD AG	1866	20000 +	Active	Auditing and System Certification, Testing Services, Product Certification, Inspection, Technical Advisory, Training, Risk Management,
3	TÜV NORD Group	1869	10000 +	Active	Certification - Management System, Food Safety, Laboratory Services, Product Certification, Third Party Inspection, Quality Assurance, Social Accountability
4	TÜV Rheinland AG		20000 +	Active	Testing and assessment, Certification and Auditing, Training and Qualification, Inspection and Supervision, Consulting and Project Management
5	Applus Services, S.A.	1996	25000 +	Active	Inspection and QA/QC, Engineering and consulting, Supervision and quality management, Non-destructive testing, Testing and analysis, Vendor surveillance, Energy efficiency, Certification service
6	Bureau Veritas	1828	80000 +	Active	Sustainability Assurance, Asset lifecylce solution, Energy Transition Conformity Assessment, Compliance, Testing, Inspection and Certification, Consulting and Training
7	DNV GL	1864	15000 +	Active	Advisory, Certification, Classification, Cyber security, Data and analytics, Inspection, Software, Testing, Training, Verification and assurance
8	4K Earth Science Private Limited	2018		Active	Auditing, Validation, Verification, Compliance, Assurance and Training
9	Carbon Check (India) Pvt. Ltd.	2012	50 +	Active	Auditing, Validation, Verification, Compliance, Assurance

Sr. No.	Company Name	Year of Incorporation	No. of Employees	VVB Status	Services Offered
10	Epic Sustainability Services Pvt. Ltd.	2010	100 +	Active	Auditing, Reporting, Assurance, Certification

Sr. No.	Company Name	Accrediation Scope							
		Agriculture	Chemical Processes/ Industrial Manufacturing	Energy Efficiency/ Fuel Switching	Forestry and Land Use	Household/ Community Devices	Renewable Energy	Transaportation	Waste Disposal
1	Earthood	☑	☑	☑	☑	☑	☑	☑	☑
2	TÜV SÜD AG	☑	☑	☑	☑	☑	☑	☑	☑
3	TÜV NORD Group	☑	☑	☑	☑	☑	☑	☑	☑
4	TÜV Rheinland AG	☑	☑	☑	☑	☑	☑	☑	☑
5	Applus Services, S.A.	☒	☒	☒	☒	☒	☑	☒	☑
6	Bureau Veritas	☑	☑	☑	☑	☑	☑	☑	☑
7	DNV GL	☑	☑	☑	☑	☑	☑	☑	☑
8	4K Earth Science	☑	☑	☑	☑	☑	☑	☒	☑
9	Carbon Check India	☑	☑	☑	☑	☑	☑	☑	☑
10	Epic Sustainability Services	☑	☑	☑	☑	☑	☑	☑	☑

Players in the verification and validation industry cater to projects across all the major sectors. While major players offer similar services, Earthood specializes in the Carbon Offset Market validation and verification area across different programs.

Earthood possesses a diverse range of accreditations, including those from the United Nations Framework Convention on Climate Change (UNFCCC) as a Designated Operational Entity (DOE), the ANSI National Accreditation Board (ANAB), and the Global Accreditation Bureau (GAB). These accreditations enable Earthood to certify carbon offset projects across diverse array of programs and registries—including the Clean Development Mechanism (CDM), Verified Carbon Standards (VCS), Gold Standards (GS), and several others. In total the company can provide validation and verification services for 23 registries and standards, allowing it to operate in multiple regulatory environments.

Earthood also provides services across multiple sectors and is accredited to operate in 11 out of 15 sectors classified by the UNFCCC. Its sectoral coverage includes renewable energy, energy demand, forestry and agriculture, waste, and others.

Earthood has been ranked as the “Best Verification Company” by Environmental Finance, an online news and analysis service, in the Voluntary Carbon Market Rankings 2023 and 2024.

