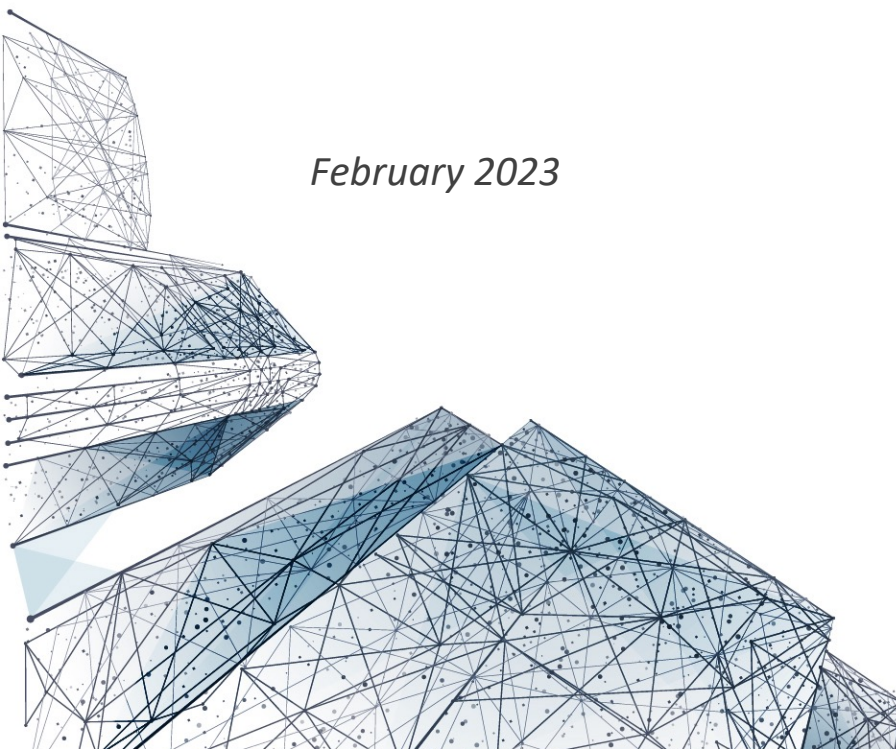
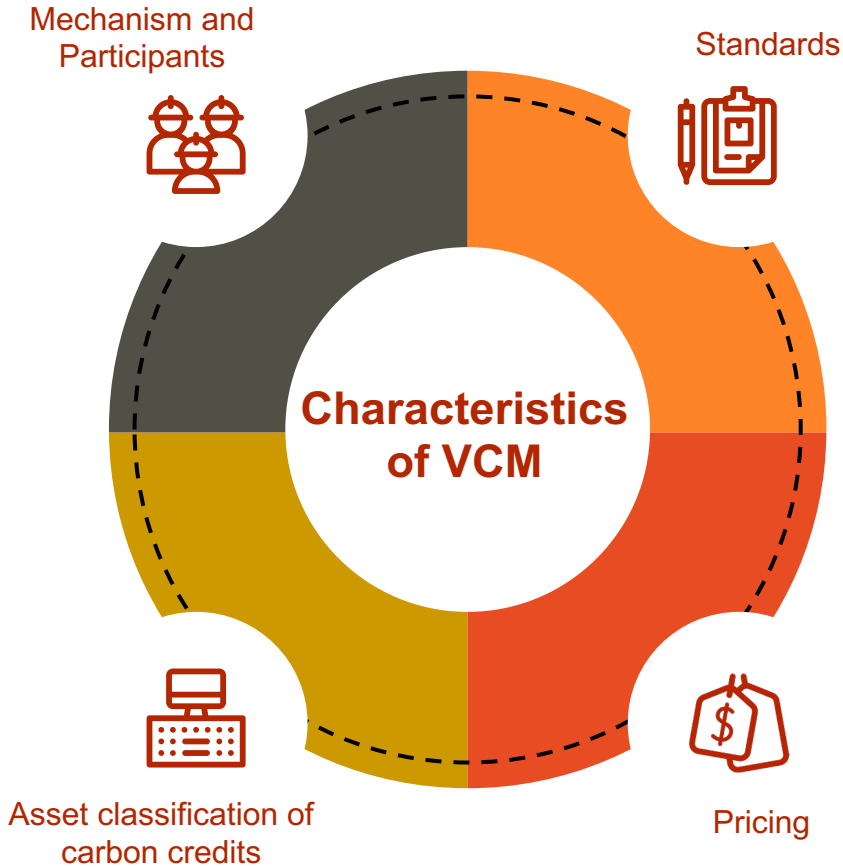


