

## Climate Exchanges and Carbon Markets Since 2022: New Developments and Emerging Trends



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*A series of five White Papers on climate change and carbon credits was published in 2022. Since then, climate exchanges and carbon markets have undergone major changes driven by new international rules, technological innovation, geopolitical competition, and evolving market expectations.*

*This Discussion Paper reviews the key developments since 2022 and examines the future direction of global carbon markets.*

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## **Introduction**

Since 2022, climate exchanges and carbon markets have undergone significant transformation. New international rules, technological innovation, growing geopolitical competition, and changing market expectations have reshaped both compliance and voluntary carbon markets. These developments have occurred against the backdrop of increasing global urgency to reduce greenhouse gas emissions while balancing economic growth, energy security, and industrial competitiveness.

The carbon market ecosystem now stands at an important turning point. The finalization of Article 6 of the Paris Agreement has established a clearer framework for international carbon trading. At the same time, the voluntary carbon market has experienced a major credibility crisis that forced participants to reconsider standards, transparency, and governance mechanisms. Meanwhile, voluntary and compliance markets are gradually converging, while carbon pricing systems are becoming more interconnected across regions and countries.

This discussion paper reviews the major developments since 2022 and explores the future direction of global carbon markets.

### **I. Article 6 of the Paris Agreement Has Been Finalized**

#### **1. About Article 6 of the Paris Agreement**

Article 6 of the Paris Agreement establishes the framework for international cooperation in achieving climate goals through carbon markets and other cooperative approaches. Although the Paris Agreement was adopted in 2015, many of the detailed implementation rules remained unresolved for years. Important technical negotiations continued through the COP26 and COP28 climate conferences, leading to substantial progress in operationalizing the framework.

COP26 was held in Glasgow, Scotland, from October 31 to November 13, 2021. COP26 finalized much of the technical rulebook for the Paris Agreement, including progress on Article 6 carbon market rules.

COP28 was held in Dubai, United Arab Emirates, from November 30 to December 13, 2023. COP28 advanced implementation, including debates over global carbon trading standards, language on the fossil fuel transition, and the scaling of climate finance.

Article 6 contains three major components:

- Article 6.2 enables countries to trade internationally transferred mitigation outcomes (ITMOs), allowing one country to count emission reductions achieved elsewhere toward its own climate targets.
- Article 6.4 establishes a centralized global carbon market supervised by the United Nations, often viewed as the successor to the Kyoto Protocol’s Clean Development Mechanism.
- Article 6.8 promotes non-market approaches such as technology transfer, financing cooperation, and capacity building.

The framework also introduces accounting rules intended to prevent “double counting,” where multiple entities claim the same emissions reduction.

## 2. Why the Finalization is Significant

Although the Paris Agreement was adopted in 2015, disagreements over accounting rules, double counting, verification systems, and credit quality delayed implementation for several years. Important negotiations concluded during COP26 and subsequent technical negotiations.

The finalization of Article 6 is significant because it:

- Creates clearer international standards for carbon trading
- Encourages cross-border investment in decarbonization projects
- Expands opportunities for developing countries to attract climate finance
- Increases the potential scale of global carbon markets
- Improves transparency and accountability mechanisms

The establishment of internationally recognized accounting systems may also help integrate fragmented regional carbon markets over time.

The finalization of Article 6 is significant because it creates a clearer legal and institutional basis for cross-border carbon trading. It provides confidence for governments, investors, and corporations to participate in international carbon markets.

## 3. Its Potential Impacts

Potential impacts of the finalized Article 6 include:

- Expansion of international carbon credit trading

- Increased investment flows into developing countries with large emissions-reduction potential
- Greater standardization and transparency in carbon accounting
- Stronger integration between national climate policies and international market mechanisms

Article 6 could eventually support the creation of a more interconnected global carbon market. However, concerns remain regarding environmental integrity, verification standards, and unequal bargaining power between developed and developing countries.

## II. The Voluntary Carbon Market Shook Up

### 1. The Crisis

Beginning in 2022 and intensifying in 2023, the voluntary carbon market faced a major credibility crisis. Investigative reports and academic studies questioned the environmental validity of many carbon credits, particularly forestry and avoided-deforestation projects.