Growth opportunities in the market

As the global carbon market continues to evolve, various strategic pathways for growth have emerged. These pathways are driven by emerging markets, increasing regulatory frameworks, and growing demand for sustainability and carbon-related advisory services.

Geographic expansion for market penetration

Expanding into diverse regions presents an opportunity to tap into diverse project portfolios, such as Latin America, offer opportunities for nature-based projects and presents growth opportunities. Increased geographic presence in diverse regions could enable more effective service delivery and penetration into new carbon markets.

Tapping opportunities into ESG advisory sector

With the rising global focus on environmental, social, and governance (ESG) factors and growing emphasis on corporate sustainability commitments, there is a growing market for ESG advisory services to support organizations in aligning with global ESG frameworks and regulatory standards. Companies in this sector are expanding their offerings beyond validation and verification to include a wide range of sustainability advisory services such as energy audits, water audits, environmental due diligence, and compliance with extended producer responsibility (EPR) regulations.

As a part of this, Earthood has undertaken notable projects including certifying the Delhi Metro Rail Corporation's headquarters, Metro Bhawan, as carbon neutral. Furthermore, Earthood has also conducted environmental audits for the Indian Army's Pulgaon military railway station to provide recommendations for CO_2 emissions reductions.

Opportunities from Transitioning Carbon Markets

The transition from the Clean Development Mechanism (CDM) to Article 6.4 of the Paris Agreement—also known as the Paris Agreement Crediting Mechanism (PACM)—marks a significant evolution in the global carbon market. This newly operationalized, UN-governed system enables the generation and trade of carbon credits to support countries in achieving their Nationally Determined Contributions (NDCs). By broadening the scope to include sectors previously excluded under the CDM, the PACM is expected to expand the overall market for emission reductions (ERs) and increase the number of eligible carbon credit-generating projects.

Although the PACM currently lacks finalized standards for credit quality, the Article 6.4 Supervisory Body has committed to fast-tracking the development of key methodological frameworks—such as those addressing additionality, leakage, and reversals—to enhance transparency and environmental integrity. The mechanism introduces a potential "quality floor" for the voluntary carbon market, which could help standardize practices and strengthen buyer confidence. As implementation advances, the mechanism is poised to play a central role in shaping the future scale and credibility of voluntary carbon markets and create new opportunities for project developers, validators, and verifiers.

Financial overview of the companies under review

Across the Third-Party Validation and Verification segment, CRISIL has considered consolidated level numbers for available players as of CY24. Total revenue across all business segments, including non-carbon market services, of the players have been considered for the purpose of analysis in this section.

Key Financials

Table 23 Total income across all business segments of the players (CY 21-24)

Sr. No.	Company Name	Revenue for CY24 (Rs. Lakhs)	Revenue for CY23 (Rs. Lakhs)	Revenue for CY22 (Rs. Lakhs)	Revenue for CY21 (Rs. Lakhs)	CAGR CY21-23
1	Earthood[3,5,6]	3379.58	4,717.71	3,254.67	1,012.67	115.84%
2	TÜV SÜD AG	3,037,168.17	2,889,191.97	2,540,090.70	2,260,643.44	13.05%
3	TÜV NORD Group	1,417,168.00	1,457,158.49	1,287,920.82	1,160,536.52	12.05%
4	TÜV Rheinland AG	2,403,694.07	2,245,053.00	1,973,132.30	1,777,376.13	12.39%
5	Applus Services, S.A.[5]	1,445,511.36	1,894,039.14	1,818,596.00	1,505,824.32	12.15%
6	Bureau Veritas	5,527,752.35	5,400,312.37	5,012,760.27	4,221,681.49	13.10%
7	DNV GL	2,628,499.11	2,573,552.46	2,114,068.20	1,813,793.86	19.12%
8	4K Earth Science[3]	-	898.26	681.33	404.01	49.11%
9	Carbon Check India[3]	-	3946.99	2,811.80	919.64	107.17%
10	Epic Sustainability Services[3]	-	675.55	653.48	425.10	26.06%