Road to Carbon Neutrality: Hong Kong's Role in Capturing the Rise of Carbon Market Opportunities

February 2023



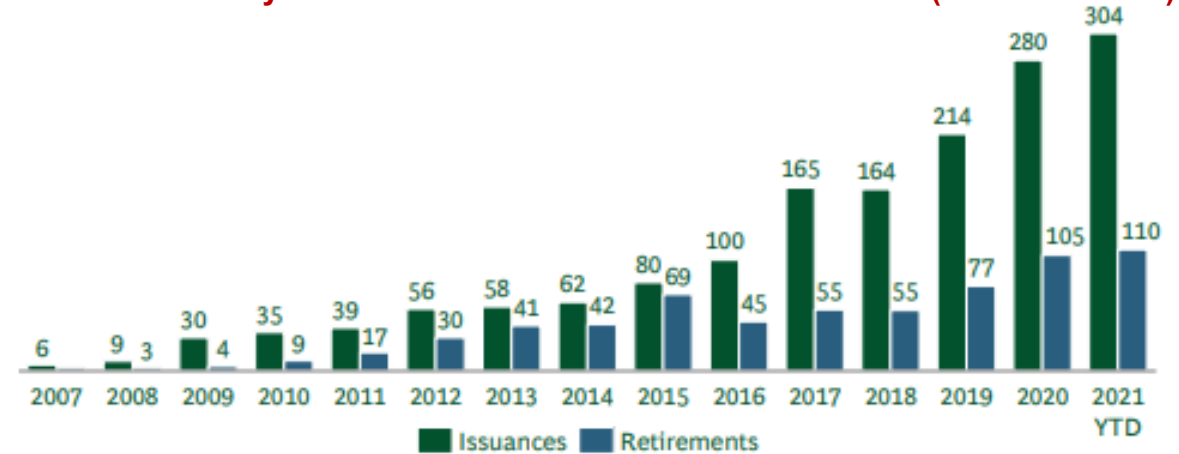
Voluntary carbon markets (VCMs)



Market landscape of the global VCM

- According to BCG, the VCM has grown significantly in recent years, with a compound annual growth rate (CAGR) of 30% between 2015 and 2021.
- In 2021 alone, the global carbon market value soared to US\$ 852 billion, representing an expansion of 164% over 2020.
- Between 2007 and 2021, the issuance of emissions reductions grew from ~6 MtCO₂e to ~300 MtCO₂e.

Annual voluntary carbon credits issuances and retirements (2007-2021 YTD)



Source: Ecosystem marketplace as of October 12, 2021; data reported by VCS, Plan Vivo, ProClima, Gold Standard, ACR, CARB, CAR, and Climate Forward

Comparison of current carbon credit offset project registries and standards*

International market

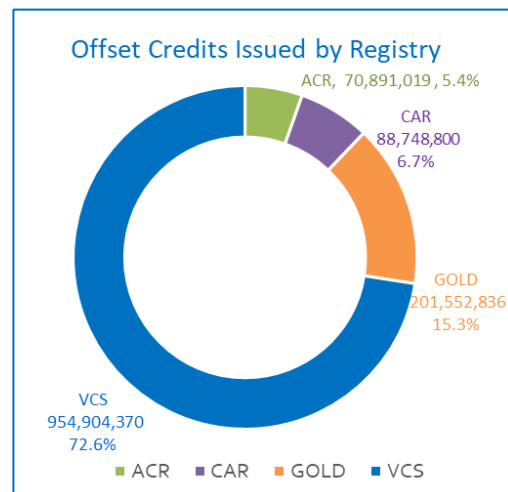
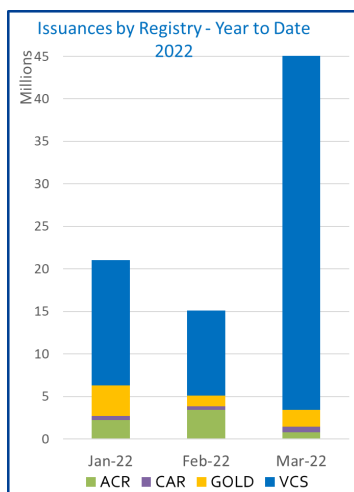
Verified Carbon Standard

Gold Standards

American Carbon Registry

Climate Action Reserve

- Volumes of carbon credits issued in global markets were dominated by primarily four full-fledged carbon registries, or standard setters, namely, the Verified Carbon Standard (VCS), the Gold Standards (GS), the American Carbon Registry (ACR), and the Climate Action Reserve (CAR).
- Total issuance of these four registries reached US\$ 45 million by March 2022.
- VCS and GS are the major standards worldwide, issuing 72.6% and 15.3% of credits, respectively. ACR (5.4% of credits) is mainly active in North America and CAR (6.7% of credits) is active only in the United States.



