

GenZero Carbon Scenarios

An Exploration of the
Future of Carbon Markets



April 2024

Acknowledgements

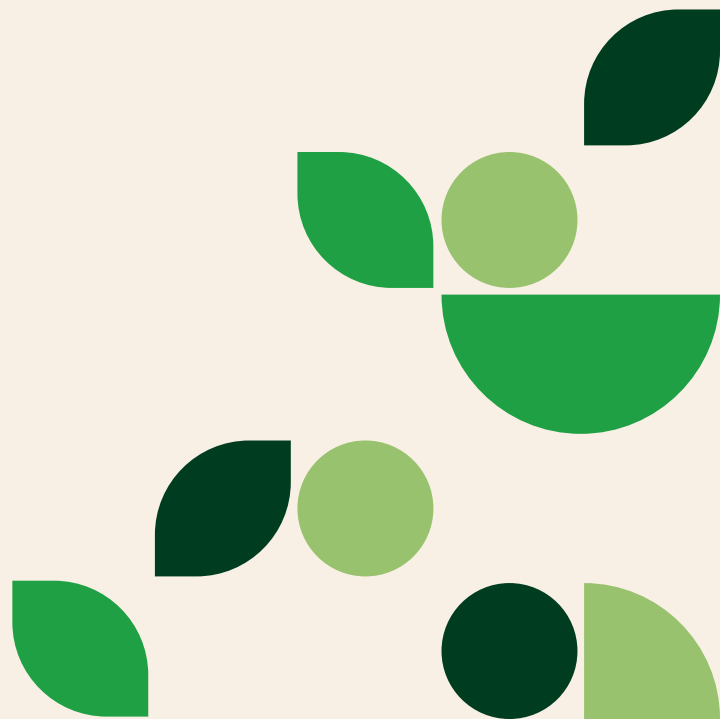
We would like to thank our industry partners who have provided their input for this paper.

About GenZero

GenZero is an investment platform company focused on accelerating decarbonisation globally. Founded by Temasek, we seek to deliver positive climate impact alongside long-term sustainable financial returns by investing in opportunities with the potential to be nurtured into impactful and scalable solutions.

Driven by a common purpose to decarbonise for future generations, we recognise the need for a holistic and integrated approach to achieve a net zero world. At GenZero, we adopt a flexible investment approach across three focus areas to drive climate impact: (i) nature-based solutions that help protect and restore our natural ecosystems while benefiting local communities and biodiversity; (ii) technology-based solutions that deliver deep decarbonisation impact; and (iii) carbon ecosystem enablers which refer to companies and solutions that support the development of an effective, efficient, and credible carbon ecosystem.

For more information on GenZero, visit <https://genzero.co/>.



Foreword

Carbon markets will remain relevant, but there are multiple futures

The Intergovernmental Panel on Climate Change's special report on 1.5°C in 2018 makes a compelling case for governments, corporates, and civil society to articulate and take clear steps to reduce our carbon footprint and invest in sustainable solutions to protect our planet and the rich biodiversity that depends on it.

Impactful climate solutions already exist today. However, there remains a lack of dedicated capital to commercialise and scale. This is where the need for carbon markets comes into play as a critical tool to catalyse financing towards meaningful projects, scale impact at pace, and protect the precious parts of nature we have left.

This paper aims to share learnings from our scenario planning exercise to encourage investors, policymakers, and industry leaders to discuss the critical driving forces, strategic pivots, and key imperatives we need to make, and ensure we have an effective pathway towards our decarbonisation objectives.

We hope the insights are useful in fostering learning, to enable us to grow and move faster together. We need to encourage the development of clear and harmonised policy frameworks. This will pave the way for concrete financing plans to attract public and private capital flows, accelerating the green transition globally.

The actions we take today are critical.

There are many challenges in front of us but, together, we stand a better chance in achieving a net-zero future.



Frederick Teo
CEO, GenZero

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Executive Summary

Carbon pricing is an essential tool to accelerate climate action.

Net-zero pledges now cover 88% of global greenhouse gas (GHG) emissions.¹ However, the world remains off-track from pathways that limit global warming to 1.5°C.² This gap needs to be bridged by effective policies and measures. Carbon pricing is a key lever to accelerate decarbonisation by factoring in a cost to emit, thus incentivising businesses and individuals to reduce their carbon footprint.

Carbon markets are a flexible and effective way to put a price on carbon.

It is politically challenging to implement carbon pricing at levels high enough to drive transformational change.³ Prices need to balance external costs of emissions with economic goals and sustainable development priorities. Carbon markets help by providing a flexible way of pricing emissions which allocates capital to the most cost-effective abatement measures, and improves the economics of nascent solutions in hard-to-abate sectors.

However, the outlook for carbon markets is highly uncertain.

There are many critical uncertainties that affect carbon markets. Several of these are already playing out in the real world. For example, geopolitical and macroeconomic headwinds have caused countries and corporates to scale back climate action in the face of competing priorities (e.g. inflation, resilience, and security). Carbon markets are also facing questions about environmental integrity at the supply, demand, and system levels.⁴

1 Net Zero Tracker (2024): *Global Net Zero Coverage*.

2 United Nations Environment Programme (2023): *Emissions Gap Report 2023*.

3 International Monetary Fund (2021): *The Poverty and Distributional Impacts of Carbon Pricing: Channels and Policy Implications*.