Source: *Company filings, Crisil Research*

Note: 1) The financial numbers for all the entities represented above have been converted to INR considering applicable exchange rates
2) The revenue numbers for all entities except Earthood, 4K Earth Science, Carbon Check India, and Epic Sustainability Services, also account for other non-carbon market related services
3) Numbers for Earthood, 4K Earth Science, Carbon Check India, and Epic Sustainability Services correspond to fiscal year (April to March cycle)
4) These figures have been obtained as is from the latest financial disclosures available of the entities considered.
5) Numbers for Applus Services, S.A are corresponds to the latest available figures till 30th September 2024
6) Numbers for Earthood are corresponds to the latest available figures till 31st December 2024
6) '-' represents that the company has not reported the numbers for the said year

The revenue numbers of the players, except Earthood, 4K Earth Science, Carbon Check India, and Epic Sustainability Services, correspond to the overall business offerings of the players and not just assurance and 3rd party verification and validation services. Earthood has seen a four-fold increase in its revenue from FY21 to FY24 driven by diversification in its geographical presence and service offerings.

Table 24 Earnings Before Interest Tax Depreciation and Amortisation (EBITDA) across all business segments of the players

Sr. No.	Company Name	EBITDA CY-24 (Rs. Lakhs)	EBITDA CY-23 (Rs. Lakhs)	EBITDA CY-22 (Rs. Lakhs)	EBITDA Margin (CY 23)	EBITDA Margin (CY 22)
1	Earthood[3,5,7]	2168.14	2,729.42	1,394.40	57.85%	42.84%
2	TÜV SÜD AG[7]	370057.99	369,144.36	335,331.36	12.78%	13.20%
3	TÜV NORD Group	317268.48	144,307.74	128,011.42	9.90%	9.94%
4	TÜV Rheinland AG	-	229,443.79	288,280.29	10.22%	14.61%
5	Applus Services, S.A.[8]	845349.56	474,430.12	432,559.71	25.05%	23.79%
6	Bureau Veritas[9]	421119.14	828,941.23	978,883.69	15.35%	19.53%
7	DNV GL	-	438,727.40	351,260.82	17.05%	16.62%
8	4K Earth Science[3,5]	-	106.62	103.92	11.87%	15.25%
9	Carbon Check India[3,5]	-	1,022.14	629.04	25.90%	22.37%
10	Epic Sustainability Services[3,5]	-	31.99	34.13	4.74%	5.22%