Critics argued that:

- Some projects overstated emissions reductions
- Certain credits would have been generated even without carbon financing
- Permanence risks, such as forest fires or illegal logging, undermined long-term climate benefits
- Verification methodologies were inconsistent or weak

As confidence declined, many corporations became more cautious about relying heavily on offsets to support net-zero claims.

### 2. What Came Out of the Crisis?

The crisis triggered significant reforms and reassessment within the industry.

Key developments included:

- Increased emphasis on high-integrity carbon credits
- New initiatives to strengthen standards and methodologies
- Greater scrutiny from regulators, investors, NGOs, and the media
- More conservative corporate climate claims
- Stronger demand for transparency and independent verification

Organizations such as the Integrity Council for the Voluntary Carbon Market (ICVCM) and the Voluntary Carbon Markets Integrity Initiative (VCMI) emerged as important efforts to improve governance and market credibility.

### 3. Looking Into the Future

The future of the voluntary carbon market will likely depend on whether it can restore trust and demonstrate measurable climate benefits.

Several trends are emerging:

- A shift from low-cost credits toward higher-quality projects
- Greater focus on carbon removal technologies rather than simple avoidance projects
- More integration with national climate accounting systems
- Stronger digital monitoring and satellite-based verification
- Growing demand for nature-based solutions combined with biodiversity and social co-benefits

While the market may become smaller in volume than earlier optimistic projections suggested, it could become more credible and institutionally mature.

## **III. The Convergence of the Voluntary and Compliance Markets**

### 1. What Led to Convergence?

Historically, voluntary and compliance carbon markets operated separately. Compliance markets were driven by government regulations, while voluntary markets were primarily shaped by corporate sustainability commitments.

Several factors have pushed the two systems closer together:

- Governments increasingly recognize the role private capital can play in financing decarbonization
- Article 6 creates mechanisms linking national and international accounting systems
- Companies seek credits that align with official climate targets and regulatory expectations
- Investors demand more standardized and reliable carbon assets

## 2. How Does Convergence Work?

Convergence of the voluntary and compliance carbon markets occurs through several mechanisms:

- Governments may authorize voluntary credits for international transfer under Article 6
- Compliance systems increasingly recognize certain categories of high-quality offsets
- Common accounting standards and registries are emerging
- Financial institutions are treating carbon credits more like regulated environmental assets

As a result, distinctions between voluntary and compliance credits may gradually narrow.

## 3. Expected Trends

Several trends are likely to continue:

- Increasing regulatory oversight of voluntary markets
- Expansion of hybrid market systems
- Greater standardization of verification and disclosure requirements
- More integration between corporate net-zero strategies and national climate commitments

The market may evolve toward a layered structure in which premium, high-integrity credits command substantially higher prices than lower-quality offsets.

## 4. Preventing Another Market Crisis

The 2022-2023 crisis slowed market development, but it also paved the way for healthier, more credible long-term growth.

To avoid repeating past credibility problems, several measures are important:

- Stronger scientific methodologies
- Transparent and publicly accessible data systems
- Independent third-party verification
- Clear legal accountability for misleading climate claims
- Better monitoring technologies and real-time reporting

- Strong safeguards for local communities and ecosystems

Market credibility will depend not only on technical standards but also on public trust.

#### **IV. Is the Carbon Market Going Regional or Global?**

##### 1. Who Sets Up the Rules?

Carbon markets currently operate through a mixture of international institutions, national governments, and regional regulatory systems.

Important market actors include:

- The United Nations Framework Convention on Climate Change (UNFCCC)
- National governments
- Regional systems such as the European Union Emissions Trading System (EU ETS)
- Independent standards organizations
- Financial regulators and international development institutions

As markets expand, governance is becoming increasingly complex and multi-layered.