* This comparison does not cover all standards/registries across the globe

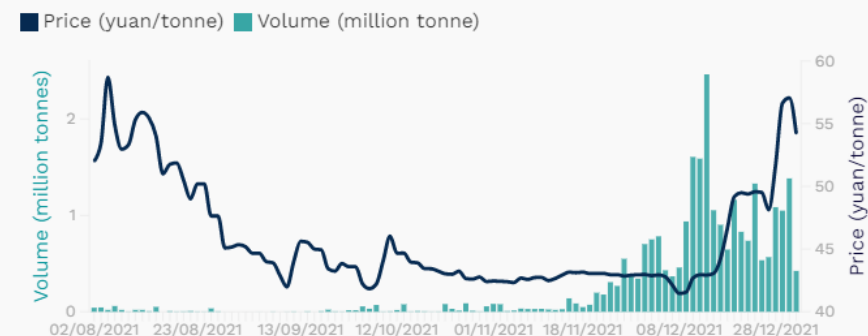
Mainland China

China Certified Emission Reductions

Guangdong Puhui Certified Emission Reductions

- China Certified Emission Reductions (CCER) refers to emissions reduction activities conducted by companies on a voluntary basis that are certified by the Chinese government.
- CCER covers renewable power generation, as well as waste-to-energy projects and forestry projects.
- As of April 2020, 1,047 CCER projects were registered and were expected to reduce emissions by 139.57 MtCO₂e annually.

National carbon market daily closing price of allowances and trading volumes



Source: Refinitiv

Comparison of VCM mechanisms and related infrastructure in different markets

- The emission reduction goal of many large emitting jurisdictions has sparked the growth of VCMs, with some of the significant ones in the US, Europe, and Asia. Each VCM varies in terms of the types of products and offset projects covered, the standards/methodologies used, quality control approaches, and technology adopted, etc.
- These VCMs are selected as they are examples of the leading or pioneering VCMs in their respective operating jurisdictions, some of which are heavy GHG emitting jurisdictions.



China Beijing Green Exchange



Shanghai Environmental and Energy Exchange



Xpansiv



European Energy Exchange



AirCarbon Exchange



Climate Impact X



Core Climate

	China Beijing Green Exchange	Shanghai Environmental and Energy Exchange	Xpansiv	European Energy Exchange	AirCarbon Exchange	Climate Impact X	Core Climate
Year of implementation	2008	2008	2009	2023 (planned)	2019 (pilot) Late 2022 (full operation)	2021	Late 2022
Headquartered	Mainland China	Mainland China	US	Europe	Singapore	Singapore	Hong Kong
Carbon offset projects	CCER; Beijing Emission Allowance	CCER; CEA; SHEA	International credits, e.g. Verified Carbon Units and Gold Standard Credits	International credits, e.g. Verified Carbon Units and Gold Standard Credits	International credits, e.g. Verified Carbon Units and Gold Standard Credits	International credits, e.g. Verified Carbon Units and Gold Standard Credits.	International credits, e.g., Verified Carbon Units.
With carbon emission allowance trading	Yes	Yes	Yes	Yes	Unknown	Unknown	Unknown
Key certification mechanism(s)/ issuer(s) of credits	Verified by one of the three methodologies issued by Mainland China	Unidentified	Global registries e.g. Verra and Gold Standard	Global registries e.g. Verra and Gold Standard	Global registries e.g. Verra and Gold Standard	Global registries, e.g. Verra and Gold Standard	Global registries, e.g., Verra and Gold Standard
Participants in the trading market	Eight major sectors with 800 key emitters	229 market entities	150 market participants active on the platform*	400 members ranging from corporations to state and municipalities	Corporate entities, financial traders, and carbon project developers	Primarily international – multinational corporations and institutional investors	Internationally-certified projects from forestry, solar, wind, hydropower and biomass initiatives in Asia, South America and West Africa
Trade volume (2021)	CCER's volume was ~17.28 MtCO ₂ e	CCERs' volume was 60.5 MtCO ₂ e	Exceeded 121.5 MtCO ₂ e	n/a	During the first 6 months of 2021, 3.6 MtCO ₂ e traded	170,000 tCO ₂ e transacted (during the piloting period)	Around 400,000 tonnes in the first 4 weeks since launch (28 October and 24 November 2022)

*Including project developers, corporate sustainability managers, banks, brokers, and trading firms

Primary Market - Registry

High registration cost

- According to a 2021 study conducted by Trove Research and University College London, project validation, management, and monitoring cost of is around US\$ 40,000 per project per year for a restoration project with a size of 72,000 tCO₂.
- Project developers will be more willing to develop offset projects if the high upfront cost can be partially funded through carbon financing or/and if the perceived return on investment is sufficient to cover the cost.