4 GenZero (2023): *Carbon Markets 2.0 – Addressing Pain Points, Scaling Impact*.

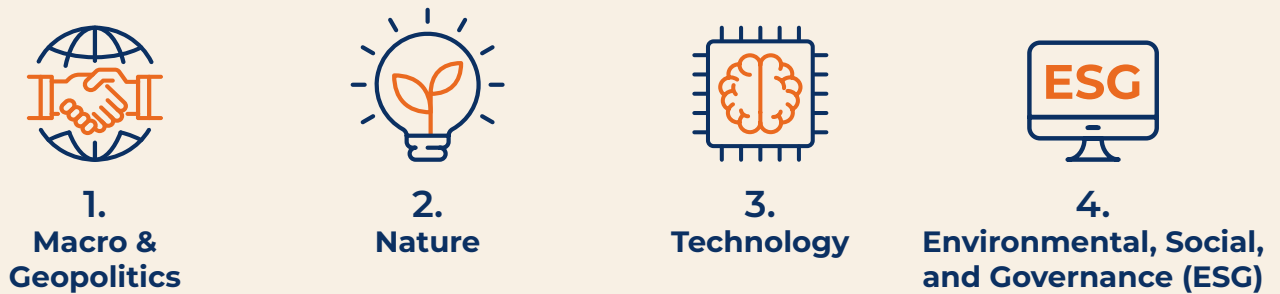


Executive Summary *(continued)*

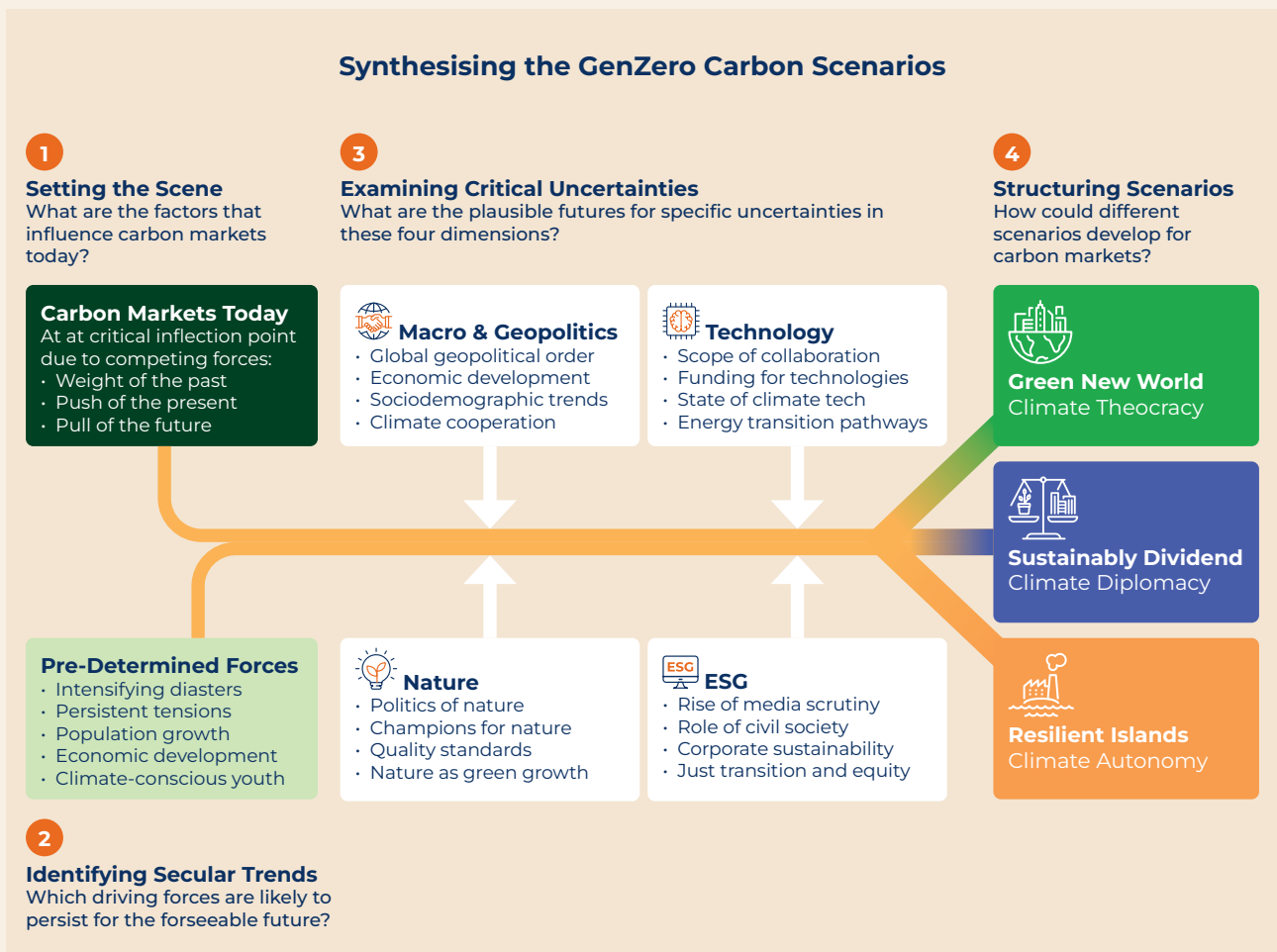
Scenarios help to stretch our thinking and navigate uncertainty.

Scenarios are not predictions or forecasts. Instead, they create narratives about possible futures to help us understand the different driving forces, deliberate on plausible variations, and chart out actionable roadmaps to be future-ready.

To unpack the uncertainties around carbon markets, four dimensions were identified for further analysis:



A structured approach is then applied to reveal assumptions and stretch thinking to arrive at three scenarios for carbon markets.



Executive Summary *(continued)*

THE GENZERO CARBON SCENARIOS

Green New World: Climate Theocracy

Faced with devastating impacts of climate change, climate cooperation becomes a top global priority



Collaboration drives cross-border optimisation of renewable energy and accelerates energy system decarbonisation. Climate-conscious consumers push governments and corporations to meet high environmental standards. International organisations establish harmonised sustainability frameworks, imposing a high quality bar for carbon markets in the mid-2030s. The focus on quality diverts carbon finance away from projects which deliver cost-effective mitigation at scale, but with higher probability of leakage and reversal risks (e.g. avoided deforestation). Instead, attention shifts towards carbon removals that are more clearly quantifiable and permanent (e.g. direct air capture). Carbon becomes a valuable commodity and is actively traded in a low-volume but high-price global market.

Sustainably Divided: Climate Diplomacy

Despite extreme weather events, geopolitical contestation results in bifurcated decarbonisation



Ideological differences hinder the adoption of global standards, causing decarbonisation pathways and narratives to diverge along geopolitical fault lines. A bifurcated carbon market emerges in the late 2020s with a focus on high-quality solutions in the West and scalable solutions in the East. The desire for inter-bloc collaboration is initially limited, but eventually rekindled due to resource constraints and increased climate disasters. By the late 2030s, there is alignment on quality principles between buyers in the West and project developers in the East, enabling carbon markets to bridge the geopolitical gap and facilitate partnerships on high-quality climate solutions.

