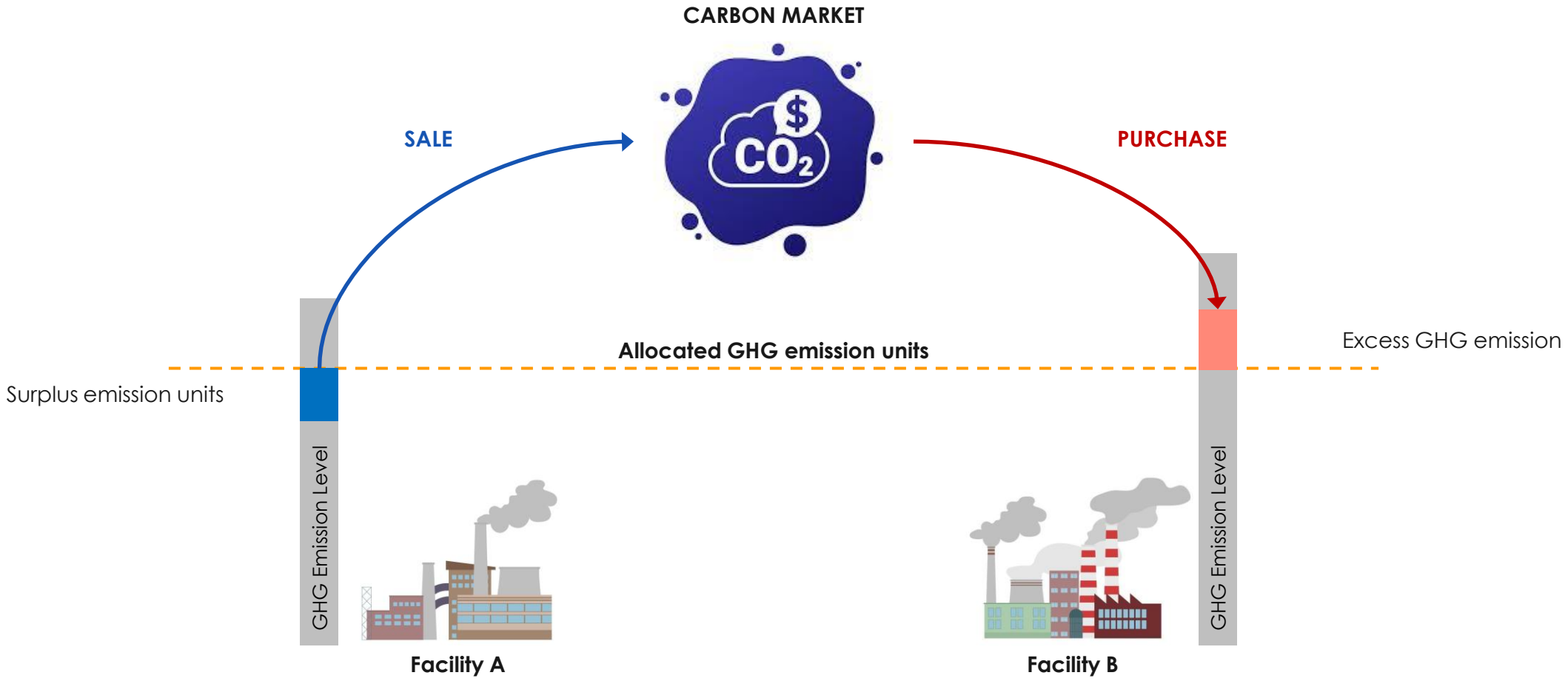
Carbon Market

Risk, Opportunities and Way Forward

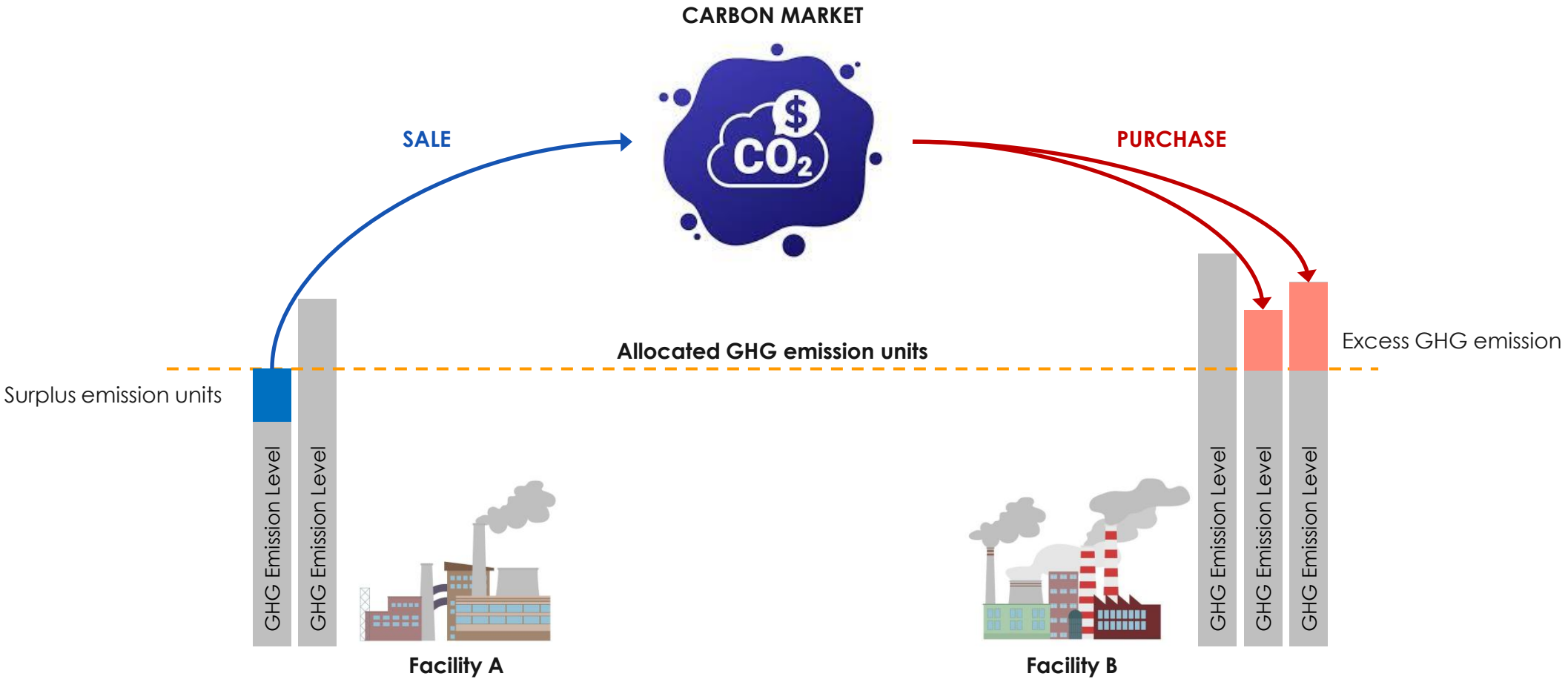
William Gee
July, 2025

A Question…

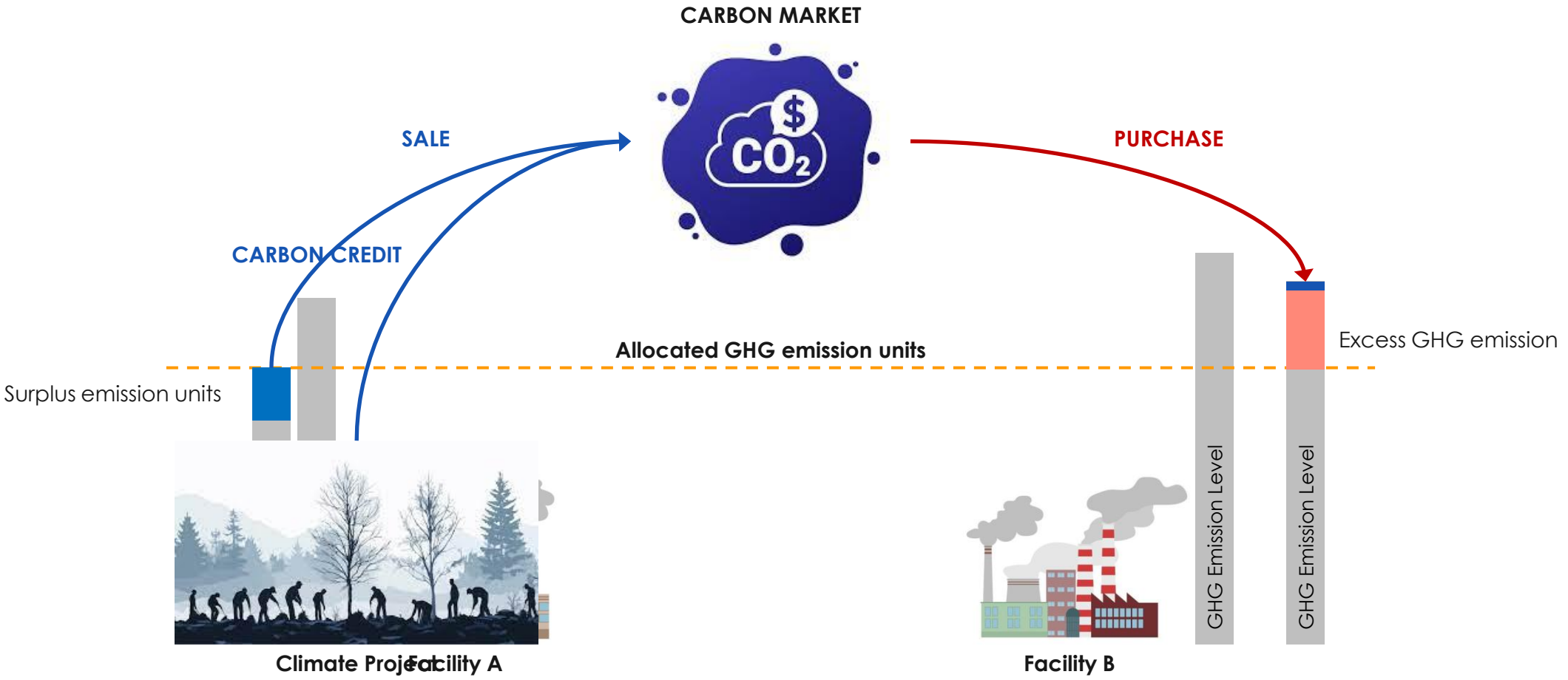
Overview of Carbon Emission and Trading System



Avoiding a Zero Sum Game…



Avoiding a Zero Sum Game…



Objectives

Understand current challenges facing:

- the voluntary carbon market
- funding of climate projects
- domestic and cross-border trading of carbon credits

Discuss practical considerations of:

- setting emission quotas
- tokenisation of carbon/emission credits

Aware of:

- industry initiatives
- opportunities in carbon market

Agenda

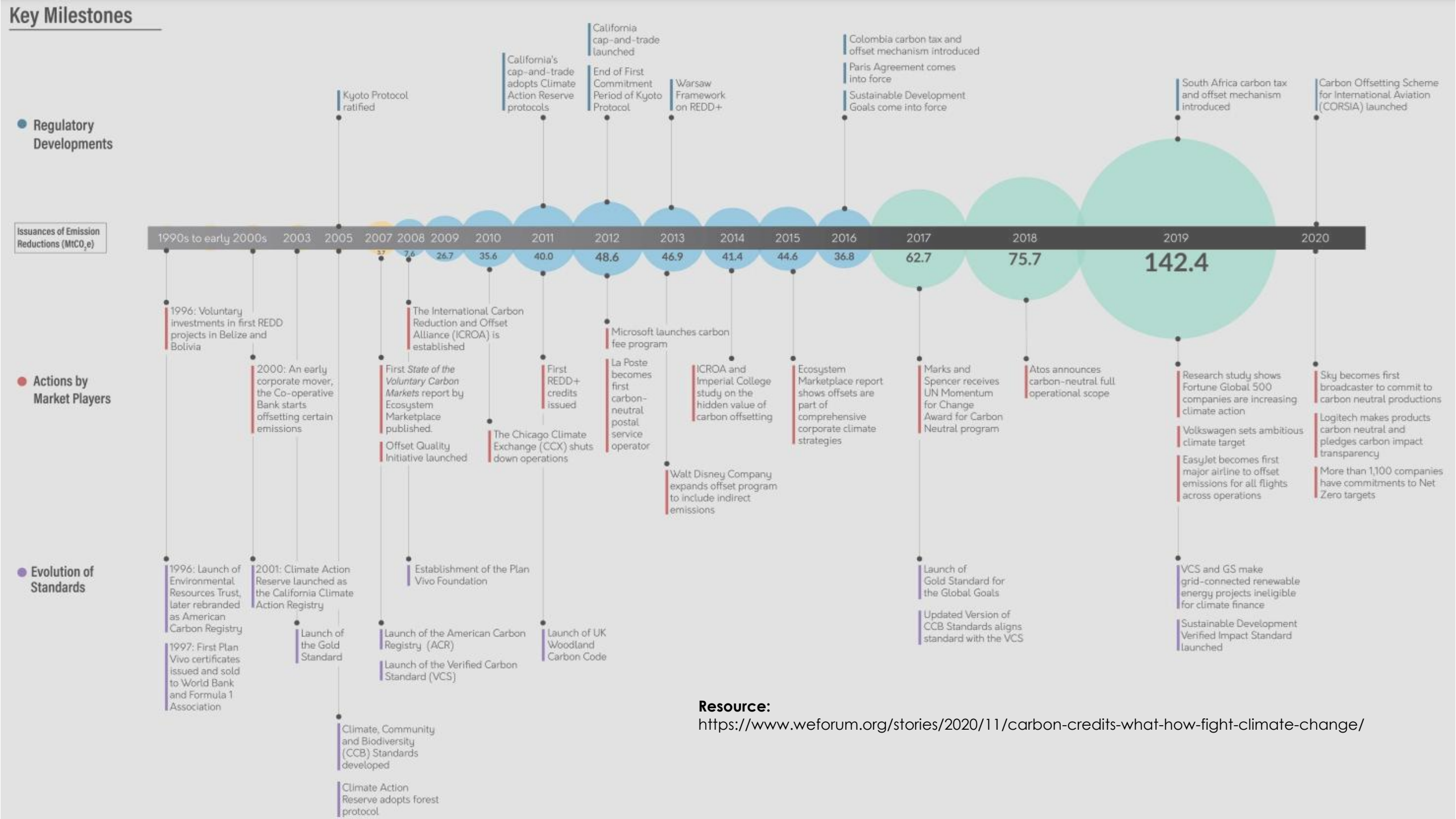
Opportunities in Carbon Market

Climate Financing Project Types and Success Factors

Realising Benefits from Emission Quota

Carbon Pricing – Trends and Reality

New Value Model: Tokenising Carbon Related Assets



Resource:
https://www.weforum.org/stories/2020/11/carbon-credits-what-how-fight-climate-change/