Long registration/ approval process of carbon credits

- As the development of a carbon offset project must go through multiple steps outlined above, the lead time required for different steps brings about a lengthy registration process, depending on the standard that a project developer chooses. In some cases, the approval process can take up to two or three years.



Secondary Market - Trading

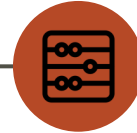
Lack of transparency

- Standards of carbon credits are central to the recognition of such. Since there is no requirement to disclose the price paid for carbon credits in the VCMs, companies may claim to have offset emissions, while they may be purchasing cheaper carbon credits of inferior quality -- or credits that are less accepted by international stakeholders.



Double counting of carbon credits

- Double counting undermines the integrity and credibility of the VCMs. Inaccurate counting leads to an overestimation of the scale of carbon reduction and an underestimation of the actual global emission, undermining international carbon reduction efforts.



Lack of liquidity/ supply of high-quality carbon credits

- The lack of liquidity in the VCM is partly due to the highly fragmented market landscape as mentioned above. In addition, carbon credits are highly heterogeneous due to the wide disparity of their underlying attributes, such as project offset types, origins, and standards of compliance.



Key considerations for developing the VCM market in Hong Kong

Carbon credit standards

- Mirroring similar experiences in the financial market in Hong Kong, the exchange should accommodate carbon credits generated from projects verified by standards that are widely recognised by international stakeholders.

Technology-enabled trading platform

- The application of technological means could effectively boost the performance of the trading mechanism and address some key operational challenges.
 - ✓ Verification of carbon credits
 - ✓ Pricing and data transparency
- Useful and possible technological solutions to consider is the combination of blockchain and IoT technology.

Upstream project development and product offering

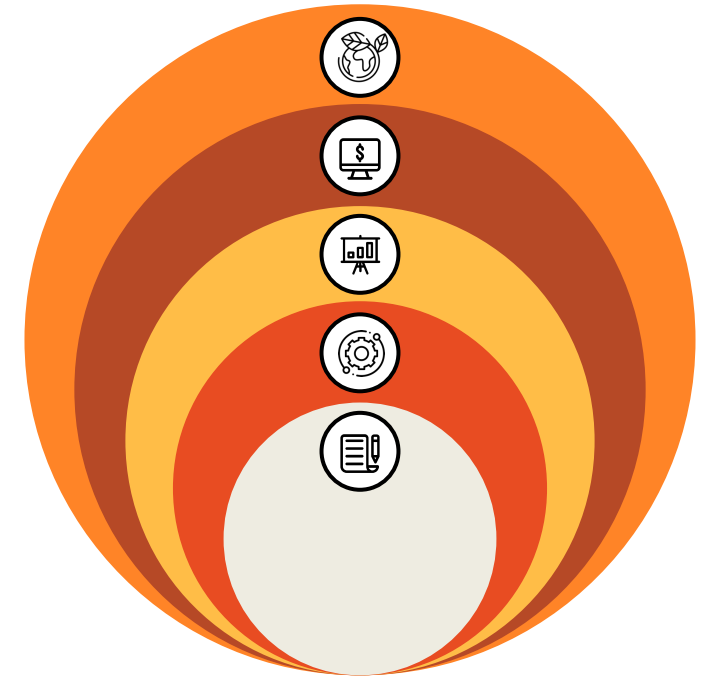
- Attracting standard setters and registries to operate in Hong Kong can be a key facilitator. The presence of these stakeholders in Hong Kong can create an amplified effect in terms of attracting quality projects and asset owners, ultimately generating quality credits in the exchange platform.

Ancillary services and government support

- Other financial sectors can play a pivotal role in driving the development of VCM in Hong Kong forward. Critical components of the ecosystem include the banking sector, particularly in the risk management arena, and insurance sector given its risk underwriting abilities.
- Another key actor in supporting the healthy development of VCM is the active role of the government. One way in which the government can provide support is through the introduction of financial incentives to carbon credit issuers.

Capacity towards a conducive ecosystem

- It is crucial to cultivate a conducive ecosystem in all aspects from creating quality credits, to registries, onboarding and post-trading settlement.
- Essential components of such an ecosystem can include the establishment of a marketplace matching projects with exchange(s), the introduction of rating agencies and risk management tools, and the initiation of custody, clearing and settlement services for carbon credits, etc.



Thank you

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