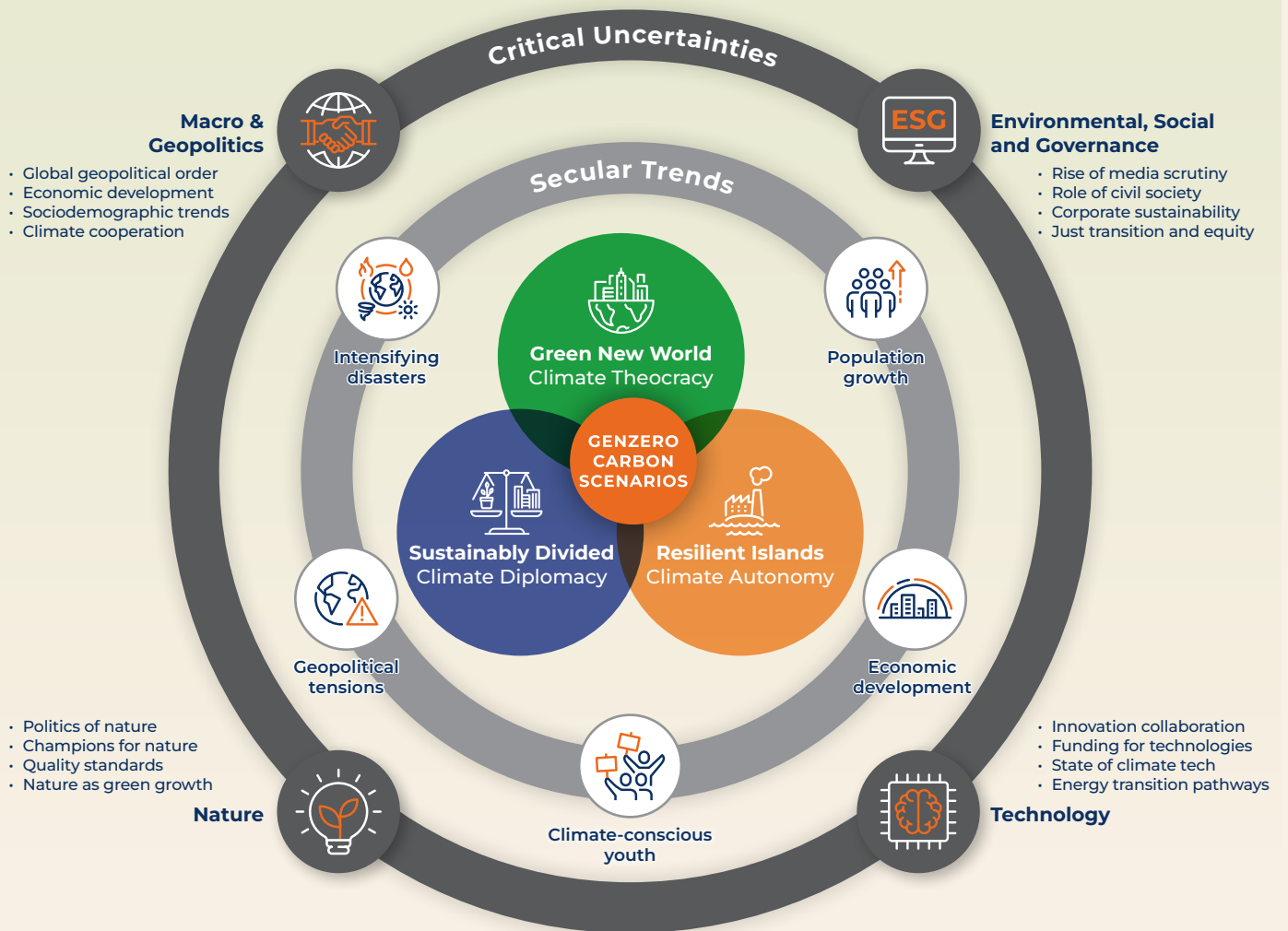
Resilient Islands: Climate Autonomy

Climate disasters strain international cooperation and result in fragmented climate action



A rising sense of nationalism fuels protectionism, and countries hesitate to commit to international initiatives. This spills over into sustainability and climate change. Frustrated by slow global action in the 2020s, the younger generations of today put increasing pressure on governments and businesses to act. Governments begin taking unilateral action in the early 2030s and with limited prospects for global collaboration on climate, there is a rising focus on resilience and adaptation. Without centralised oversight, sustainability efforts become fragmented. Numerous definitions emerge of what counts as legitimate climate action. Some countries implement effective carbon market schemes and bilateral carbon trading emerges where key quality principles align, offering a limited path for collaboration in a tense geopolitical landscape.

Executive Summary (continued)



Executive Summary (continued)


Green New World
Climate Theocracy

Sustainably Divided
Climate Diplomacy

Resilient Islands
Climate Autonomy

Secular Trends				
Intensifying disasters		Physical climate change effects worsen in 2020s		
Geopolitical tensions		A tense geopolitical environment persists until the 2030s		
Population growth		Emerging economies drive steady population growth till 2050		
Economic development		Economic development remains an essential policy objective		
Climate-conscious youth		Younger generations see climate change as a growing problem		
Critical Uncertainties				
 Macro & Geopolitics	Global geopolitical order	Small world after all	Strategic rivals, climate allies	Global fragmentation
	Economic development	Inclusive green growth	Bifurcated development	Security first
	Sociodemographic trends	Climate revolution	Green connection	Decarbonisation polarisation
	Climate cooperation	Unite as one	Ambition outruns action	Climate clubs
 Nature	Politics of nature	Cooperative efforts	Nature traders	Green guardians
	Champions for nature	Enlightened enterprises	Supportive governments	Catalytic enablers
	Quality standards	Tower of excellence	Steady standardisation	Flexible approach
	Nature as green growth	Communities first	Economic powerhouse	Selective investments
 Technology	Innovation collaboration	Creative commons	Divergent discoveries	Independent innovation
	Funding for technologies	Motivated risk-takers	Government-led	Conservative investors
	State of climate tech	Reach for the sky	Competitive advantage	Defensive pivot
	Energy transition pathways	Borderless transition	Clean resource race	Safeguarding independence
 ESG	Rise of media scrutiny	Radical transparency	Vigilant watchdog	Competing narratives
	Role of civil society	Aggressive advocacy	Give and take	Localised influence
	Corporate sustainability	Social license	Rising tides	To each his own
	Just transition and equity	Shared responsibility	Negotiated support	All by myself

Executive Summary *(continued)*

The scenarios reveal five key takeaways about carbon markets.

As we explore how the different futures could take shape, several characteristics of carbon markets become evident.