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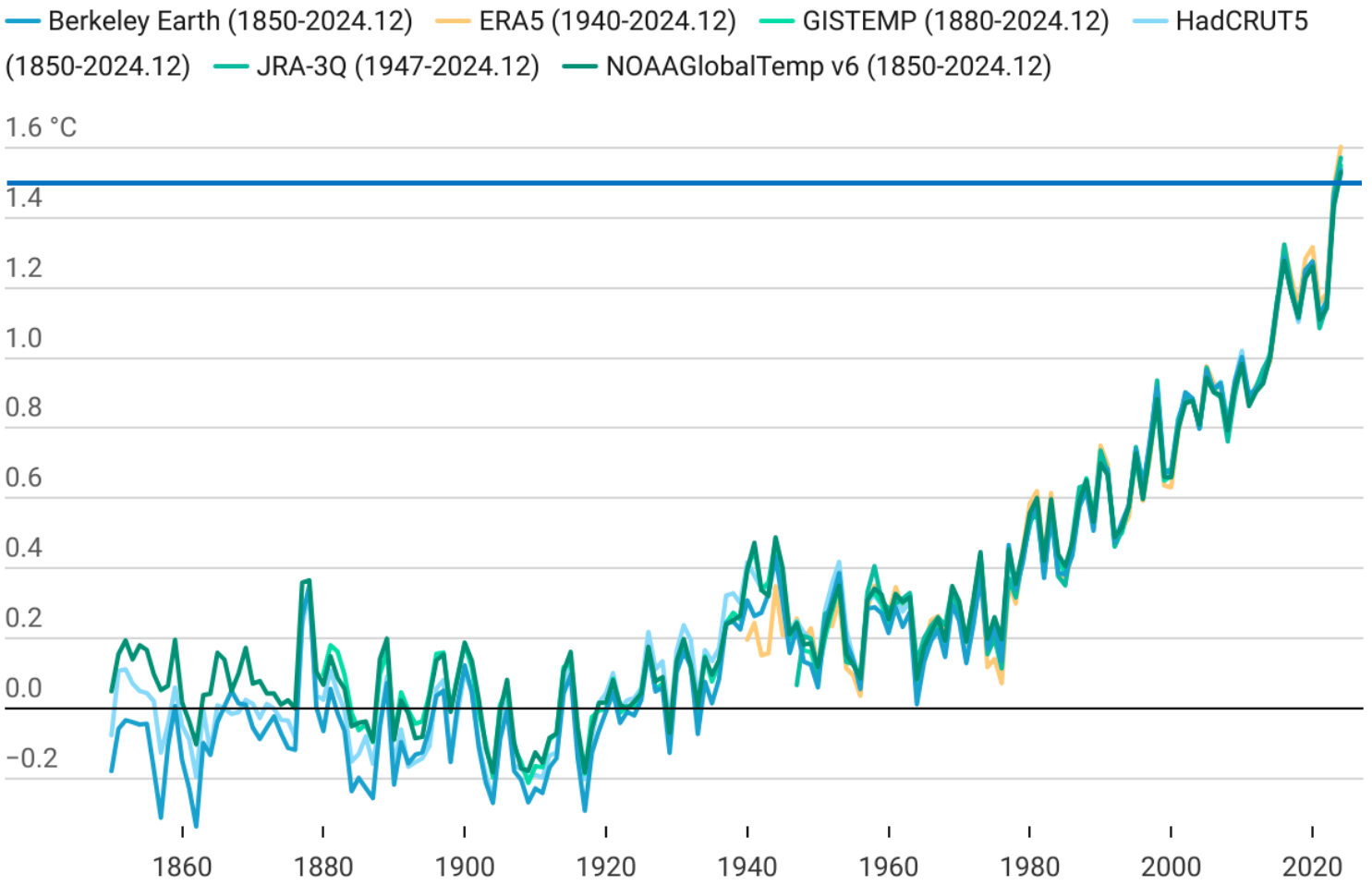
1

Opportunities in Carbon Market

Global Mean Temperature 1850-2024



Annual global mean temperature anomalies relative to a pre-industrial (1850–1900) baseline shown from 1850 to 2024

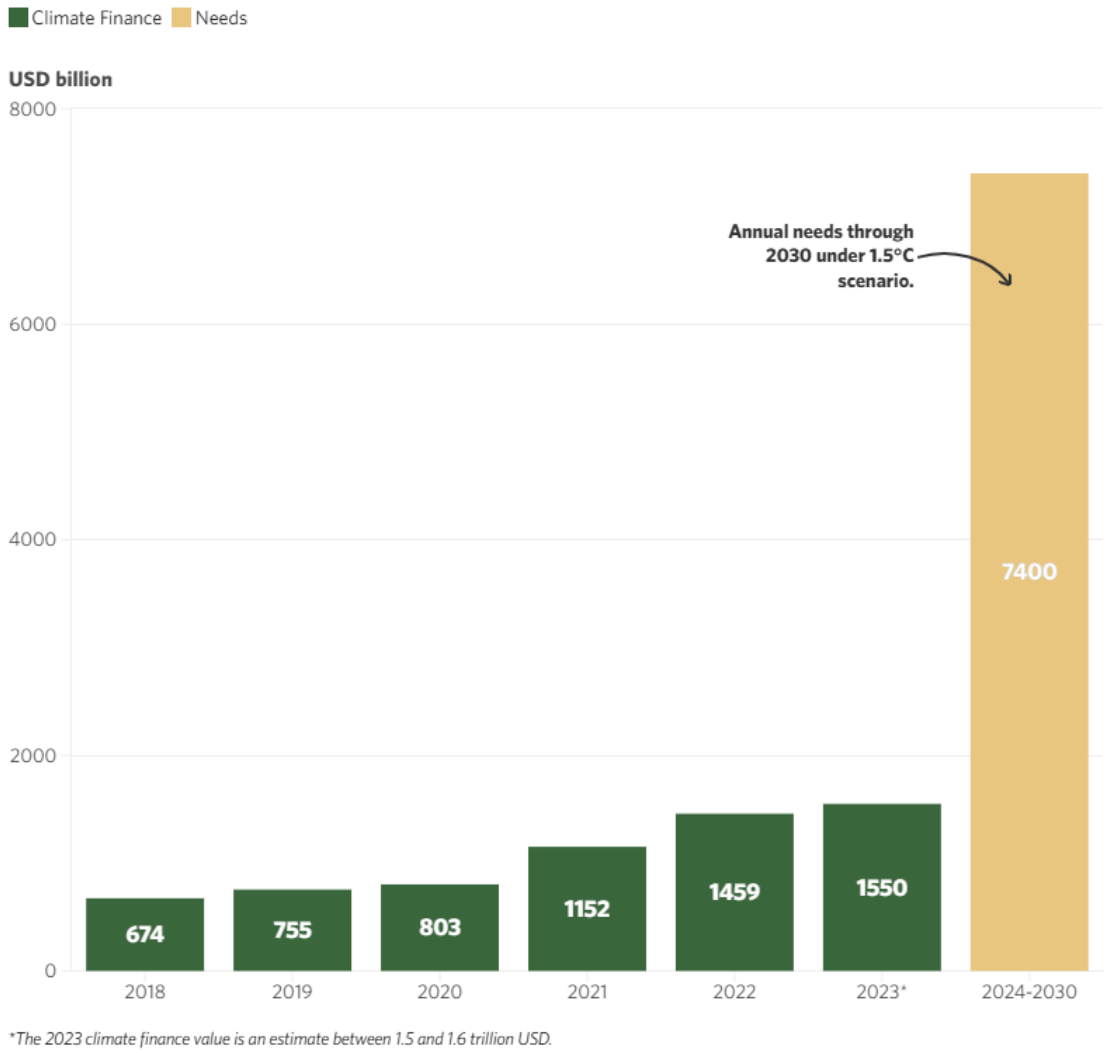
The 1.5°C goal was adopted during the 2015 Paris Agreement and forms the basis for concrete technical benchmarks

Resource:
https://wmo.int/publication-series/state-of-global-climate-2024

Climate Finance Trend

Climate finance has grown at unprecedented rates and reached **USD1.46 trillion** in 2022, but these amounts still fall short of global needs

Report by Climate Policy Initiative (CPI), Global Landscape of Climate Finance, indicates an investment level of almost **USD 7.4 trillion** a year globally through 2030, of which at least USD 2.4 trillion is needed for **emerging markets and developing economies** (EMDEs), excluding China



Resource:
https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2024/
https://www.climatepolicyinitiative.org/leveraging-ndc-updates-to-bridge-the-climate-finance-gap/

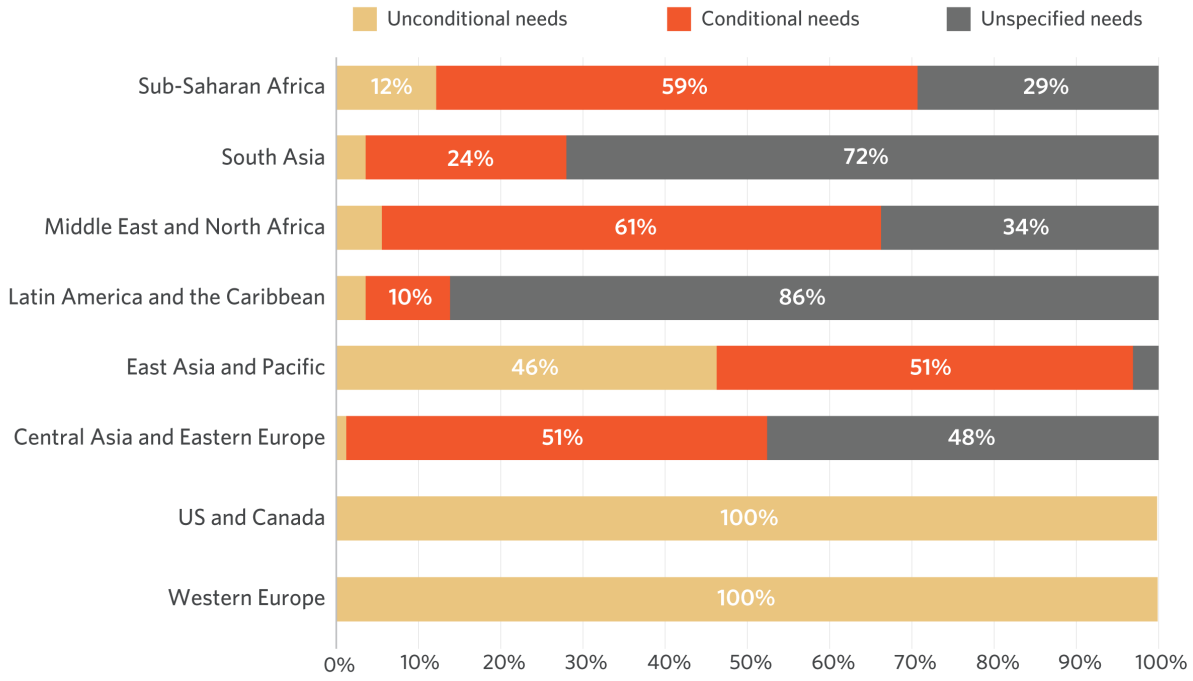
Global Funding Gap

USD5-11Tn needed **annually** to effectively **mitigate** climate change and **adapt** to the impacts of a rapidly warming planet