##### 2. Regional and National Forerunners

Several countries and regions are leading the development of carbon markets:

- The European Union remains the most advanced and influential compliance carbon market
- China has established the world's largest emissions trading system by volume of covered emissions
- California of the U.S. and Quebec of Canada operate linked regional systems
- Singapore is positioning itself as a carbon trading and climate finance hub
- Countries such as South Korea, Japan, and New Zealand continue expanding carbon pricing mechanisms

Developing countries are also emerging as important suppliers of carbon credits under the Article 6 framework.

##### 3. Impacts on Developed and Developing Countries

Carbon markets create both opportunities and challenges for countries around the world.

For developed countries:

- Carbon trading may reduce the cost of achieving climate targets
- New financial and technology sectors may emerge
- Industries may face competitiveness concerns under stricter carbon pricing

For developing countries:

- Carbon finance may support sustainable development and infrastructure investment
- Participation could attract foreign capital and technology transfer

However, there are concerns about unequal bargaining power, dependence on external financing, and the risk of “carbon colonialism.”

The distribution of benefits will depend heavily on governance quality and institutional capacity.

#### 4. Contribution to the Global Climate

If designed effectively, carbon markets can:

- Lower the global cost of emissions reduction
- Encourage innovation and technology diffusion
- Mobilize private-sector climate finance
- Accelerate international cooperation

However, carbon markets alone cannot solve climate change. They must complement direct emissions regulations, industrial policy, renewable energy expansion, and broader structural economic transformation.

#### 5. Pros and Cons of Carbon Market Globalization

There are potential advantages:

- Greater market liquidity
- More efficient allocation of capital
- Lower compliance costs
- Faster international diffusion of clean technologies

There are also potential disadvantages:

- Regulatory fragmentation

- Market volatility and speculation
- Risks of weak oversight and greenwashing
- Uneven distribution of benefits between countries

The future system may ultimately evolve into a partially interconnected network of regional markets rather than a fully unified global market.

## V. What Roles Is Technology Playing?

Technology is becoming increasingly central to the operation, verification, and expansion of carbon markets.

Several technological developments are particularly important: Digital Monitoring and Verification, Blockchain and Digital Registries, Carbon Removal Technologies, Financial Technology and Market Infrastructure, and Artificial Intelligence.

1. Digital Monitoring and Verification: Satellite imaging, remote sensing, drones, and artificial intelligence are improving the monitoring of forests, land use, and industrial emissions. These tools can increase transparency and reduce fraud.
2. Blockchain and Digital Registries: Blockchain-based systems are being explored to improve traceability and reduce double-counting of carbon credits. Digital registries may enhance market transparency and efficiency.
3. Carbon Removal Technologies: New technologies such as direct air capture, carbon mineralization, and bioenergy with carbon capture and storage are expanding the range of potential carbon removal activities.
4. Financial Technology and Market Infrastructure: Climate exchanges are increasingly using advanced trading platforms, automated reporting systems, and real-time market analytics. This is helping carbon markets become more integrated with mainstream financial markets.
5. Artificial Intelligence: AI can assist with forecasting emissions, climate risk modeling, project verification, and optimization of energy systems. However, the growth of AI infrastructure also raises concerns about rising electricity demand and emissions from data centers.

Technology is therefore both an enabler and a new challenge within the broader climate transition.

## Conclusion

Since 2022, climate exchanges and carbon markets have entered a new phase of institutional development and strategic importance. The operationalization of Article 6, the restructuring of voluntary carbon markets, and the growing convergence between voluntary and compliance systems are reshaping the global climate finance landscape.

At the same time, unresolved challenges remain. Questions surrounding market integrity, governance, equity, and geopolitical competition continue to influence how carbon markets evolve. Technological innovation is expanding market capabilities, but it also introduces new regulatory and environmental complexities.

The future of carbon markets will likely depend on whether policymakers, businesses, and international institutions can balance efficiency with credibility and global cooperation with national interests. If properly governed, carbon markets may become an important component of the broader transition toward a low-carbon global economy. If poorly managed, however, they risk losing public trust and undermining climate objectives.

The coming decade will therefore be critical in determining whether carbon markets mature into an effective global climate instrument or remain fragmented and contested policy tools.

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