Source: *Company filings, Crisil Research*

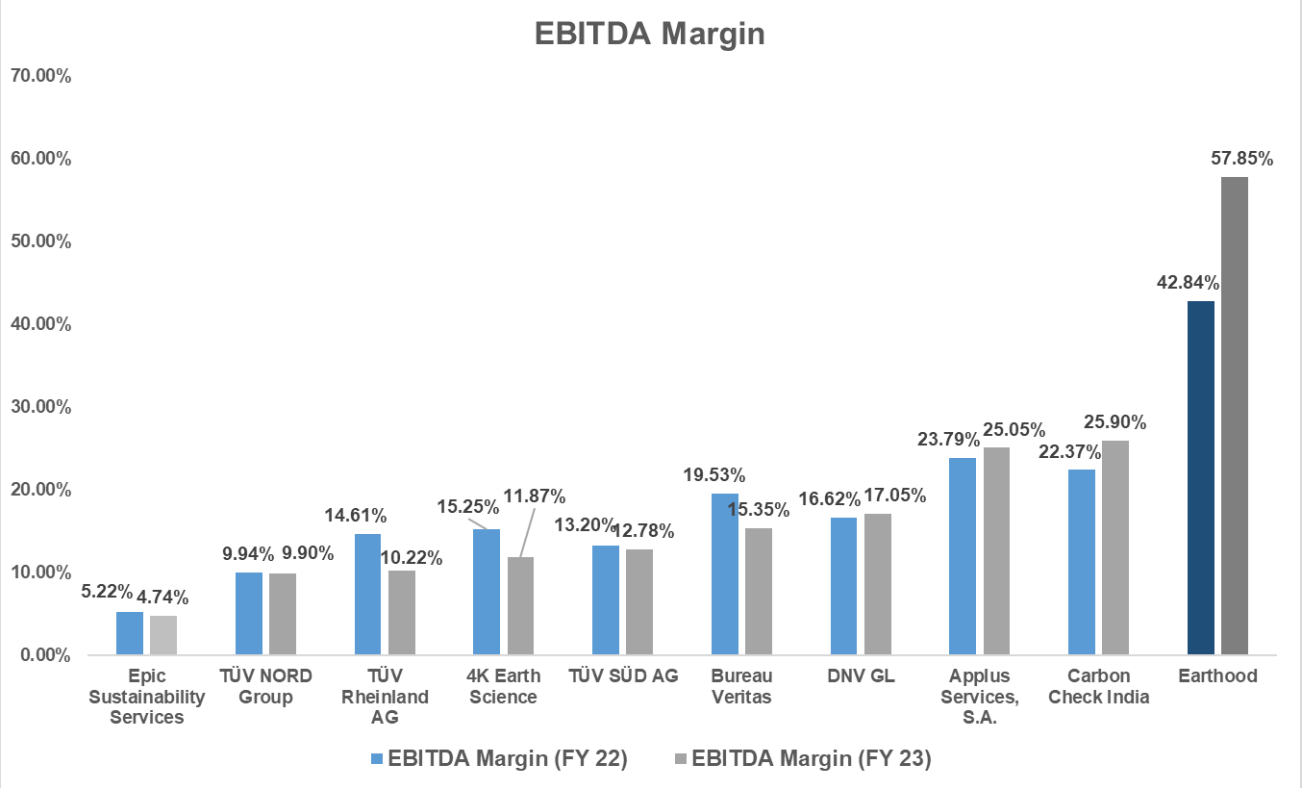
Note:
1) The financial numbers for all the entities represented above have been converted to INR considering applicable exchange rates
2) The revenue numbers for all entities except Earthood, 4K Earth Science, Carbon Check India, and Epic Sustainability Services, also account for other non-carbon market related services
3) Numbers for Earthood, 4K Earth Science, Carbon Check India, and Epic Sustainability Services correspond to fiscal year (April to March cycle)
4) These figures have been obtained as is from the latest financial disclosures available of the entities considered.
5) The financial data for Earthood, 4K Earth Science, Carbon Check India, and Epic Sustainability Services presented corresponds to the latest available figures for the fiscal year (FY23 & FY24)
6) Numbers for Applus Services, S.A are corresponds to the latest available figures till 30th September 2024
7) Numbers for Earthood are corresponds to the latest available figures till 31st December 2024
8) EBITDA = Total income – Total expenses + Finance costs + Amortization and depreciation
9) In case of TÜV SÜD AG, EBITDA: Earnings before interest, before other financial result, before amortization & depreciation and before income tax, but after income/loss from participations.
10) In case of Applus Services, S.A., EBITDA: Total Revenue – operating expenses (procurements, staff costs) – other operating expenses + Depreciation and amortization charge
11) In case of Bureau Veritas, EBITDA: Total operating income – operating expenses (Supplies, Other purchases and external charges, Taxes other than on income, Wages and salaries, Payroll taxes, Other expenses) + Depreciation, amortization and impairment
12) '-' represents that the company has not reported the numbers for the said year

Earthood recorded a robust EBITDA margin of 57.85% during FY24 which indicates strong operational efficiencies.