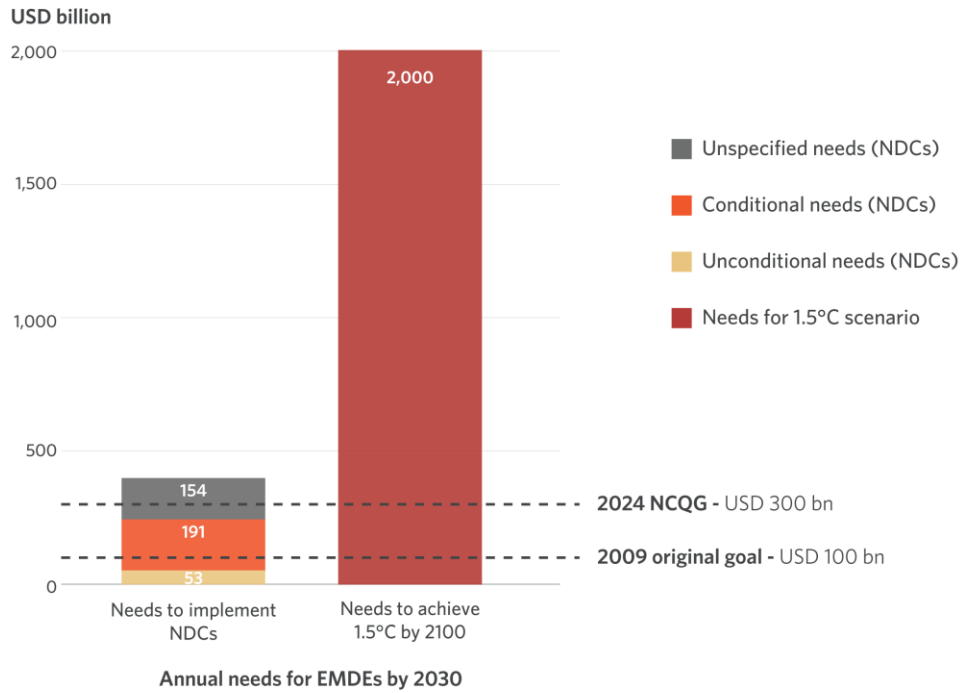
USD6.9Tn **per year** required for developing countries to meet **goals** related to social protection, decent jobs, universal access to essential services, equality, and human rights

Resource:
https://earthshotprize.org/news/new-report-reveals-the-emerging-finance-models-to-bridge-the-climate-funding-gap/
https://earthshotprize.org/wp-content/uploads/2025/06/Unlocking-Critical-Finance-for-Climate-Economic-Resilience.pdf

Commitments and Financing Needs



Unconditional, conditional, and unspecified needs in countries' NDCs, by region (%)

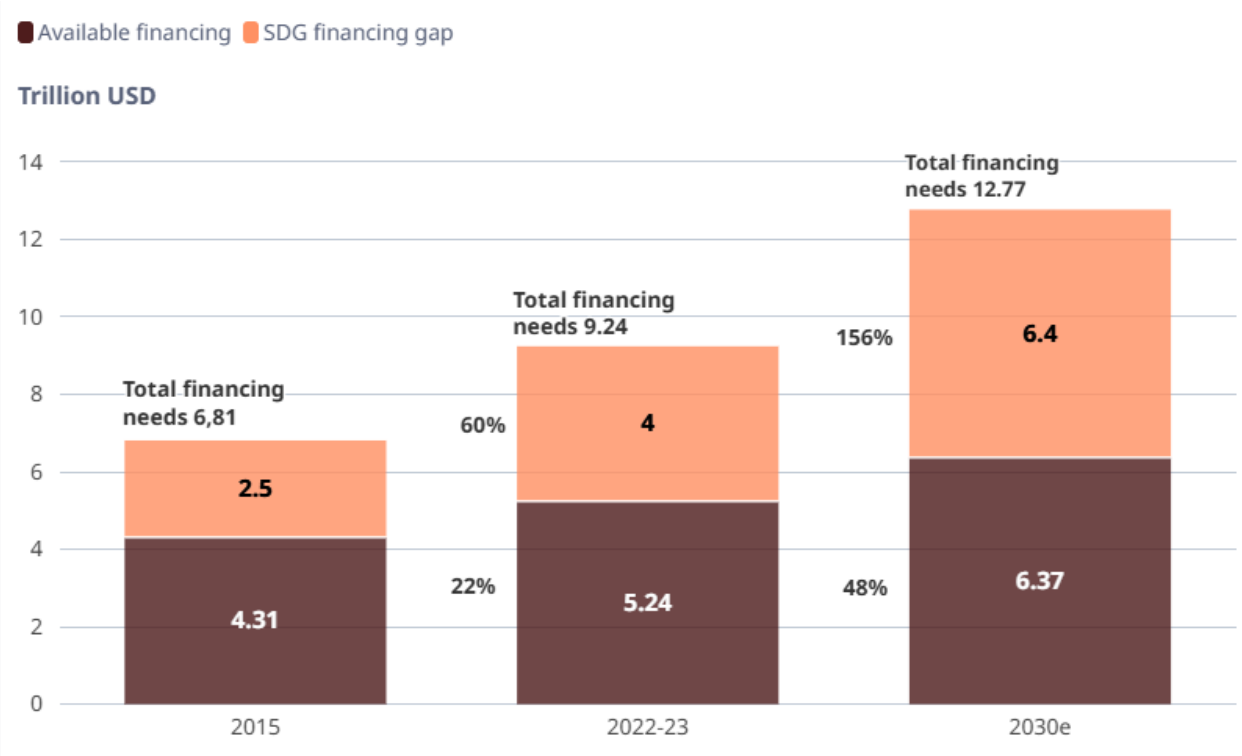


NCQG and NDC ambition compared to global climate finance needs for a 1.5°C scenario for EMDEs

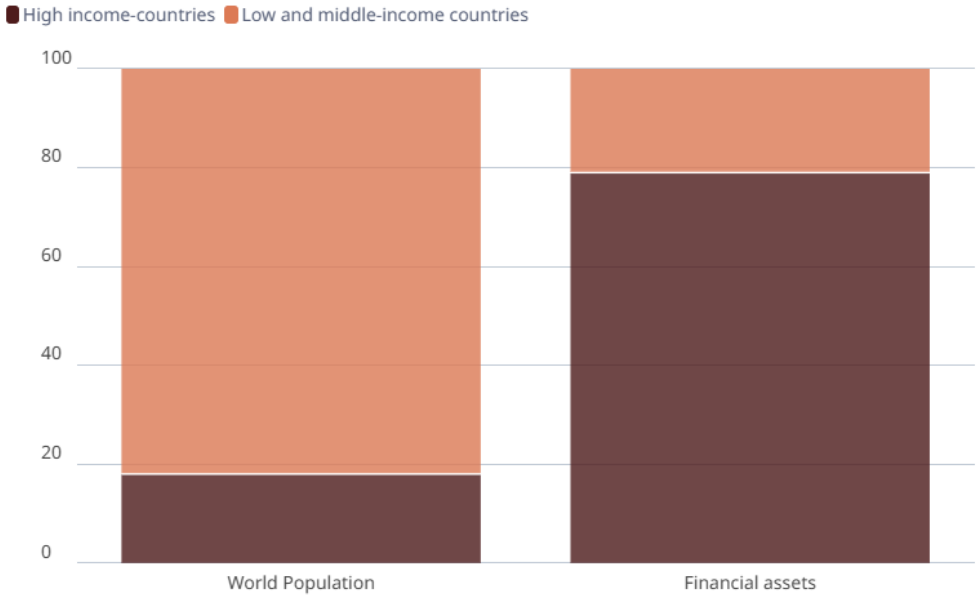
Resource:
https://www.climatepolicyinitiative.org/leveraging-ndc-updates-to-bridge-the-climate-finance-gap/

Growing Gap and Macro-level Challenge

Growing gap…



Global wealth distribution



Resource:
OECD (2025), Global Outlook on Financing for Sustainable Development 2025: Towards a More Resilient and Inclusive Architecture, OECD Publishing, Paris, https://doi.org/10.1787/753d5368-en

Continuing Hydrocarbon-intensive Investments

- Investor Returns vs. Asset Lifespans
- Regulatory and Infrastructure Bottlenecks
- Familiarity
- Hydrocarbon Subsidies
- Financing Constraints in EMDEs
- Optimism in Technologies (CCS / DAC / SRM)
- Lack of Credibility in Climate Commitments
- Moral Hazard

Resource:
https://www.chathamhouse.org/2024/11/closing-climate-finance-gap/04-increasing-demand-climate-finance

The Need to Transition from Debts to Value Creation

> Around 60 per cent of low-income countries are at high risk of debt distress or already in debt distress, and in a number of cases their net debt service payments have turned negative.

Resource:
https://www.chathamhouse.org/2024/11/closing-climate-finance-gap/02-increasing-public-international-climate-finance
https://www.worldbank.org/en/news/press-release/2023/12/13/developing-countries-paid-record-443-5-billion-on-public-debt-in-2022

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Climate Finance

Financing Climate Projects: Funding Purpose

Mitigation

Wide range of initiatives intend to decrease greenhouse gas emissions or to remove carbon dioxide from the atmosphere; overall aim to reduce greenhouse gas emissions and transition to a low-carbon economy

Examples:

- Renewable energy projects
- Energy efficiency improvements and upgrades in buildings and industries
- Public transportation infrastructure enhancements
- Sustainable agriculture practices
- Reforestation and afforestation efforts
- Waste management solutions

Adaption

Enable communities and ecosystems to cope with the unavoidable impacts of climate change, with the aim to reduce the negative impacts of climate change by adjusting to current and future conditions

Examples:

- Implement water conservation measures
- Develop drought-resistant crops and irrigation systems
- Construction of coastal defenses such as seawalls and restoring ecosystems like mangroves
- Establish early warning systems for extreme weather events

Project Attributes: Capital Intensive; Long Payback Period (if at all)

Climate Funding Source and Traditional Instruments

Non-repayable funds provided for specific projects or programs, usually from government

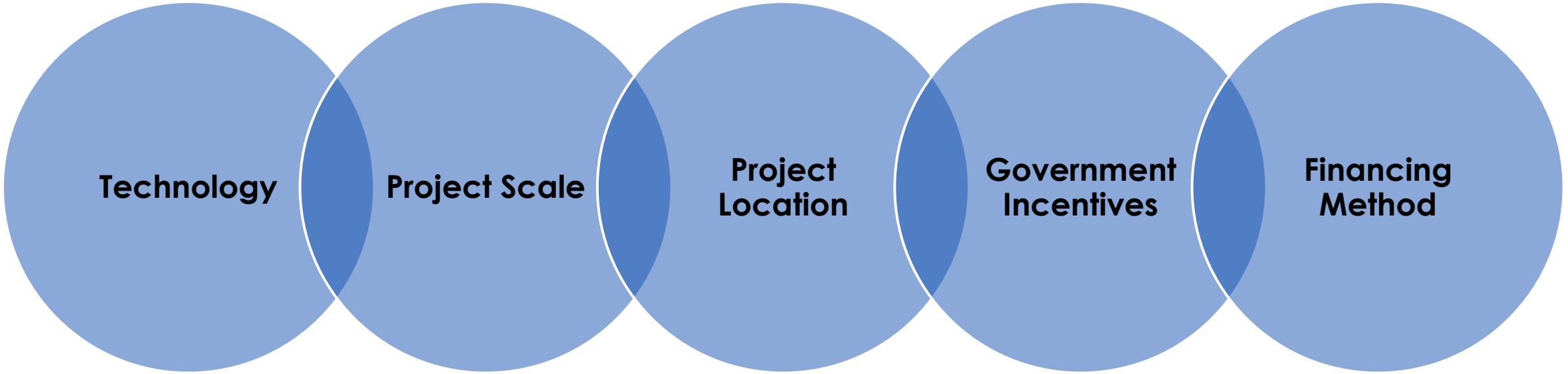
Funds provided with the expectation of repayment, often with **concessional terms**

Debt instruments issued to **raise capital** for climate-related projects, such as green bonds

Investment in companies or projects that contribute to climate solutions

Arrangements where a country's debt is reduced in **exchange** for commitments to **invest** in climate-related projects

Factors Impacting Project Returns



Securing Funding…

Complex stakeholder relationships including developers, contractors, regulators, service providers, communities, etc.

Project ⟷ **Investors**

Web of contracts and liabilities between stakeholders to distribute risks and responsibilities

Evaluation criteria, such as projected revenues, costs, and perceived risks, etc. to assess the project ability to service the debt

Reality: Private Finance tends to flow into projects that can prove long-term viability…

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Generating Carbon Credits…

Carbon Market

Regulated systems where governments require companies to cap or offset their emissions; compliance markets place legally binding limits on emissions and allow companies to trade allowances or buy approved Carbon Credits to stay within regulatory thresholds

Expose to the risks of allowance surpluses, as well as carbon leakage to less regulated jurisdictions; additional challenges on price transparency and market efficiency, as well as broader political and economic risks

Optional participation where companies (and individuals) can buy carbon credits outside of legal requirements; the purpose is often to meet net-zero goals or enhance ESG credentials; Carbon Credits are issued by independent registries

Currently facing criticism for inconsistent standards, greenwashing, and questionable impact; Integrity is the key to Trust and impact the value of Voluntary Carbon Credits

Types of Carbon Credits

Renewable Energy Credits (RECs)

Environmental benefits of generating one megawatt-hour (MWh) of electricity from renewable energy sources

Carbon Sequestration Credits

Generated from projects that physically remove carbon dioxide from the atmosphere and securely store it

Methane Capture Credits

Generated by projects that capture methane emissions, preventing its release into the atmosphere

Avoided Emissions Credits

Generated from projects that prevent the release of greenhouse gasses that would have otherwise occurred

Resource:
https://ecocart.io/types-of-carbon-credits/
https://www.carbon-direct.com/insights/how-do-carbon-credits-actually-work-removal-reduction-and-avoidance-credits-explained
https://carboncredits.com/the-ultimate-guide-to-understanding-carbon-credits/

International Certification Standards

Verified Carbon Standard (VCS)

Credits verified under VCS, ensuring emissions removal is real, measurable, and permanent

Gold Standard

Focused on projects that not only remove carbon emissions but also contribute to sustainable development goals

Clean Development Mechanism (CDM) Credits

Arrangement under the Kyoto Protocol: allow emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equiv. to one tonne of CO_2

Resource:
https://ecocart.io/types-of-carbon-credits/
https://www.carbon-direct.com/insights/how-do-carbon-credits-actually-work-removal-reduction-and-avoidance-credits-explained

Key Attributes for Certification Standards

- Ensuring Additionality
- Permanence
- Applicability
- Verification Costs

Resource:
https://greenerinsights.com/carbon-credits-verification-standards-explained/#the-carbon-credit-standards

Path to International Carbon Trading

THE WALL STREET JOURNAL.