- 1. Carbon markets are likely to remain a key lever for climate action but could look very different depending on how quickly and cooperatively we decarbonise.** Younger generations are expected to ramp up pressure on corporations and countries to decarbonise. Carbon prices are an important lever to accelerate decarbonisation, but implementing high carbon prices can be challenging. Carbon markets offer a flexible solution that is adaptable to economic and political cycles. Nevertheless, they could look very different from the carbon markets of today. Whether they are global and harmonised (**Green New World**), fragmented and local (**Resilient Islands**), or bifurcated but interconnected (**Sustainably Divided**), carbon markets are likely to exist in some shape or form given their flexibility to be implemented in various ways that reflect the level of climate ambition.
- 2. In the absence of harmonised quality standards, shared quality principles are essential to accelerate investments and confidence in carbon projects.** This occurs naturally if the global market is collaborative and standardised (**Green New World**). However, in the absence of a central authority, the lack of clear and widely-accepted quality principles will likely result in market fragmentation (**Resilient Islands**). It is particularly important to agree on harmonised principles in a fragmented world, as they will help form the bedrock to draw the carbon markets together. This is a necessary first step to facilitate future connections across fragmented markets (**Sustainably Divided**).
- 3. Carbon markets can provide a neutral platform to facilitate collaboration on climate action even amidst broader tensions.** It can provide a neutral platform for collaboration even when underlying political ideologies differ. In **Sustainably Divided**, the economic incentive to trade eventually overcomes political differences, creating a common ground for cooperation. Even in **Resilient Islands**, successful carbon markets can serve as building blocks for broader bilateral partnerships between countries.
- 4. Low-integrity projects can have outsized negative impacts and hold us back from delivering sustained impact at scale.** If low quality projects are not weeded out, it can cause consumers to lose faith in the system and carbon markets to collapse. In **Resilient Islands**, jurisdictions with weak quality controls eventually reform their carbon markets amidst rising ground-up demand for actual decarbonisation. Low-quality projects can also cause the market to react by imposing perfectionist standards. In **Green New World**, poorly-executed projects become prime targets for investigative journalism and high-profile litigation.
- 5. Narrow quality definitions can potentially hinder the development of many carbon project types and the broader carbon markets to incentivise near-term decarbonisation.** Many project types that deliver near-term decarbonisation, such as nature-based solutions (NBS), will contain some risks. A pragmatic and informed discussion on the trade-offs will be important in looking at appropriate industry discussions on quality to prevent hindering less-than-perfect projects that can still deliver meaningful near-term impact. In **Green New World**, narrow quality definitions negatively impact the speed, scale, and costs of decarbonisation as several project types, such as nature conservation, face challenges. In **Sustainably Divided**, the flexible application of shared quality principles encourages the use of present-day climate solutions to deliver immediate near-term decarbonisation.

Executive Summary *(continued)*

We see three strategic imperatives for carbon market participants.

- 1. Supporting the development of regulatory oversight in carbon markets.** Thoughtful regulation benefits the carbon market by boosting trust, signalling demand, and attracting investment. There is still a need for thoughtful industry self-governance, but some degree of regulatory oversight is important. Industry standards benefit from knowledge and understanding, encouraging rather than forcing actions. Nevertheless, some degree of regulatory oversight fosters integrity and trust and, where necessary, provides the weight of regulatory force to incentivise action. Support from industry is essential to have alignment on key quality principles and avoid confusing and overlapping guidance. Flexibility in applying these principles allows for regional variations while maintaining environmental integrity. Well-designed regulations can significantly catalyse and boost the impact of carbon markets.
- 2. Providing clarity on the role of carbon markets in decarbonisation pathways.** Corporates that leverage the voluntary carbon market need clear guidance to signal their future demand for carbon credits, without which project developers will struggle to scale up investments. Companies need a clear framework to demonstrate genuine emission reduction efforts alongside use of carbon credits to foster trust with stakeholders and avoid greenwashing. Defining credible claims ensures transparency and allows responsible businesses to leverage the carbon markets for real environmental impact.
- 3. Leveraging digitalisation as a tool to enable integrity at scale and restore confidence.** Digital technologies have the potential to revolutionise the carbon market by boosting transparency and efficiency. Blockchain creates traceable and immutable records of carbon credits, reducing fraud and strengthening trust. Digital monitoring, reporting, and verification (MRV) tools gather vast amounts of environmental data, improving authentication and transparency at scale. Remote sensing cuts costs by replacing on-site monitoring, while digital platforms standardise processes and reduce administrative burdens for both developers and regulators. Digital technologies are critical in a fragmented market, where interoperability is a key enabler for carbon trading across different systems.

1. Setting the Scene

Carbon Market Crossroads

Carbon markets are at a critical inflection point.

After a phase of rapid growth in recent years, carbon markets are now experiencing multiple headwinds. Geopolitical, macroeconomic, and sociodemographic circumstances have affected the appetite for countries and corporates to participate in carbon markets. Important questions have also emerged around the environmental integrity of the carbon markets, especially regarding carbon credits and the legitimacy of their use as part of decarbonisation efforts. Nevertheless, many institutions still look to carbon markets as a tool to put a price on carbon and incentivise climate action.

A confluence of forces sets the scene for carbon markets today.

In addition to current-day trends, there are other forces at play that are shaping carbon markets. Historical perspectives are important, as carbon markets have been around for decades and carry with them legacy issues. It is also important to consider broader contexts such as climate change, sustainability, geopolitics, economic development, and energy transition. Each of these have, and continue to, shape the evolution of carbon markets.



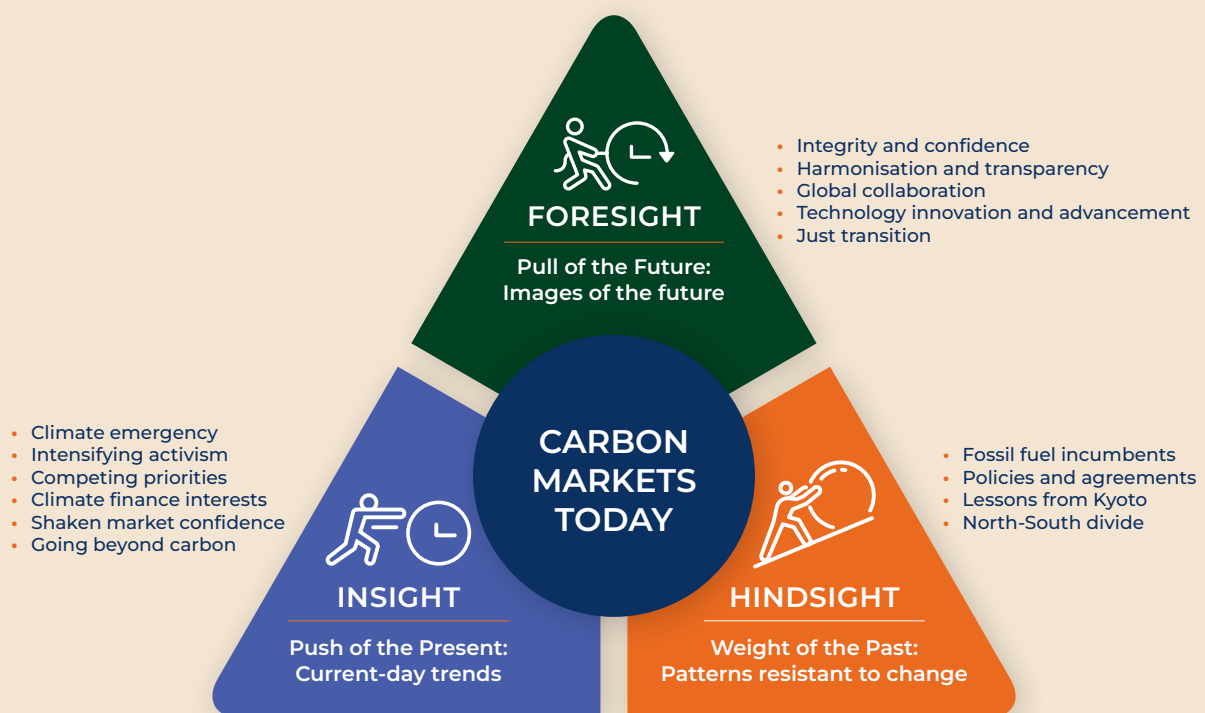
1. Setting the Scene

Carbon Market Crossroads (continued)