Managing employee costs a critical factor

Underscoring the service-driven nature of the industry, employee costs constitute a substantial share of total revenue. It is generally understood that in service sectors, employee-related expenses—including salaries, benefits, and training—can account for anywhere from 15% to 30% of total revenue. This range varies depending on factors such as company size, operational efficiency, and specific business models. In the Validation and Verification industry, the demand for highly skilled employees is even more pronounced. These services require specialists with advanced expertise in areas such as environmental science, carbon accounting, and regulatory compliance. The need for ongoing training, certifications, and deep technical knowledge adds to the cost, making employee-related expenses a crucial factor in maintaining service quality and meeting industry standards.

EBIDTA across all business segments of the players (CY23)



Source: *Company filings, Crisil Research*

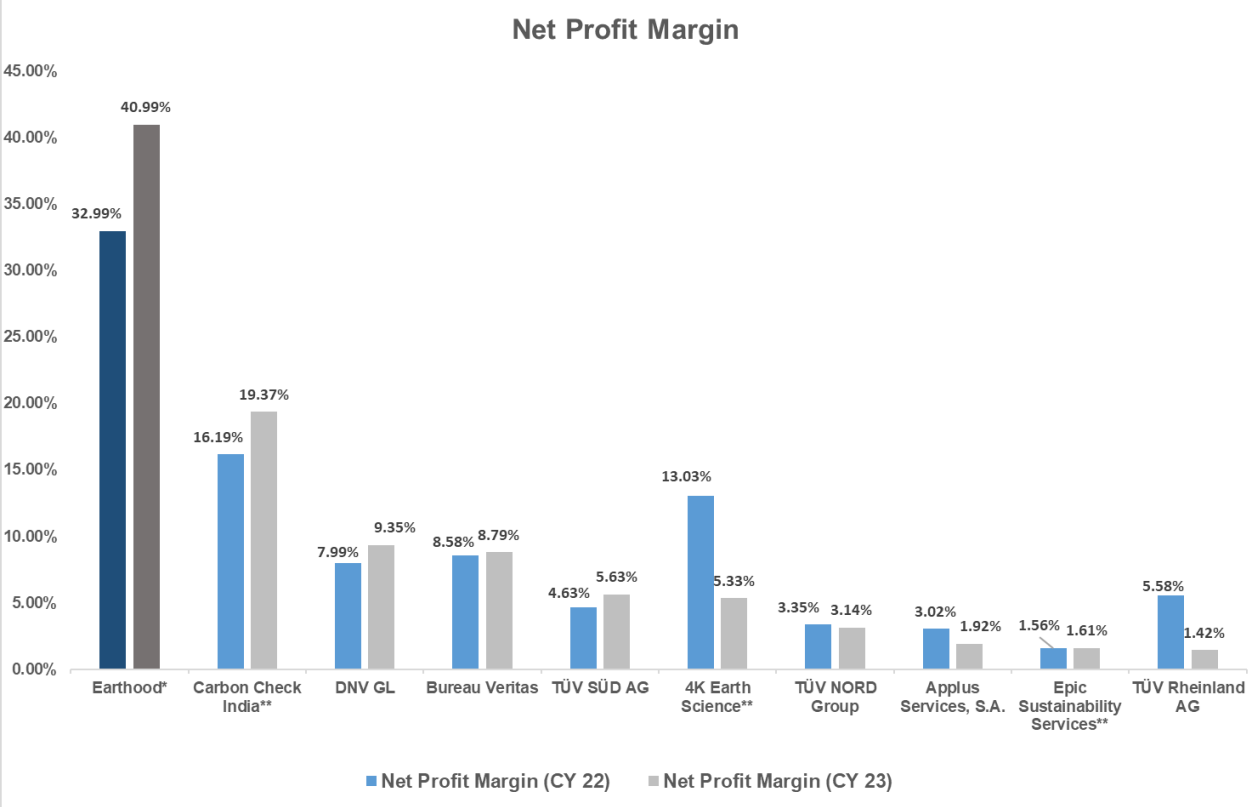
Table 25 Net Profit across all business segments of the players