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WORLD

COP26 Opens Path to International Carbon Trading

U.N.-certified carbon credit could be used by regulated markets and standardize more informal ones

By Sarah McFarlane Follow and Matthew Dalton Follow

Updated Nov. 14, 2021 4:49 pm ET

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Agreement

- Creation of a central system that will be open to public and private sectors
- Separate, bilateral system that allow countries to trade credits
- 5% of proceeds from offsets to go towards an adaptation fund for developing countries
- 2% of offset credits will be cancelled

Resource:
https://www.wsj.com/world/cop26-opens-path-to-international-carbon-trading-11636922314
https://carboncredits.com/cop26-global-carbon-market-deal-reached/
https://www.reuters.com/business/cop/outline-carbon-markets-deal-emerges-un-climate-summit-2021-11-13/

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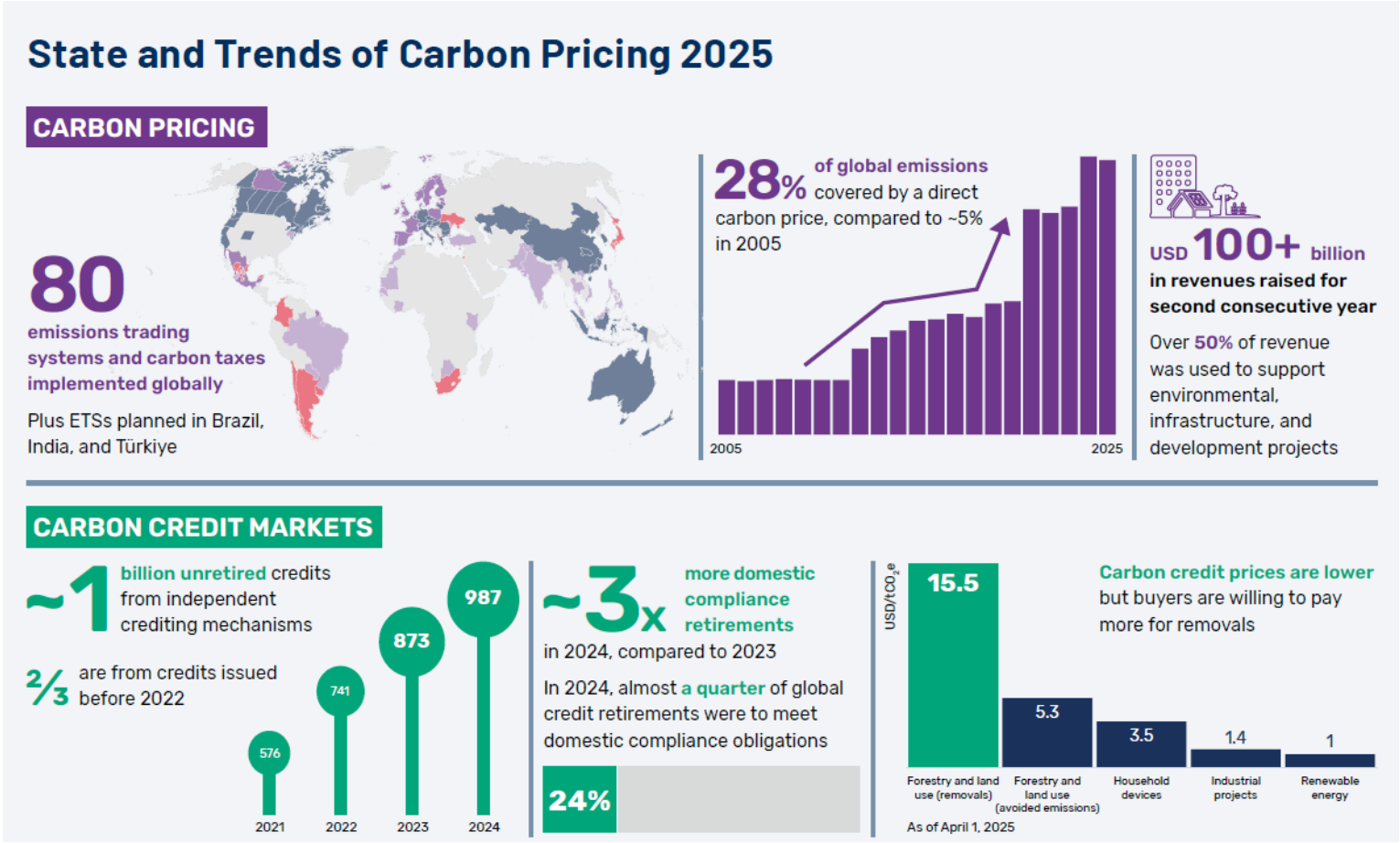
Carbon Pricing – Trends and Reality

Growing Market

- Large middle-income economies have implemented or contemplating direct carbon pricing, covering around 28% of global emissions
- Average carbon price almost doubled in the past 10 years in real terms (from just above USD 10 per ton in 2015 to around USD 19 per ton in 2025)
- Retirements increase, issuances stabilize, and average prices slightly decline; however **surplus of unretired credits in market increased to almost 1 billion tons**
- Retirements of nature-based **carbon removal** credits rose by nearly 25%, through a combination of increased supply and buyer interest in credits from carbon removal projects



Resource: World Bank Group – State and Trends of Carbon Pricing 2025
https://openknowledge.worldbank.org/entities/publication/e5f6e755-e6a6-4d2c-927a-23b5cc8a9b03

Anticipated Market Size

Carbon Credit Market Size

Worth 16,379.53 Bn by 2034

According to Precedence Research, the global carbon credit market size is valued at USD 933.23 billion in 2025 and is expected to be worth USD 16,379.53 billion by 2034, growing at a robust CAGR of 37.68% from 2025 to 2034.

Credit prices point to a strengthening correlation between quality and price — credits with a perceived higher quality trade at a premium …

*There is an observed **price premium** for credits eligible to be used for NDC achievement and international compliance markets relative to voluntary markets*

World Bank Group – State and Trends of Carbon Pricing 2025

Resource:
World Bank Group – State and Trends of Carbon Pricing 2025
https://openknowledge.worldbank.org/entities/publication/e5f6e755-e6a6-4d2c-927a-23b5cc8a9b03
https://climatefocus.com/publications/state-and-trends-of-carbon-pricing-2025/
https://www.reccessary.com/en/news/key-carbon-market-trends-2025
https://www.globenewswire.com/news-release/2025/06/26/3105670/0/en/Carbon-Credit-Market-Size-Worth-16-379-53-Bn-by-2034.html

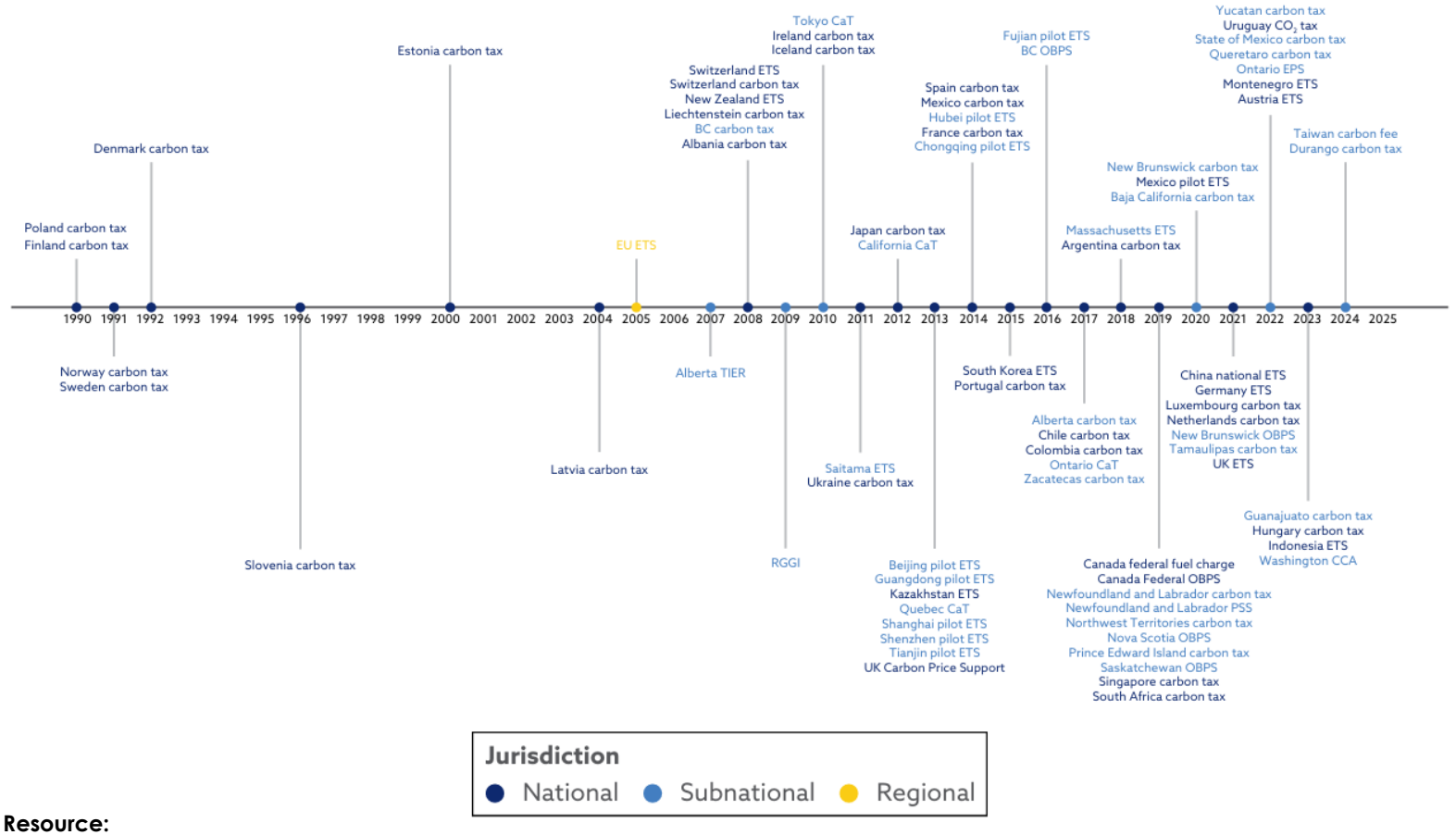
Primary Pricing Mechanisms: ETS vs. Carbon Taxes

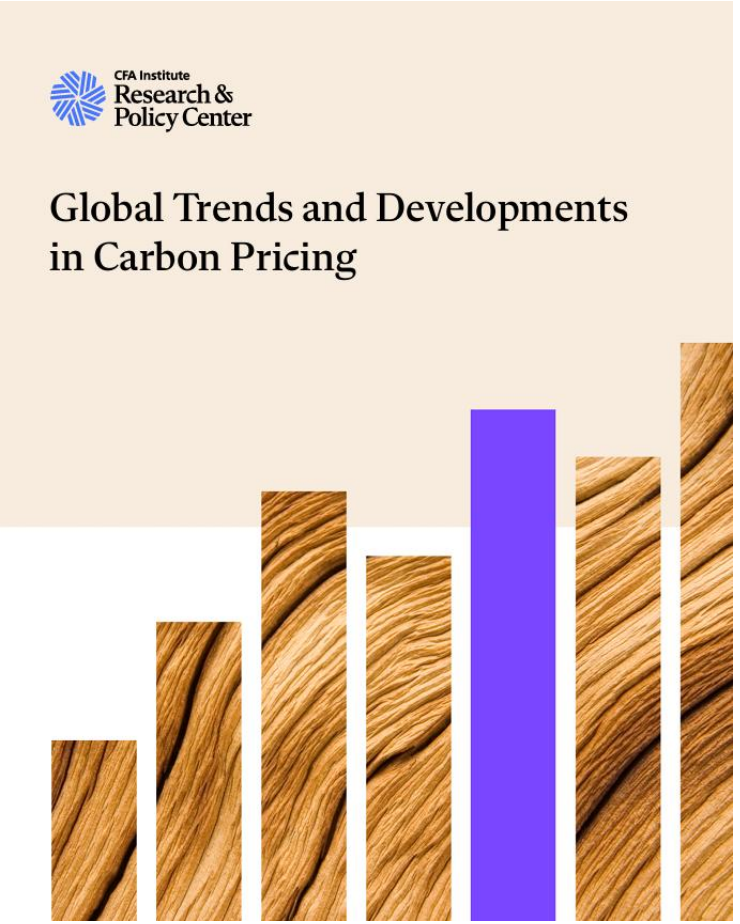
Establish a system for trading CO_2 emissions with the market setting the price usually within certain constraints; regulatory bodies typically create a **baseline price** that increases over time to provide incents for decarbonization

Tax levied on institutions that emit CO_2, governments can reduce negative impacts of emissions while providing a revenue stream; extra financial burden encourage institutions to reduce emissions

Limitations: tax tends to be fixed; adjusting tax rates usually a time-consuming process, therefore difficult to respond to market demand