To set the scene for carbon markets today, the confluence of forces is distilled along three dimensions:

- **Enduring historical constraints (“weight of the past”)**
- **Current trends that exert pressure for change (“push of the present”)**
- **Visions and aspirations of a preferred future (“pull of the future”)**

Carbon markets at the intersection of past, present, and future



1. Setting the Scene

Carbon Market Crossroads (continued)



HINDSIGHT

1. Weight of the Past

Patterns resistant to change

- Fossil fuel incumbents:** Modern civilisation depends heavily on fossil fuels to supply energy and raw material inputs. Society has ingrained habits linked to the convenience of goods and services derived from fossil fuels. On the demand side, while the importance of energy transition is recognised, there are limits to the speed and extent of behavioural change. On the supply side, fossil fuel production will need to continue in order to minimise disruptions while cleaner alternatives are phased in. Those with established fossil fuel business interests may influence the trajectory of the transition to suit their interests.
- Policies and agreements:** Domestic and international climate policies are often formed over many years, with a complex history of negotiation and compromise among groups with competing interests. For example, developments surrounding the United Nations Framework Convention on Climate Change (UNFCCC) and the annual Conference of the Parties (COP) meetings provide important context that have long-lasting impacts. The landmark Paris Agreement from COP21 and the Article 6 rulebook from COP26 continue to heavily influence carbon markets today. As new carbon market policies are considered, the backdrop of previous discussions and agreements is an important consideration.
- Legacy of Kyoto:** The Kyoto Protocol was a groundbreaking agreement at the international level and gave rise to the Clean Development Mechanism (CDM), the world's first global carbon market scheme. The Kyoto Protocol ultimately did not meet its targets due to a lack of enforceability and deep divides between developed and developing countries. The CDM saw some success with effective projects and decent prices, especially when the European Union (EU) allowed credits under its emissions trading system (ETS). However, the market ultimately collapsed due to environmental integrity concerns, notably the chemical hydrofluorocarbon-23 (HFC-23) scandal and the withdrawal of large buyers, like the EU and Japan from the market.⁵ There are important lessons learnt from the Kyoto Protocol and the CDM that influence thinking on carbon markets today.
- North-South divide:** There is perceived inequity towards the Global South which holds less responsibility for the climate crisis but is disproportionately impacted by it. Developed countries account for 12% of global population, but are responsible for 50% of all emissions since 1850.⁶ While they have greater financial and technological resources, the burden lies with developing countries to address climate change, as more than two-thirds of the deaths caused by climate-related disasters have been in these regions.⁷ This sense of inequity extends beyond climate to the broader economic and political system, resulting in a deep North-South divide and fuelling scepticism about carbon market cooperation.

⁵ HFC-23 is a by-product in the production of a chemical (HCFC-22) primarily used in air conditioning and refrigeration. It is 14,800 times more damaging to the climate than carbon dioxide. There was evidence that manufacturers created excess HFC-23 simply to destroy it and earn carbon credits.

⁶ Global Carbon Budget (2023).

⁷ United Nations Development Programme (UNDP) (2023): *Supporting climate action in least developed countries*.

1. Setting the Scene

Carbon Market Crossroads (continued)



INSIGHT

2. Push of the Present

Current-day trends

- Climate emergency:** In the past, the physical impacts of climate change were often thought to be decades away, resulting in a lack of urgency to decarbonise. That thinking has now changed. 2023 was the warmest year on record with temperatures 1.45°C above pre-industrial levels, and saw extreme weather events with wide-ranging socioeconomic impacts.⁸ The world can no longer afford to wait to decarbonise, and there is a growing sense of urgency to act before climate disasters get worse.
- Intensifying activism:** Climate-conscious groups are ramping up activist pressure on governments and businesses to embrace sustainable practices. There are strong voices coming from youths, non-governmental organisations (NGOs), and media. Initially focused on raising awareness, activists are increasingly demanding concrete action. Further, civil society is wary of the potential for carbon markets to be used for greenwashing, and closely scrutinises its environmental integrity.
- Competing priorities:** Countries and corporates face a multitude of other concerns such as geopolitical tensions, slowing growth, rising inflation, and high interest rates. They are likely to divert resources away from climate to tackle these other challenges. Geostrategic competition results in countries becoming more sceptical of international dealmaking. Instead, they look to leverage green industrial policies such as the U.S. Inflation Reduction Act (IRA) to support both environmental and economic objectives.
- Interest in climate finance:** There is rising interest in climate finance with growing support from both public and private funds. Annual average climate finance flows doubled from 2019/20 to 2021/22 to reach US\$1.3 trillion.⁹ Flows are still significantly below estimated needs of US\$5-11 trillion, but more commitments are being made through international partnerships such as the Green Climate Fund,¹⁰ Just Energy Transition Partnership (JETP),¹¹ and the Loss and Damage Fund.¹²
- Distrust of carbon credits:** Recent media reports of pervasive over-crediting, human rights scandals, and greenwashing have sparked a serious rethink of the role of carbon credits in decarbonisation. While initiatives like the Integrity Council for the Voluntary Carbon Market (ICVCM) have developed tools to safeguard environmental integrity, complexities of carbon accounting and carbon crediting mechanisms are often lost in the headlines. For some segments of the market, confidence in carbon credits has been shaken and will take some time to be rebuilt.
- Going beyond carbon:** Half of the 140 targets under the 17 Sustainable Development Goals (SDGs) are not on track, notably around biodiversity loss.¹³ There has been a spillover effect on carbon markets as carbon projects, especially NBS, are increasingly expected to support the SDGs, such as Good Health and Well-being (SDG 3), Decent Work and Economic Growth (SDG 8), and Life on Land (SDG 15). Project revenues should also be equitably distributed local communities. Carbon credits are emerging as a mechanism to fund ecosystem and community benefits that go beyond emissions reductions.

⁸ World Meteorological Organization (2024): *State of the Global Climate 2023*.

⁹ Climate Policy Initiative (2023): *Global Landscape of Climate Finance 2023*.