Sr. No.	Company Name	Net Profit CY-24 (Rs. Lakhs)	Net Profit CY-23 (Rs. Lakhs)	Net Profit CY-22 (Rs. Lakhs)	Net Profit Margin (CY 23)	Net Profit Margin (CY 22)
1	Earthood[3,5]	814.05	1,933.60	1,073.58	40.99%	32.99%
2	TÜV SÜD AG	141628.22	162,714.34	117,632.11	5.63%	4.63%
3	TÜV NORD Group	117451.34	45,794.70	43,114.92	3.14%	3.35%
4	TÜV Rheinland AG	-	31,940.05	110,117.32	1.42%	5.58%
5	Applus Services, S.A.	521872.11	36,353.04	54,912.73	1.92%	3.02%
6	Bureau Veritas	236794.95	474,798.25	429,898.35	8.79%	8.58%
7	DNV GL	-	240,542.52	168,831.54	9.35%	7.99%
8	4K Earth Science[3]	-	47.90	88.79	5.33%	13.03%
9	Carbon Check India[3]	-	764.54	455.09	19.37%	16.19%
10	Epic Sustainability Services[3,5]	-	10.85	10.21	1.61%	1.56%

Source: *Company filings, CRISIL Research*
Note: 1) The financial numbers for all the entities represented above have been converted to INR considering applicable exchange rates

2) The revenue numbers for all entities except Earthood, 4K Earth Science, Carbon Check India, and Epic Sustainability Services, also account for other non-carbon market related services.
3) Numbers for Earthood, 4K Earth Science, Carbon Check India, and Epic Sustainability Services correspond to fiscal year (April to March cycle)
4) Numbers for Applus Services, S.A are corresponds to the latest available figures till 30th September 2024
5) Numbers for Earthood are corresponds to the latest available figures till 31st December 2024
6) These figures have been obtained as is from the latest financial disclosures available of the entities considered
7) The financial data for Earthood, 4K Earth Science, Carbon Check India, and Epic Sustainability Services presented corresponds to the latest available figures for the fiscal year (FY23 & FY24)
8) '-' represents that the company has not reported the numbers for the said year

Net Profit across all business segments of the players (CY23)



Source: Company filing, CRISIL Research

Earthood recorded a strong net profit margin of 41% during FY24 which indicates company's prudent financial management.

Table 26 Financial snapshot of key players considered

Sr. No.	Company Name	Revenue CY 24 (Rs. Lakhs)	Revenue CY 23 (Rs. Lakhs)	Revenue CAGR (CY21-23)	EBIDTA CY 23 (Rs. Lakhs)	EBITDA Margin (FY 23)	Net Profit for CY 23 (Rs. Lakhs)	Net Profit Margin (CY 23)
1	Earthood	3379.58	4,717.71	115.84%	2,729.42	57.85%	1,933.60	40.99%
2	TÜV SÜD AG	3,037,168.17	2,889,191.97	13.05%	369,144.36	12.78%	162,714.34	5.63%
3	TÜV NORD Group	1,417,168.00	1,457,158.49	12.05%	144,307.74	9.90%	45,794.70	3.14%
4	TÜV Rheinland AG	2,403,694.07	2,245,053.00	12.39%	229,443.79	10.22%	31,940.05	1.42%

5	Applus Services, S.A.	1,445,511.36	1,894,039.14	12.15%	474,430.12	25.05%	36,353.04	1.92%
6	Bureau Veritas	5,527,752.35	5,400,312.37	13.10%	828,941.23	15.35%	474,798.25	8.79%
7	DNV GL	2,628,499.11	2,573,552.46	19.12%	438,727.40	17.05%	240,542.52	9.35%
8	4K Earth Science	-	898.26	49.11%	106.62	11.87%	47.90	5.33%
9	Carbon Check India	-	3946.99	107.17%	1,022.14	25.90%	764.54	19.37%
10	Epic Sustainability Services	-	675.55	26.06%	31.99	4.74%	10.85	1.61%