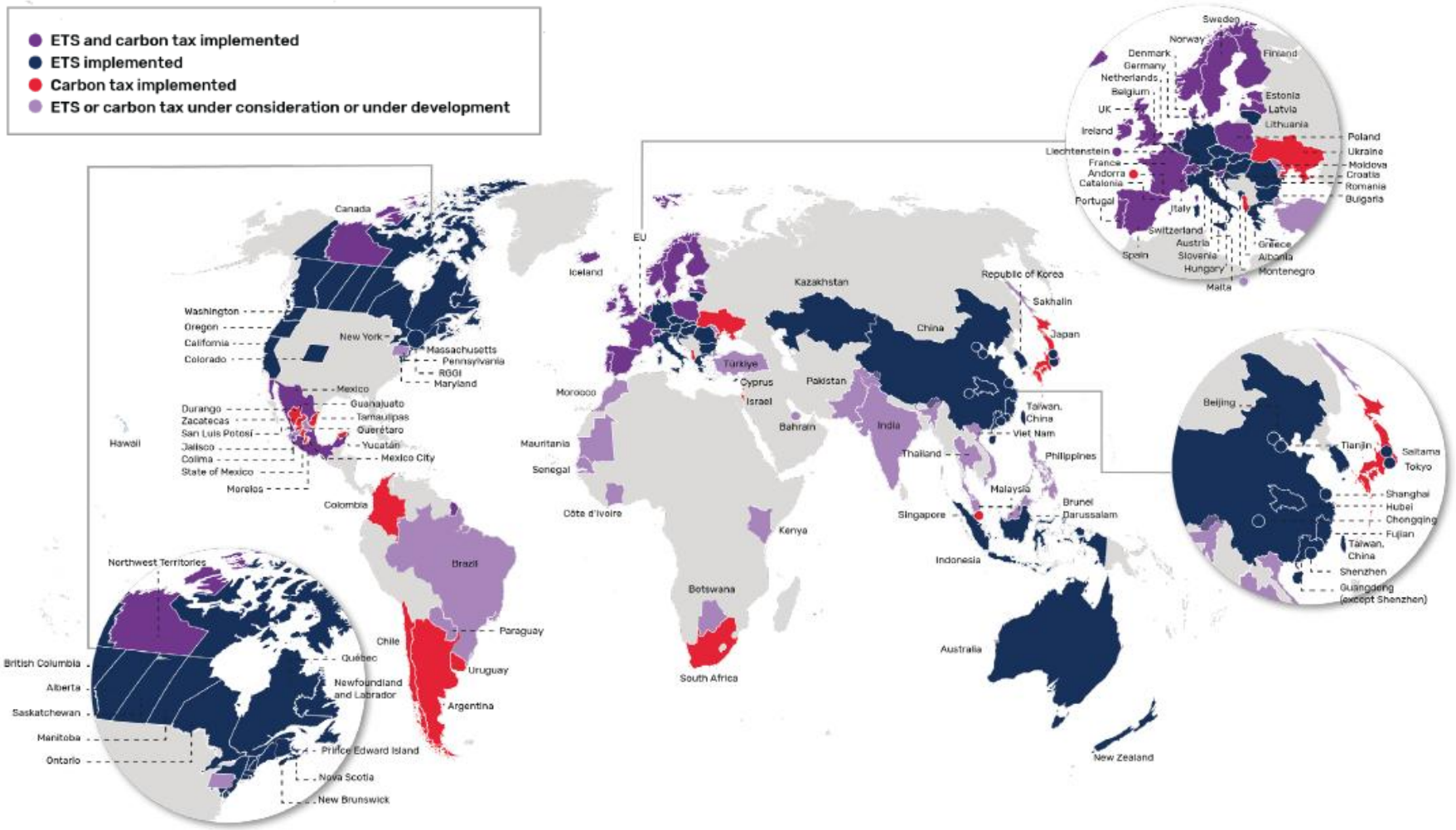
Timeline: Introduction of Carbon Taxes and ETSs





Resource:
CFA Institute – Global Trends and Development in Carbon Pricing
https://rpc.cfainstitute.org/sites/default/files/docs/research-reports/nzg_7_globaltrends_pham_online.pdf

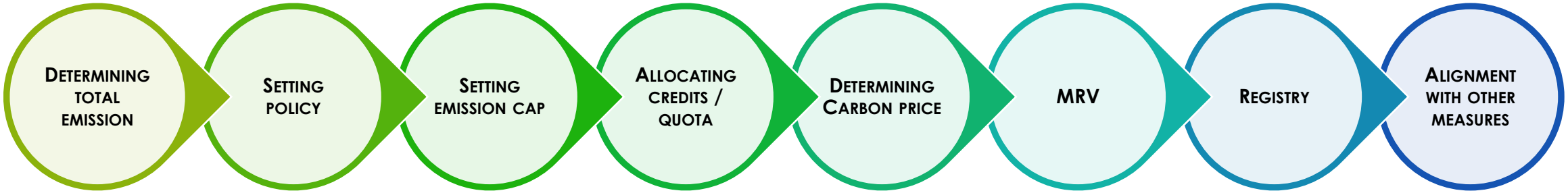
Global Status of ETS and Carbon Tax Implementation



ETS vs. Carbon Tax

Resource: World Bank Group – State and Trends of Carbon Pricing 2025
https://openknowledge.worldbank.org/entities/publication/e5f6e755-e6a6-4d2c-927a-23b5cc8a9b03

Considerations for a Successful Emission Trading System



- Basis of measurement
- Collecting data

- Regulations and standards
- Incentives and subsidies
- Linkage with Net-Zero objective

- Scope and coverage
- Top-down vs. bottom up
- Historical vs. future projection
- Technology and innovation

- Approach such as benchmarking and auctioning
- Ensuring fairness, efficiency and political feasibility

- Carbon tax
- Market driven pricing

- Approach to Measurement, Reporting, and Verificataion
- Standard setting and adoption

- International vs. jurisdictional registry

- Scope and coverage
- Retirement

Allocating Emission Quota

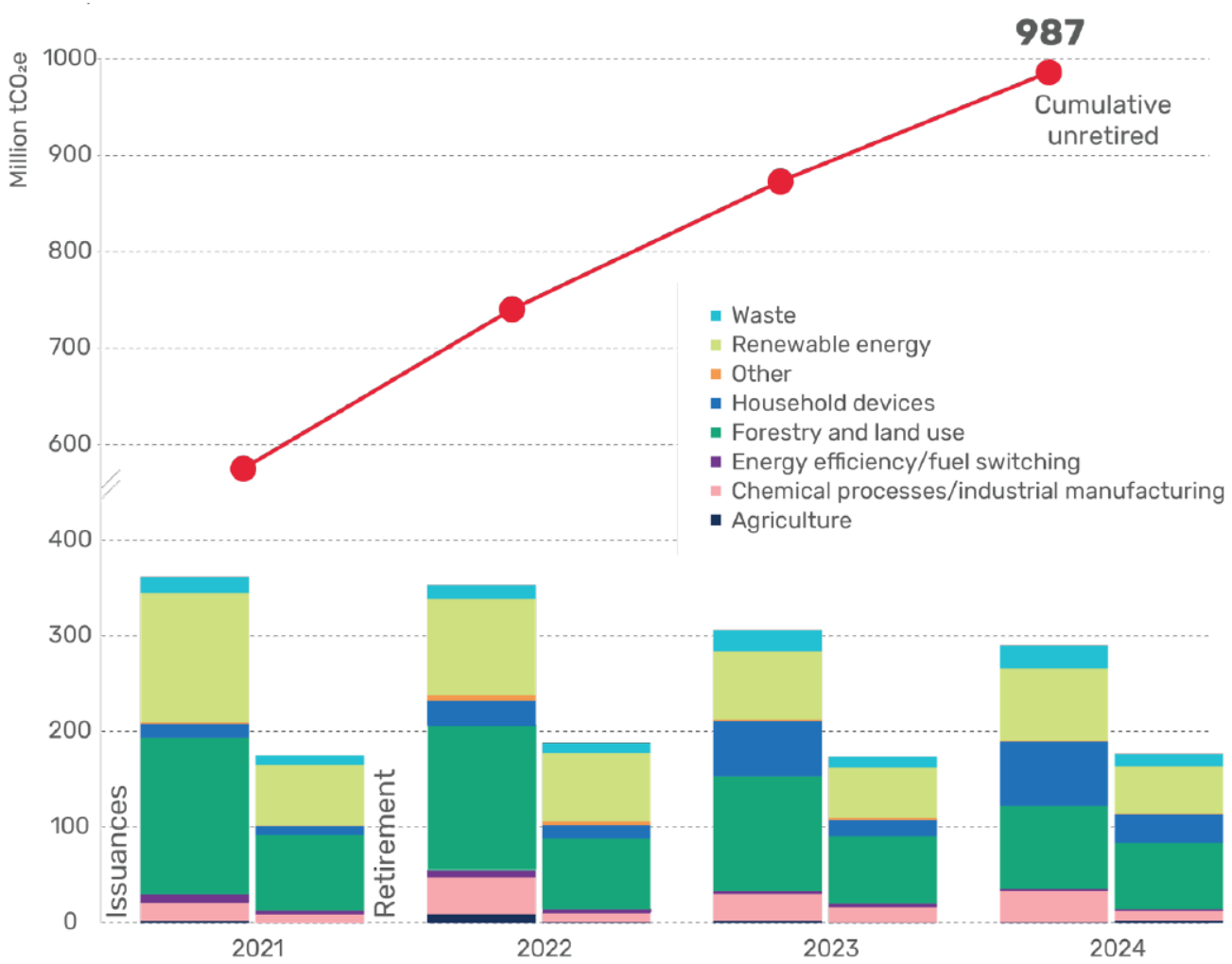
Cap-and-Trade

Baseline and Credit

Challenges

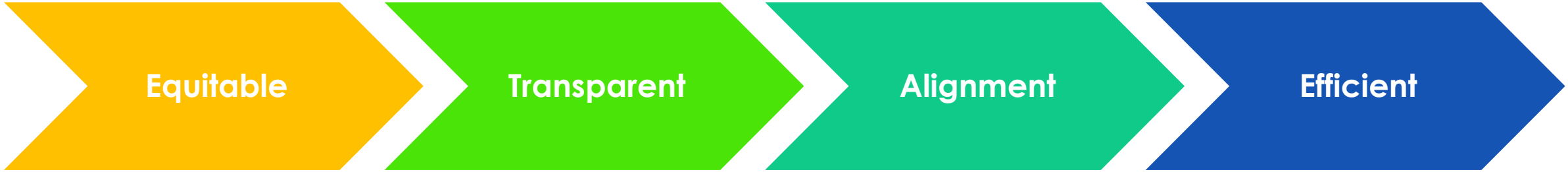
- Determining the initial cap and scope
- Fair, efficient, flexible, and adaptable
- Expiry and retirement mechanism
- Monitoring, Verification and Reporting
- National Registry
- Political and social acceptability

Carbon Credit Issuances and Retirements



Resource: World Bank Group – State and Trends of Carbon Pricing 2025
https://openknowledge.worldbank.org/entities/publication/e5f6e755-e6a6-4d2c-927a-23b5cc8a9b03

Key to Successful Pricing Mechanism



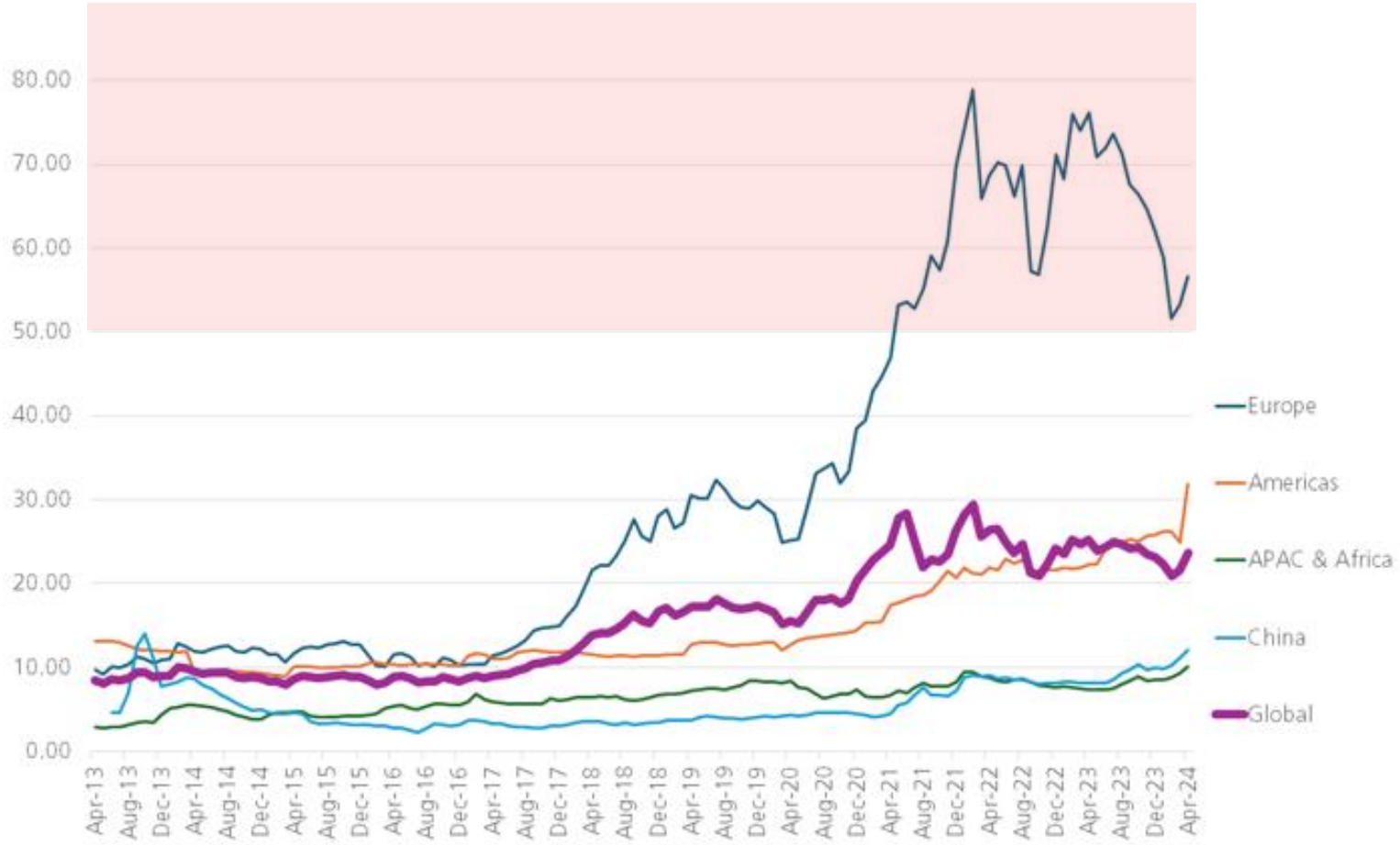
Polluters bear the monetary cost for the negative social impact of emissions