¹⁰ The Green Climate Fund is the world's largest climate fund mandated to support developing countries raise and realise their Nationally Determined Contributions ambitions.

¹¹ Just Energy Transition Partnerships are a financing cooperation mechanism to support coal-dependent emerging economies to make a just energy transition.

¹² The Loss and Damage Fund aims to support vulnerable countries deal with the effects of climate change.

¹³ United Nations Department of Economic and Social Affairs (UN DESA) (2023): *The Sustainable Development Goals Report 2023*.

1. Setting the Scene

Carbon Market Crossroads (continued)



FORESIGHT

3. Pull of the Future

Aspirations of the future

- **Integrity and confidence:** An end-to-end framework governing supply, demand, and system-level integrity can help to address many of the criticisms that carbon markets face today. Complementary voluntary market integrity initiatives and compliance market regulations can help to establish the legitimacy of carbon markets. With confidence restored, corporates and countries can use carbon credits as part of their decarbonisation strategy, knowing that every credit is backed by real, additional, verifiable, and permanent emissions reductions.
- **Harmonisation and transparency:** Clear and consistent standards for carbon accounting and carbon crediting can provide the necessary transparency that supports green claims and facilitates interoperability among various systems. Harmonised quality standards and sustainability frameworks can support system-level integrity, eliminating bad projects and greenwashing from the market. Transparency should be augmented by digital technologies that enable real-time MRV at scale.
- **Global collaboration on climate:** Effective international cooperation, technology transfer, and financial support can be a big boost to achieving ambitious climate goals. Instead of countries being constrained to climate solutions and technologies available within its borders, vibrant international collaboration and open trade can unlock the full potential of carbon markets. A globally connected carbon market can drive resource allocation to enable cost-effective emissions reductions at scale.
- **Technology innovation and advancement:** Carbon markets can help catalyse innovation for new climate solutions. Continued technological advancement is required to achieve decarbonisation targets. One priority is dispatchable clean power and alternative energy pathways for hard-to-abate sectors. The last decade has seen an exponential acceleration of solar and wind adoption enabled by cost reductions, and there is hope that new technologies can achieve similar results.¹⁴ While many low-carbon solutions have a green premium today, carbon finance can scale up deployment, drive down costs, and accelerate the transition towards a decarbonised economy.
- **Just and equitable transition:** A transition that disproportionately burdens specific communities or ignores their needs is likely to face resistance and social unrest. This breeds resentment and undermines the long-term sustainability of the transition. A just approach can foster a sense of shared responsibility for climate action, gain legitimacy and public support, and ensure buy-in from governments and locals. It leads to more successful projects and sustainable outcomes.

¹⁴ RMI (2023): *The Renewable Revolution*.

1. Setting the Scene

Carbon Market Crossroads (continued)



UNLOCKING LOW-COST BASELOAD CLEAN ENERGY SUPPLY



A complete phase out of fossil fuels is challenging due to a lack of close substitutes. While the levelised cost of electricity for wind and solar is often cheaper than fossil fuels, they are intermittent and are not able to provide the same baseload power profile. Fossil fuels have a stronghold where electrification is challenging as alternative low-carbon fuels are significantly more expensive.

A plausible future could see breakthrough technologies fully replacing fossil fuels even without carbon pricing. There is a chance that a carbon-free energy source is unlocked that can closely replicate the characteristics of fossil fuel energy supply, and be competitive even without a carbon price. Such significant breakthroughs are excluded from this scenario analysis due to their transformational impact, but there are several key areas that are worth watching:

- **Long duration energy storage:** The Achilles' heel of renewable energy is energy storage, especially at longer durations of days or weeks. Breakthroughs in energy storage, such as solid-state batteries, could unlock dispatchable renewable energy supply from solar and wind. This could allow for a complete shift away from fossil fuels in power generation.
- **Nuclear fusion:** Replicating the sun's energy on Earth has long been the holy grail of clean energy. Recent international collaboration projects like the 35-country US\$20 billion International Thermonuclear Experimental Reactor (ITER) have shown significant progress. If commercial fusion reactors become a reality, they could provide a virtually limitless source of baseload clean energy.
- **Green hydrogen:** Hydrogen is an energy carrier with vast potential. It can be used for a wide variety of applications, including hard-to-abate sectors that cannot be easily electrified. However, green hydrogen is expensive to produce. If radical innovations unlock low-cost production and storage of green hydrogen at scale, hydrogen and its derivatives could fuel everything from road transport to heavy industry.

2. Identifying Secular Trends

Driving Forces that are Likely to Persist

The road ahead for carbon markets remains unclear. There are many uncertainties that can have significant bearing on how carbon markets will evolve. Many of these driving forces are from the external environment, outside the influence of individual carbon market actors.

Amidst all the uncertainty, there are five secular trends that are likely to impact carbon markets across all plausible futures. These are predetermined forces that are likely to persist across all scenarios, and act as the foundation upon which various potential futures are built. They are distinct from critical uncertainties, which are less predictable future events or trends with a range of plausible outcomes.

1. Physical climate change effects worsen in the 2020s.

The climate system has inertia and responds slowly to changes in GHG concentrations. While mitigation efforts can still influence long-term outcomes, near-term warming is highly likely based on all credible scientific assessments and scenarios developed by the Intergovernmental Panel on Climate Change (IPCC). This warming is likely to worsen the physical impacts of climate change in the near term, elevating the sense of climate emergency and urgency for climate action.

2. A tense geopolitical environment persists until the 2030s.

Deep-rooted ideological differences are manifesting today, deepening fault lines between geopolitical rivals. In the medium term, the rise of nationalism and populism, increased competition between major powers, and the emergence of new power centres are trends that are likely to persist.¹⁵ There may be an eventual shift towards re-globalisation and global collaboration, but this seems unlikely within the current decade.

3. Emerging economies drive steady population growth towards 2050.

The global population is expected to continue growing steadily, driven by high fertility regions and increasing life expectancy. Growth from developing regions in Sub-Saharan Africa and South Asia are expected to outweigh the slowdown from developed regions such as Europe, North America, and Northeast Asia. The United Nations (UN) estimates the world's population to grow from 8 billion today to 10 billion by 2050, which could trigger second-order impacts on resource demand, economic development, and the pace of urbanisation.¹⁶

4. Economic development remains an essential policy objective.

While the specific features of economic development and its relationship with issues such as inequality and sustainability might evolve, the objective of economic development is likely to remain core for policymakers worldwide.¹⁷ This is particularly important for developing countries, many of which have yet to realise their economic potential. The question is not whether countries should pursue economic development or not, but how trade-offs with other important considerations are managed.