Open and transparent pricing mechanism, including how carbon price is calculated

Carbon pricing as an integrate component of the overall approach to addressing the climate challenge

Include drivers that ensure compliance, encouraging entities to reduce CO_2 emissions over time

Aggregate Carbon Price (US$/tonne)

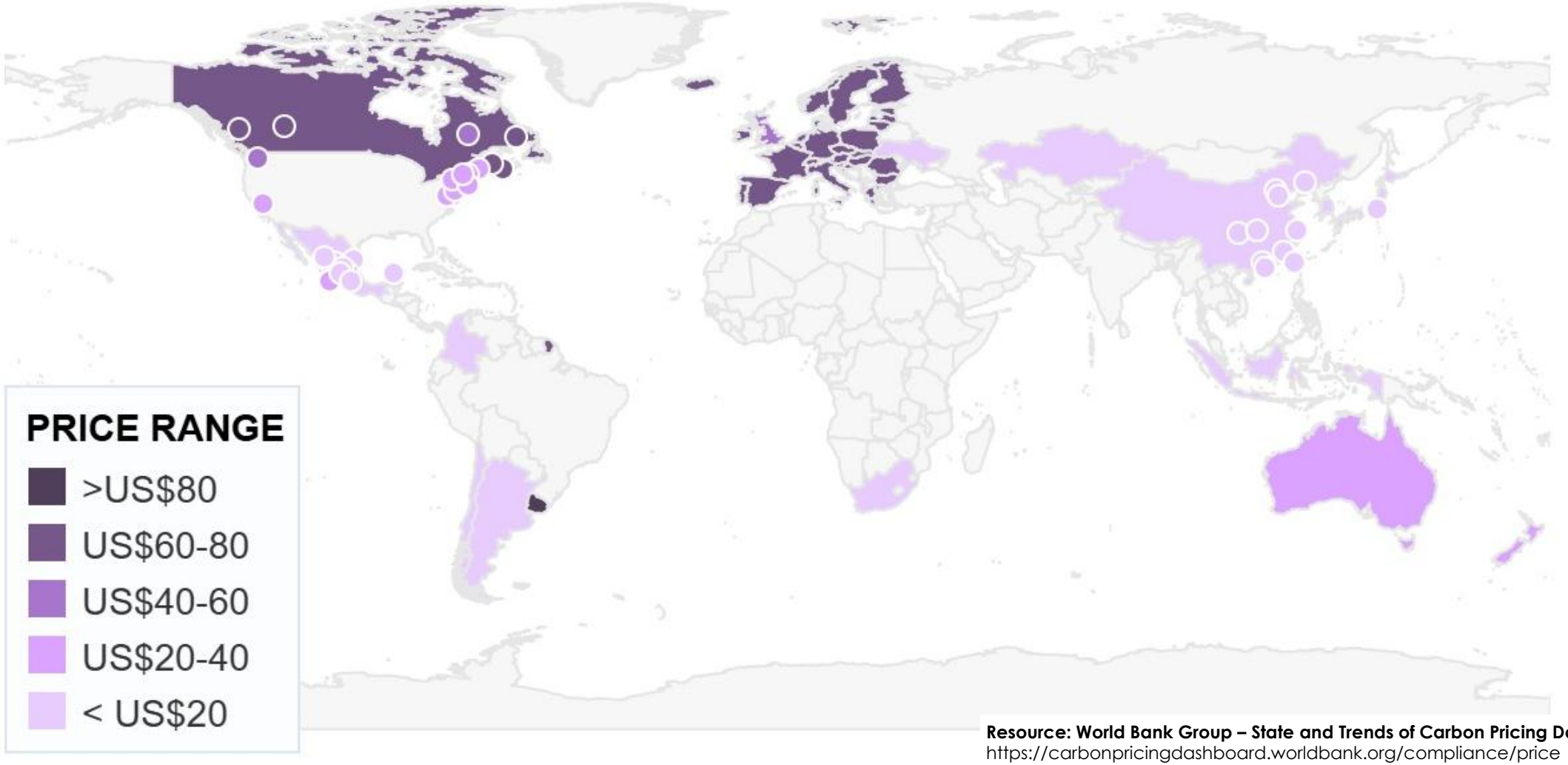


*The World Bank estimates that a carbon price of **$50-100 per metric ton** of carbon dioxide is required by 2030 to meet the temperature goals of the Paris Agreement – to limit global warming to well below 2 degrees Celsius above pre-industrial levels*

World Bank Group – State and Trends of Carbon Pricing 2025

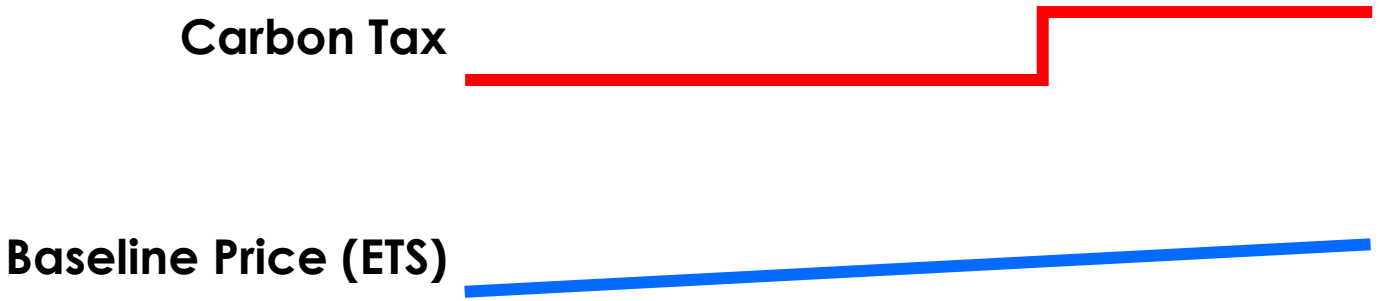
Resource:
https://www.thecityuk.com/news/sustainable-finance-data-carbon-pricing-schemes-and-the-price-of-carbon/
https://about.bnef.com/insights/finance/the-untapped-power-of-carbon-markets-in-five-charts/

World Bank Data: Carbon Pricing Dashboard



Resource: World Bank Group – State and Trends of Carbon Pricing Dashboard
https://carbonpricingdashboard.worldbank.org/compliance/price

Reality of Carbon Pricing



Cross-Jurisdiction	Additionality and Permance	Registry and Retirement	Robust Quantification	Consistent Standards and Quality

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Realising Benefits

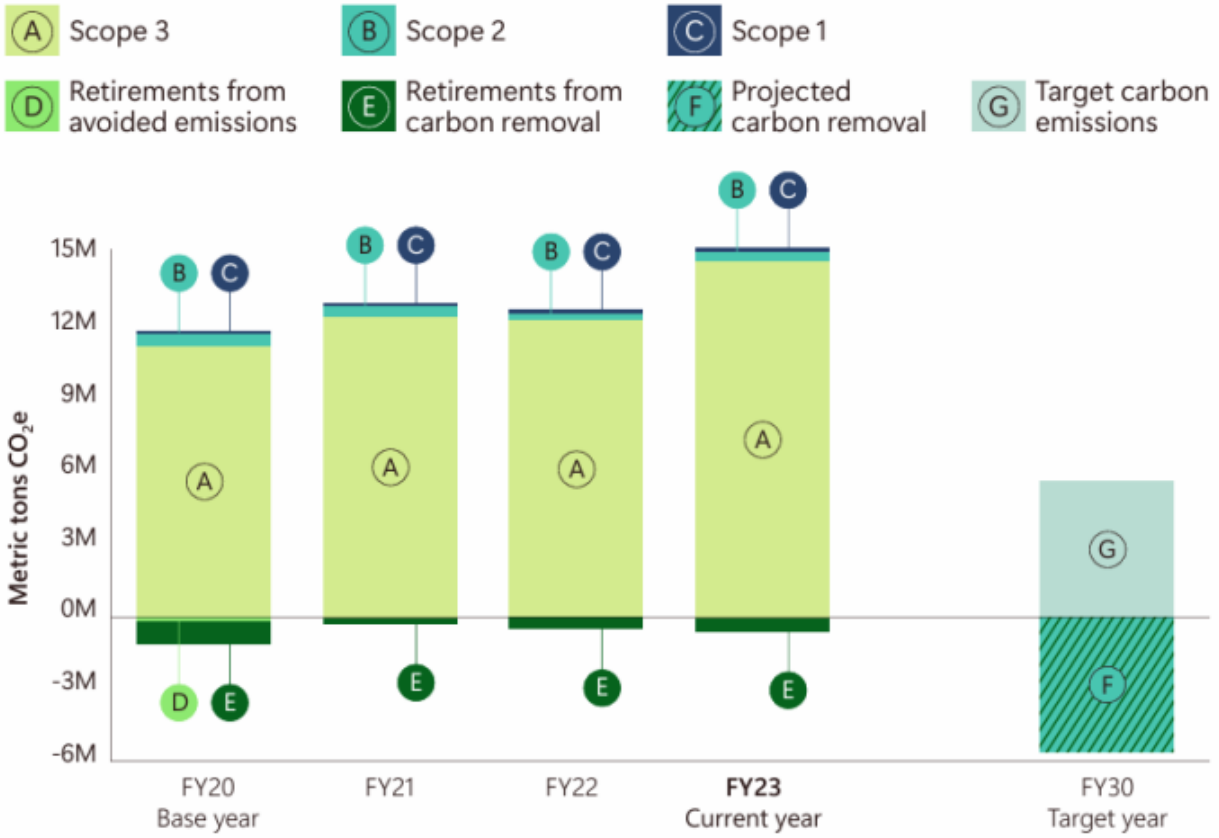
Case Study: MSFT

Points to Note:

- Ambitious goal to remove all emissions since 1975 by 2050, and have invested over USD1 billion in carbon removal projects to date
- Scope 3 Emission comprising over 96% of Microsoft's carbon footprint
- Retirement of carbon credits
- Avoidance vs. Removal

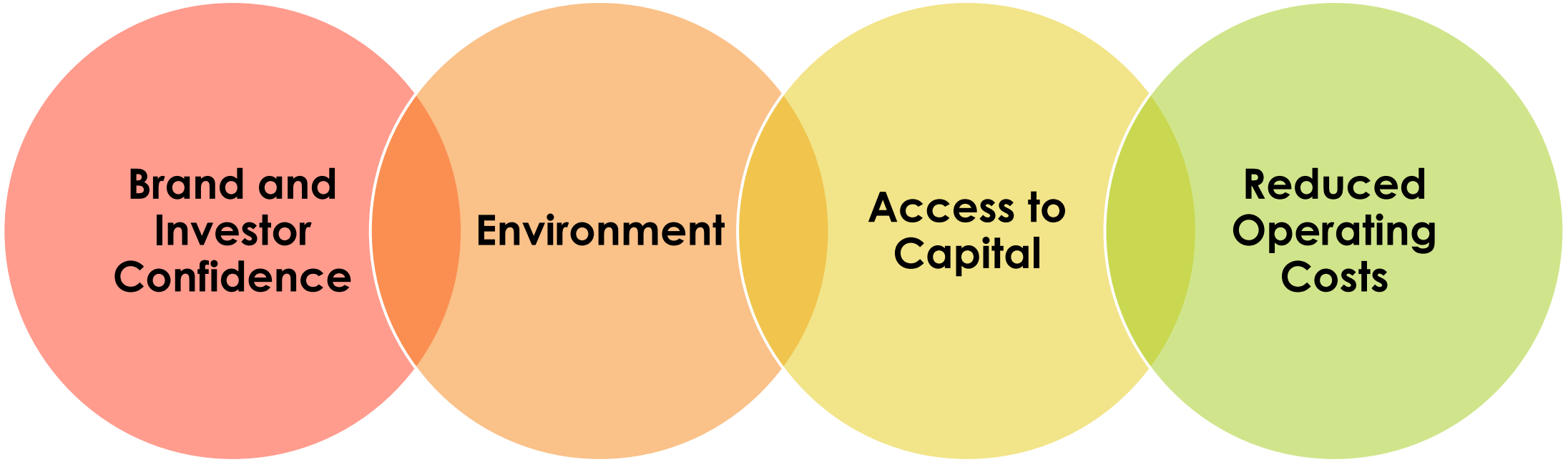
Carbon Table 2–Tracking progress toward carbon negative by 2030

Microsoft's overall emissions increased by 29.1% in FY23, in relation to our base year. Additionally, we retired 605,354 metrics tons of carbon removal as part of achieving our annual target to be carbon neutral.

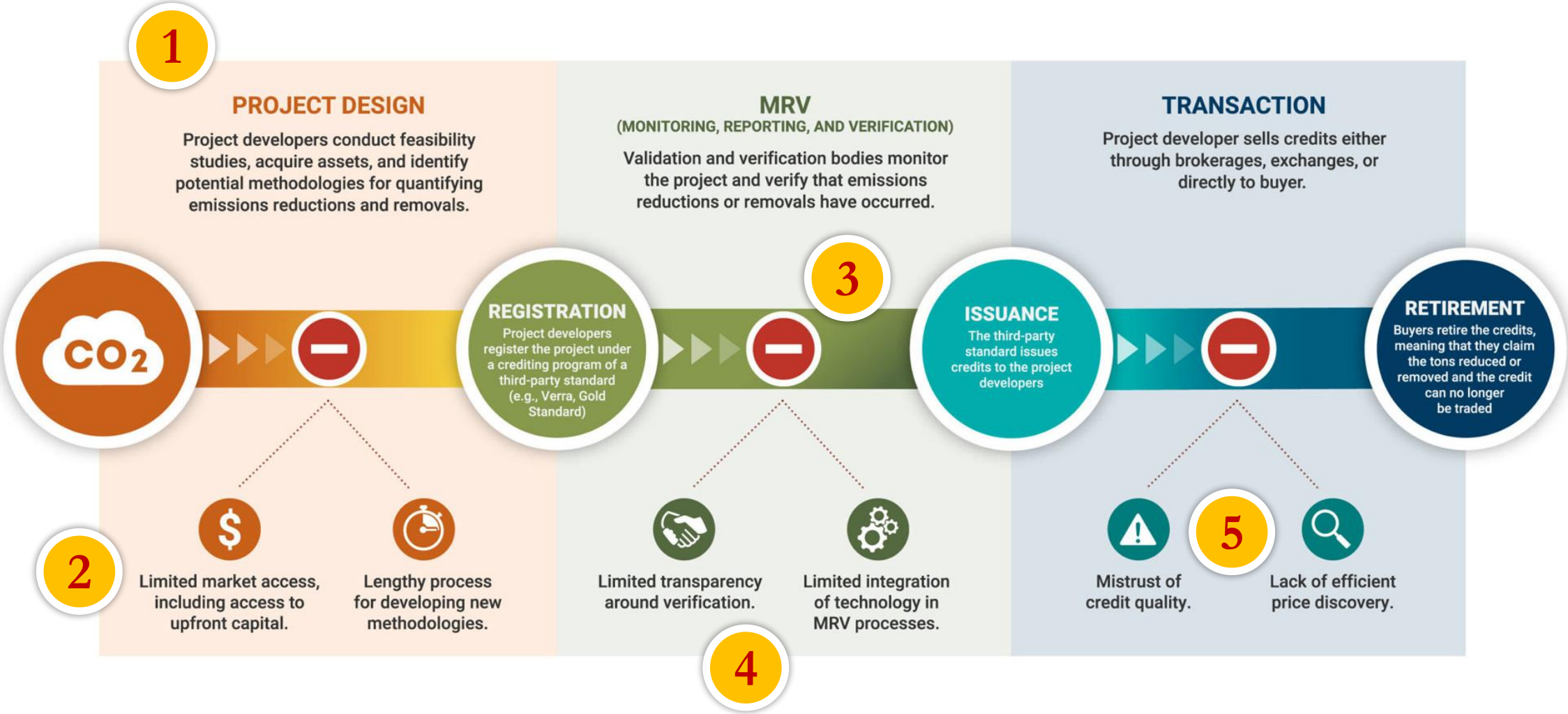


Resource:
https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/
https://carboncredits.com/microsofts-9-billion-power-move-revolutionizing-u-s-clean-energy-and-communities/
https://unfccc.int/climate-action/un-global-climate-action-awards/climate-neutral-now/microsoft-carbon-negative-goal

Benefits…

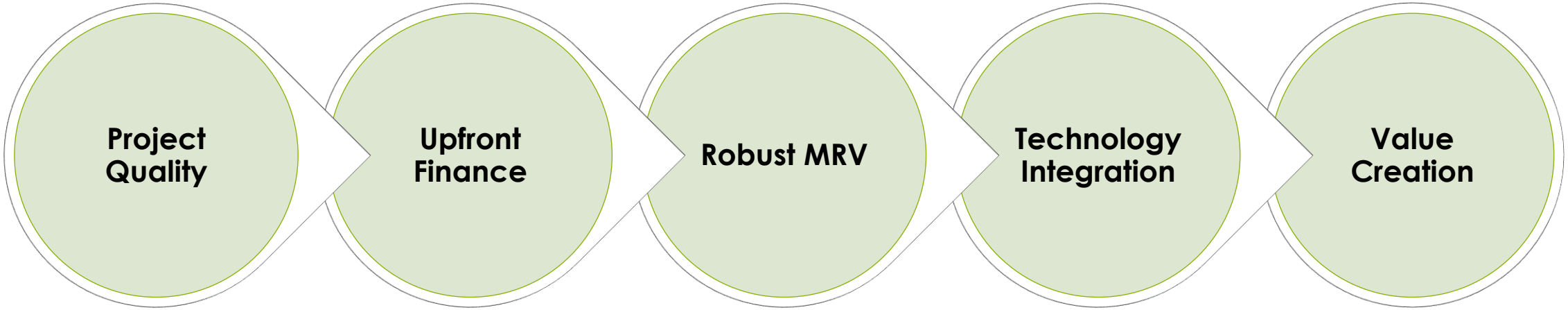

Brand and Investor Confidence
Environment
Access to Capital
Reduced Operating Costs

Closing the Loop: Carbon Credit Life Cycle



Resource:
https://carbonfreezone.com/carbon-credits/what-are-carbon-credits/

Key Considerations for Value Creation



But there is more…

Case Study: TSLA and PSNY

CARBON CREDITS .com

Carbon Credits › Tesla's Carbon Credit Revenue Soars to $2.76 Billion Amid Profit Drop

Tesla's Carbon Credit Revenue Soars to $2.76 Billion Amid Profit Drop

January 30, 2025 | **Updated**: January 30, 2025

By **Jennifer L**

Tesla's profits took a hit in 2024, dropping 23%. But one revenue stream kept surging—carbon credit sales. The carmaker reached a new record in selling regulatory credits, recording a 54% jump from 2023. As the EV market evolves and emissions rules tighten, can Tesla keep profiting from carbon credits?

Reuters World Business Markets More My News Subscribe

Automakers to pool CO2 emissions with Tesla, Polestar to meet EU 2025 rules

By **Reuters**

January 8, 2025 1:07 AM GMT+8 · Updated January 8, 2025

Resource:
https://www.reuters.com/business/autos-transportation/stellantis-toyota-ford-mazda-subaru-plan-pool-co2-emissions-with-tesla-2025-01-07/
https://carboncredits.com/teslas-carbon-credit-revenue-soars-to-2-76-billion-amid-profit-drop/
https://theicct.org/publication/eu-co2-standards-cars-vans-may23/

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6

New Value Model: Tokenising Carbon Related Assets

Tokenisation: Purpose

Project Financing

Investment Asset

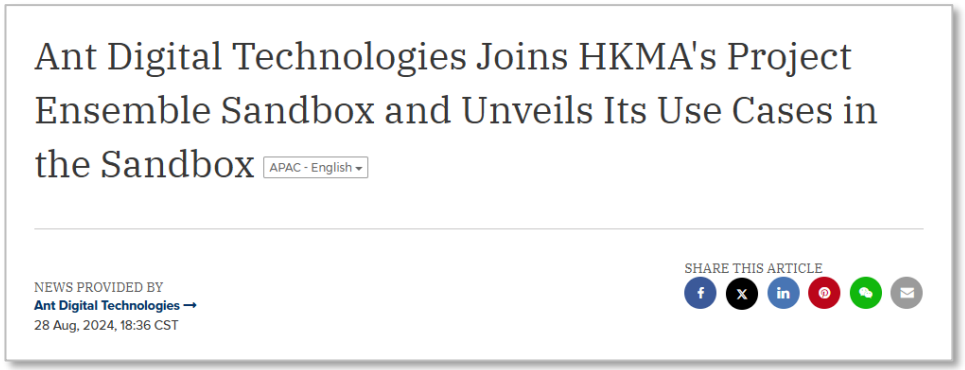
Reward Scheme

Case Study: Ant Digital + Longshine RWA Tokenisation

OSL & Ant Digital Technologies Forge Landmark RWA Partnership – Pioneering the Future of Tokenised Finance

May 5, 2025 Share

(Dubai, 2 May 2025) – OSL Group (863.HK), a publicly listed company fully dedicated to digital assets, and Ant Digital Technologies have signed a Memorandum of Understanding (MoU) to establish a strategic partnership in Real-World Asset (RWA) tokenisation. The agreement, announced at the *RWA REAL UP Dubai Summit 2025* on 30 April, marks a significant step in developing institutional-grade infrastructure for asset digitisation.



Ant Digital Technologies Joins HKMA's Project Ensemble Sandbox and Unveils Its Use Cases in the Sandbox APAC - English

NEWS PROVIDED BY
Ant Digital Technologies →
28 Aug, 2024, 18:36 CST

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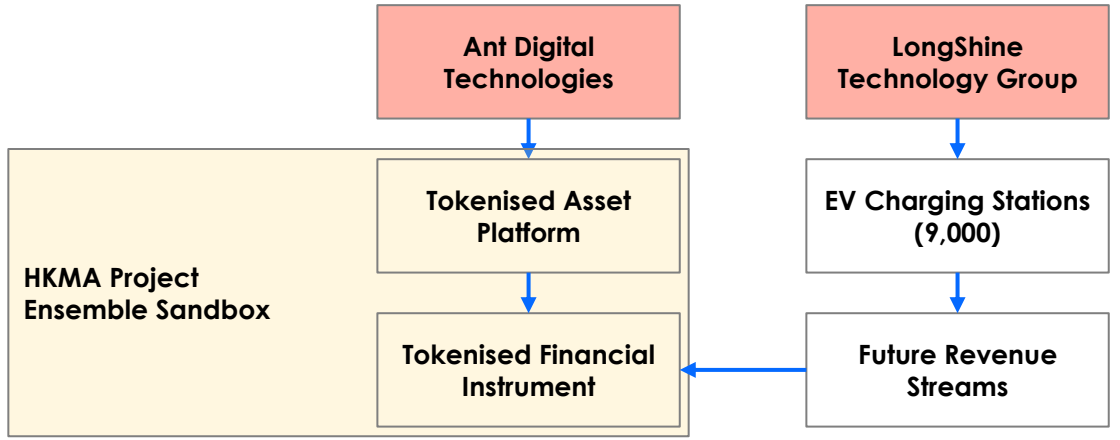

Project Financing —— Proceeds intended for financing electric-vehicle charging station operations in Mainland China

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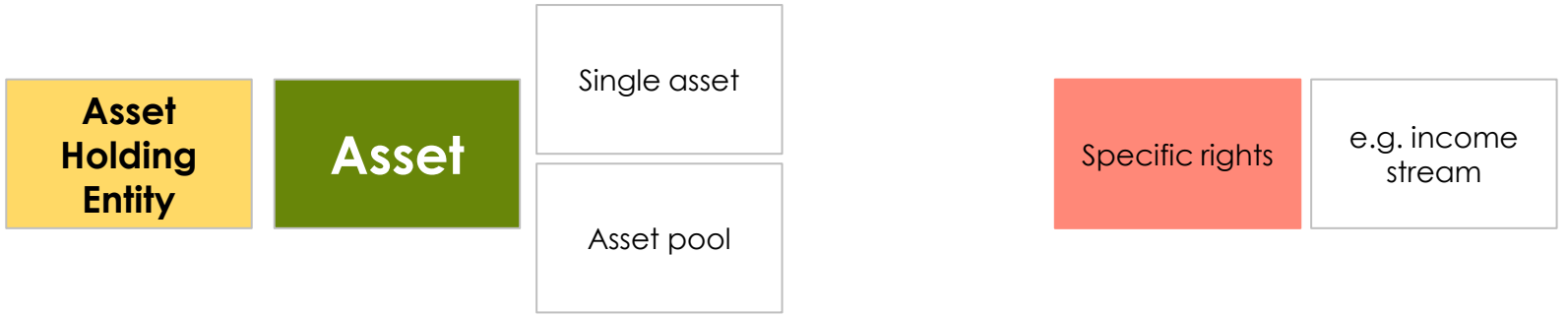
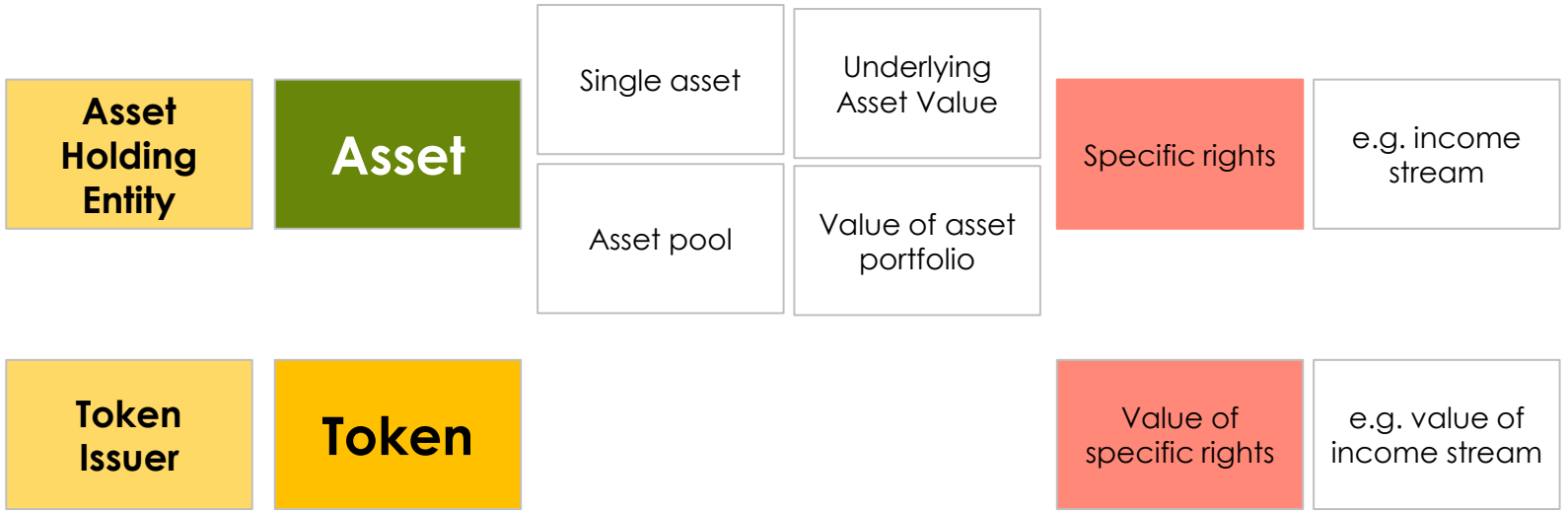
Reference Asset