5. Younger generations see climate change as a growing problem.

According to a UNDP survey, youths (under 18) are more likely to view climate change as an emergency compared to older people (over 60) globally.¹⁸ There may be short-term pressure and swings from election cycles, but as younger generations eventually rise into positions of authority in the private and public sectors, they are expected to gain influence over time. With a longer time horizon to face the first-hand impacts of climate change, their views and actions will likely influence consumer behaviour and political decision-making.

¹⁵ Rabinowitz (2023): *Defensive Nationalism: Explaining the Rise of Populism and Fascism in the 21st Century*.

¹⁶ UN DESA (2022): *2022 Revision of World Population Prospects*.

¹⁷ World Economic Forum (2024): *The Future of Growth Report 2024*.

¹⁸ UNDP (2021): *The Peoples' Climate Vote*.

3. Examining Critical Uncertainties

Plausible Futures

While secular trends are expected to remain constant, critical uncertainties have varied outcomes that can significantly influence the future for carbon markets. These are external factors that are largely uncontrollable by any single entity. For each critical uncertainty, the future can look very different depending on how the trend evolves. Each narrative represents a hypothetical outcome based on specific assumptions.

We have identified four key areas for horizon scanning across the scenarios. The objective is to shed light on the various driving forces impacting carbon markets, and guide us on actions we have to take to realise a net-zero future by 2050.



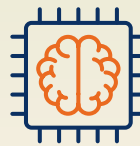
1. Macro & Geopolitics

- Global geopolitical order
- Economic development
- Sociodemographic trends
- Climate cooperation



2. Nature

- Politics of nature
- Champions for nature
- Quality standards
- Nature as green growth



3. Technology

- Innovation collaboration
- Funding for technologies
- State of climate tech
- Energy transition pathways



4. Environmental, Social, and Governance (ESG)

- Rise of media scrutiny
- Role of civil society
- Corporate sustainability
- Just transition and equity

We describe plausible futures for each critical uncertainty before synthesising them into three major scenario narratives.



3. Examining Critical Uncertainties

Plausible Futures (continued)



Macro & Geopolitics

Global geopolitical order

The state of geopolitical relations influences the international dealmaking environment and affects the willingness of countries to cooperate on climate issues. However, there can still be a willingness to cooperate on global issues despite geopolitical tensions.

- **Small world after all:** Extreme weather events force renewed international collaboration. Shared challenges like resource scarcity and supply chain disruptions become catalysts for a global approach. A growing global citizenry demands solutions, leading to a resurgence of cooperation in the mid-2030s.
- **Strategic rivals, climate allies:** Eastern and Western blocs compete globally to advance their geostrategic interests, but eventually cooperate on climate due to public pressure and worsening climate impacts. Collaboration is limited as national interests are prioritised, but the two blocs are open to arms-length cooperation on climate action.
- **Global fragmentation:** Heightened geopolitical tensions lead to a multipolar world with limited cooperation. Countries prioritise alliances and security over global action, resulting in stalled progress on climate change. International climate efforts become symbolic rather than substantive.

PLAUSIBLE FUTURES

Economic development

Countries are likely to continue pursuing economic development as a core policy objective, but may choose to make trade-offs with other priorities such as innovativeness, inclusiveness, sustainability, and resilience.¹⁹ Openness to trade affects countries' willingness to cooperate internationally.

- **Inclusive green growth:** Environmental concerns, social justice, and sustainable development drive investments and collaboration. Developed countries support developing nations. Social and environmental well-being is prioritised.
- **Bifurcated development:** Innovation fuels economic growth within geopolitical blocs. Trade and technology sharing are limited, with each bloc focusing on its own competitive advantage. Automation creates inequality, but social programmes aim to mitigate some of the impact.
- **Security first:** Geopolitical tensions and economic anxieties lead to a focus on domestic production and resilience. Protectionism, onshoring, and subsidies prioritise security over efficiency, reducing trade and lowering GDP growth. Populist leaders capitalise on these concerns, further hindering international cooperation.

PLAUSIBLE FUTURES

¹⁹ World Economic Forum (2024): *The Future of Growth Report 2024*.

3. Examining Critical Uncertainties

Plausible Futures (continued)



Macro & Geopolitics

Sociodemographic trends

Despite growing awareness of climate change, society needs to confront other issues such as the cost-of-living crisis and income inequality. The relative importance of sustainability when compared to these other issues of concern affects how business leaders and politicians act to address climate change.

- **Climate revolution:** Rising public concern elevates climate action to the top of the global agenda, making it a key political and social issue. Consumers demand eco-friendly products, driving green supply chains and regulations. International organisations gain trust and guide policy recommendations.
- **Green connection:** Strong scientific evidence unites the world on the urgency of climate action. Communication platforms enable knowledge sharing and collaboration, but local issues remain central. Decarbonisation initiatives must also address economic and social concerns alongside climate goals.
- **Decarbonisation polarisation:** Climate action becomes polarised along cultural lines, hindering consensus. Competing advocacy groups and standards cause confusion and inefficient resource allocation as countries pursue divergent decarbonisation paths.

PLAUSIBLE FUTURES

Climate cooperation

The UNFCCC has proven to be a useful multilateral platform to rally global climate action. Agreements and COP decisions have far-ranging implications on the private sector as it serves as a bellwether of the level of global climate ambition. There are knock-on effects on the direction, speed, and scale of private sector action.

- **Unite as one:** Extreme weather events in the 2020s trigger a global commitment to aggressive climate action in the 2030s. Stricter environmental policies and legally-binding emissions targets with clear monitoring mechanisms are implemented. A centralised carbon market and substantial financial resources are established to support mitigation and adaptation efforts, particularly in vulnerable countries.
- **Ambition outruns action:** Despite persistently ambitious climate pledges, concrete action falls short, leading to missed targets and public disillusionment. Lack of effective implementation and accountability mechanisms leads to continued high emissions and a shift of resources towards adaptation.
- **Climate clubs:** Regional blocs and thematic clubs facilitate carbon pricing, green innovation, and knowledge sharing. However, harmonisation across various initiatives proves challenging due to differing cooperation levels and conflicting stances on critical issues like fossil fuels. Finding common ground for global collaboration remains a hurdle.

PLAUSIBLE FUTURES

3. Examining Critical Uncertainties

Plausible Futures (continued)



Nature

Politics of nature

How countries and governments view their natural capital endowments plays a significant role in shaping policies on NBS. There is room for buyer and seller countries to collaborate, but they will need to agree on a framework to exchange funding for the right to claim emissions reductions. Government policies play an important role to manage the trade-offs between delivering environmental, economic and societal returns.²⁰ Host countries have different approaches on how to leverage their natural capital to attract foreign investment and export mitigation outcomes. Some may focus more on capital inflows, while others focus on value capture and benefits for local communities.