Basis of Valuation



Tokenisation Value Model: Challenges for Carbon Credits

Factors:
Quantity
Quality
Applicability
Cashflow pattern

Upper bound: Carbon Tax
Lower bound: ETS Baseline Value

Essential consideration: The underlying business and revenue model in driving long-term asset value

Practical Challenges of Tokenisation

Project Financing

Demonstrating long-term project viability; long pay-back period could be barrier to attract investment

Investment Asset

Demonstrating long-term income generating capability; climate related projects may not be scalable especially for single project initiatives

Reward Scheme

Demonstrating diversity of reward scheme; size of ecosystem, portability and acceptability a key consideration for long-term viability

Agenda

Summary

Regulatory Market: Paris Agreement Article 6

Enables international collaboration on carbon reduction projects; creates opportunities for countries to trade carbon credits, paving the way for a more inclusive and effective approach to climate action

Article 6.2: Cooperative Approaches

- Allows countries to collaborate and trade carbon credits bilaterally or multilaterally (e.g. Country A could fund a renewable energy project in Country B, with resulting emission reductions count towards Country A's climate goals)

Article 6.4: The Sustainable Development Mechanism (SDM)

- Facilitates the creation of a global carbon market, enabling countries to generate carbon credits from emission reduction projects; help countries meet their Nationally Determined Contributions (NDCs) while driving sustainable development

Article 6.8: Non-Market Approaches

- Recognises that climate actions don't require market mechanisms but can be achieved through technology transfer, capacity building, and financial support

Reference:
https://www.greenstory.io/blogs/regulatory-market-and-carbon-credits-development

Growth in Voluntary Market

Exponential growth, with annual transactions estimated to exceed USD50 billion (compared to USD2 billion in 2020) fueled by a **global wave of net-zero commitments**

Clear shift toward **quality and transparency** as buyers seek credits that are **independently verified**, have strong **additionality**, are **permanent**, and provide **co-benefits**

Rising demand for **Carbon Removal Credits**, which are more expensive but are considered more credible; global market for carbon removal credits could reach USD100 billion annually between 2030 and 2035 based on analysis by consultancy firm Oliver Wyman

Technology is also transforming the market; blockchain platforms are used for traceability and preventing double counting; remote imaging and AI-driven verification are increasing confidence in project performance

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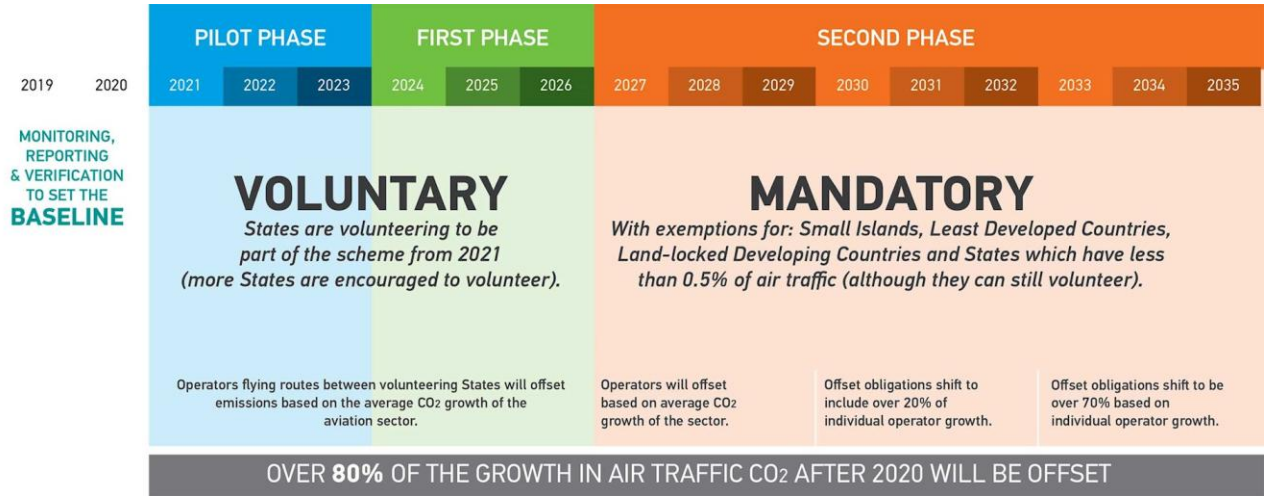
Industry Schemes Driving Growth

CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) will become **mandatory** for most countries starting in 2027

Airlines operating international flights between participating countries will be required to offset their emissions above a 2019 baseline



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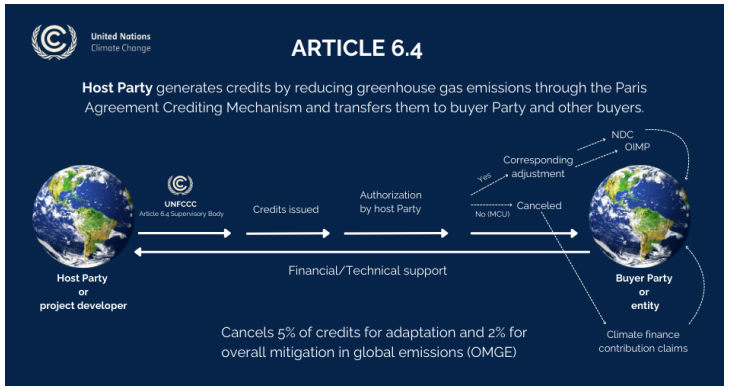
Standards to Drive Quality and Trust

The Paris Agreement Crediting Mechanism (PACM) is a UN Body responsible for setting up a carbon market under the Paris Agreement, adopted new standards to guide how emission-reducing projects measure their impact

The PACM is tasked with developing and supervising the requirements and processes, including developing and approving methodologies, registering activities, accrediting third-party verification bodies, and managing the Article 6.4 Registry

In addition to PACM, the ISO has also published a series of standards to provide recognition, credibility and accountability to climate projects and initiatives



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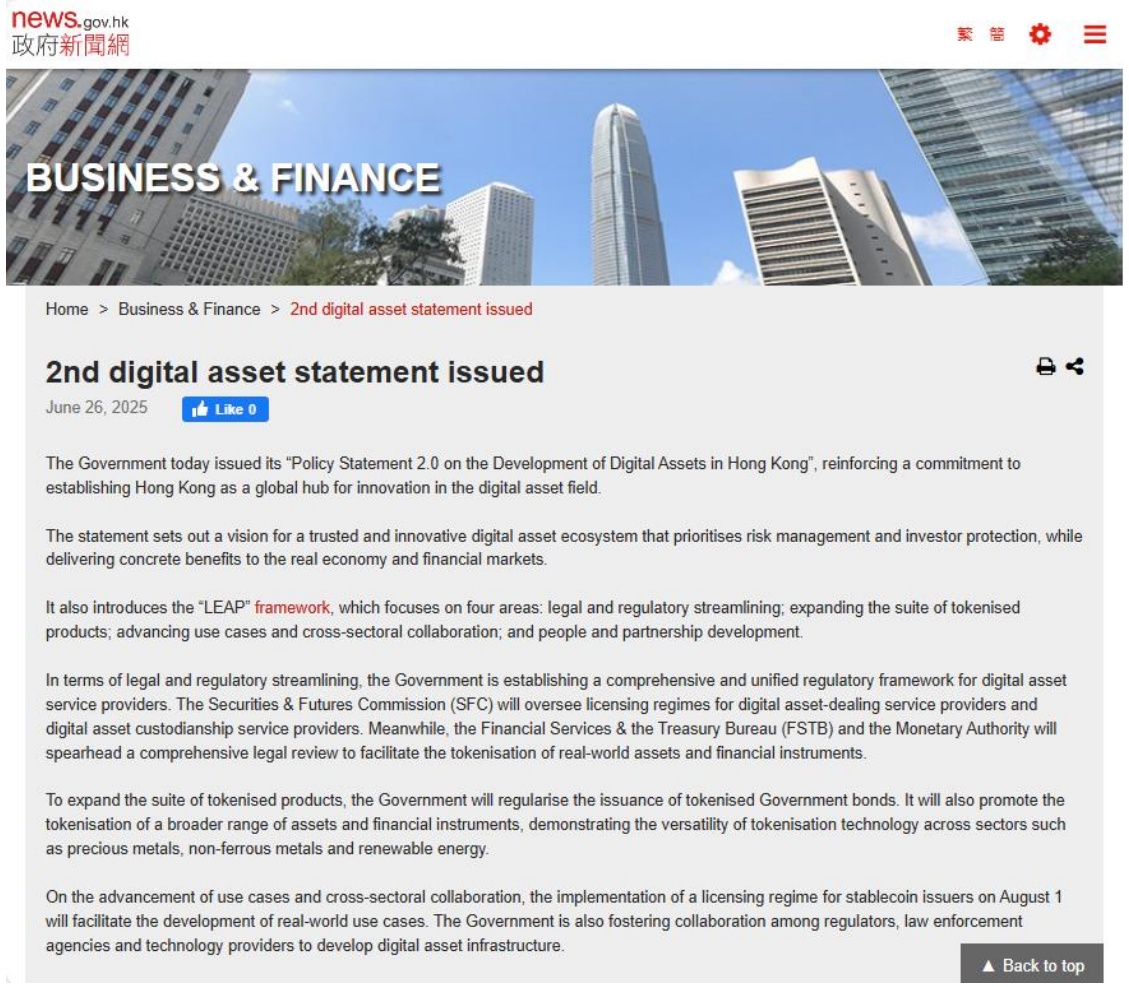
Leveraging HK's Digital Asset Policy



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BUSINESS & FINANCE

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2nd digital asset statement issued

June 26, 2025 Like 0

The Government today issued its "Policy Statement 2.0 on the Development of Digital Assets in Hong Kong", reinforcing a commitment to establishing Hong Kong as a global hub for innovation in the digital asset field.

The statement sets out a vision for a trusted and innovative digital asset ecosystem that prioritises risk management and investor protection, while delivering concrete benefits to the real economy and financial markets.

It also introduces the "LEAP" framework, which focuses on four areas: legal and regulatory streamlining; expanding the suite of tokenised products; advancing use cases and cross-sectoral collaboration; and people and partnership development.

In terms of legal and regulatory streamlining, the Government is establishing a comprehensive and unified regulatory framework for digital asset service providers. The Securities & Futures Commission (SFC) will oversee licensing regimes for digital asset-dealing service providers and digital asset custodianship service providers. Meanwhile, the Financial Services & the Treasury Bureau (FSTB) and the Monetary Authority will spearhead a comprehensive legal review to facilitate the tokenisation of real-world assets and financial instruments.

To expand the suite of tokenised products, the Government will regularise the issuance of tokenised Government bonds. It will also promote the tokenisation of a broader range of assets and financial instruments, demonstrating the versatility of tokenisation technology across sectors such as precious metals, non-ferrous metals and renewable energy.

On the advancement of use cases and cross-sectoral collaboration, the implementation of a licensing regime for stablecoin issuers on August 1 will facilitate the development of real-world use cases. The Government is also fostering collaboration among regulators, law enforcement agencies and technology providers to develop digital asset infrastructure.

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Reference:
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Maximising Value of Quality Climate Related Projects

Leverage Hong Kong's Unique Role for Cross-border Project Financing

United Nations Climate Change
Gold Standard
VERRA
CLIMATE, COMMUNITY & BIODIVERSITY STANDARDS
REDD+
American Carbon Registry
puro.earth
VERIFIED CARBON STANDARD
REGEN NETWORK
CLIMATE ACTION RESERVE
PLAN VIVO

Thank You

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Illuminăre