- **Cooperative efforts:** Nature-based carbon projects create jobs, promote sustainable tourism, and ensure equitable resource access. International efforts prioritise environmental integrity while offering benefits for local communities. Although expensive due to high standards, projects are seen as valuable investments in a sustainable future.
- **Green bargain:** Developed nations invest in projects in nature-rich countries to the benefit of both parties. Buyers meet decarbonisation goals, and sellers achieve economic development and better environmental management. There are concerns about fairness and exploitation, but overall the market manages to efficiently allocate risk and reward.
- **Green guardians:** Countries with high potential for NBS exert control over carbon credit exports. Local communities gain power, influencing project implementation and benefiting directly from carbon revenue. Strict government oversight and over-involvement by local stakeholders make project development more complex for investors.

PLAUSIBLE FUTURES

²⁰ Capitals Coalition (2018): *Natural Capital for Governments: What, Why and How?*

3. Examining Critical Uncertainties

Plausible Futures (continued)



Nature

Champions for nature

While nature is recognised as an important sector for climate action, funding and supporting nature projects is not a straightforward endeavour. The financial returns from investing in nature are often heavily dependent on the price of carbon and other ecosystem services, which are still highly nascent markets. Current annual NBS finance flows of US\$200 billion are only a third of the levels needed to reach climate, biodiversity and land degradation neutrality targets by 2030.²¹ Championing investments in nature is risky and not always commercially viable. Aside from the private sector, the public sector must step up to provide state-directed support and grant funding to achieve desired results.

- **Enlightened enterprises:** Businesses see NBS as providing impactful near-term (e.g. avoided deforestation) and high-quality long-term (e.g. reforestation) emissions reductions and actively look for high-quality opportunities in the sector. Government policies enable private sector-led action. Forward-leaning companies spearhead innovations to improve NBS projects, such as digital MRV and remote sensing.
- **Supportive states:** Public funds enable strategic interventions to protect and restore nature. Limited by fiscal constraints, governments look to carbon markets to crowd in additional private finance. Investor-friendly carbon market policies are developed, helping corporates to achieve commercial returns and attract funding.
- **Catalytic enablers:** Philanthropic organisations, academia, and non-governmental organisations (NGOs) are the first movers to support NBS project initiation. Their limited funding limits scalability, and they co-opt the public and private sectors for support to scale up NBS project implementation.

PLAUSIBLE FUTURES

Quality standards

There is a lack of consensus regarding what level of quality is sufficient. The Integrity Council for the Voluntary Carbon Market (ICVCM) has developed the Core Carbon Principles (CCPs) which helps to distil the quality dimensions, but what level of quality is good enough? How many layers of checks are sufficient from a governance perspective? How can technology play a role in enabling MRV at scale? These are questions the market will have to answer. There is a trade-off between quality and costs, as there is a price to pay for increased quality. Depending on the role that NBS is expected to play in broader decarbonisation, quality standards could end up evolving very differently.

- **Tower of excellence:** The NBS market sets exceptionally high quality standards, excluding some project types. Blockchain and remote sensing technologies enable real-time verification but increase costs. High expenses may disadvantage smaller projects and communities in developing nations.
- **Steady standardisation:** The market continuously raises its quality bar to filter out low-quality projects. Improved measurement technologies and more robust methodologies address concerns about additionality, quantification, and permanence of NBS carbon credits. Transparent benchmarks ensure high-quality projects while NGOs refine benefit-sharing guidance.
- **Flexible approach:** Diverse standards address local priorities like carbon capture, biodiversity, or community development. This makes it difficult to value and trade carbon credits internationally due to varying definitions of best practice. Collaboration across borders requires bilateral agreements based on common quality principles.

PLAUSIBLE FUTURES

²¹ UNEP (2023): *State of Finance for Nature 2023*.

3. Examining Critical Uncertainties

Plausible Futures (continued)



THE CRITICAL IMPORTANCE OF PROTECTING AND RESTORING NATURE



The fight against climate change and building a sustainable future requires more than just technological innovation. Nature itself holds immense potential for near-term, scalable solutions that benefit both the environment and human well-being. The benefits of nature include:

- **Ecosystem Services for Abatement:** Healthy forests, wetlands, and coastal ecosystems act as natural carbon sinks that absorb and store GHG. Protecting and restoring these ecosystems offers a cost-effective and scalable way to mitigate climate change impacts.
- **Biodiversity for Resilience:** A diverse and healthy natural world is more resilient to climate change disturbances. Investing in biodiversity conservation helps protect ecosystems and the vital services they provide, like clean air, water purification, and flood control.
- **Green Jobs and Sustainable Livelihoods:** Ecosystem restoration, reforestation, sustainable land management, and other forms of NBS can create new green jobs. This shift towards a greener economy fosters sustainable livelihoods and empowers communities dependent on natural resources.

The problems associated with climate change could be greatly increased if money is not invested in such land use and natural solutions. By 2050, the social risks of improperly managing land transitions and changing land uses combined with the financial burden of declining ecosystem services due to natural disasters could cause underlying climate risks to increase by a factor of two to three.²²

22. Inevitable Policy Response (2024): *Nature and land use will make or break the climate transition.*

3. Examining Critical Uncertainties

Plausible Futures (continued)



Nature

Nature as green growth

Historically, the agriculture, forestry, and other land use (AFOLU) sector has largely been monetised through agriculture, farming, and forestry activities. There has been little attention paid to the economic potential from a carbon lens. As nature has emerged as a critical sector for scalable near-term emissions reductions, the perception has now changed. The potential of NBS to attract foreign investors and forge international partnerships has caught the attention of host countries. While they must balance achieving their NDC targets with export revenues, it is clear that the value of nature from a carbon perspective is much higher than before. There is now potential to create local employment, uplift local communities, and provide rural populations with a meaningful way to contribute to the economy.

- **Economic powerhouse:** Host countries successfully leverage carbon credits from NBS projects to generate significant revenues. State-owned enterprises and large corporations lead the development of a global NBS market. There is an emphasis on capturing benefits for the host country, similar to resource extraction agreements.
- **Communities first:** Local communities gain greater influence over their lands and manage them sustainably for ecological and economic benefits. Traditional knowledge guides conservation efforts, ensuring harmony with the environment. NBS projects create jobs, empower communities, and contribute significantly to the local economy.
- **Selective investments:** Difficulty in quantifying the full value of nature hinders the attraction of investment in conservation and restoration. Tight regulations by host countries reduce investor confidence. High costs and risks associated with NBS projects limit countries' ability to attract sufficient capital.

3. Examining Critical Uncertainties

Plausible Futures (continued)

Technology



Innovation collaboration

While innovation is key to continued technological advancement, the speed and direction of innovation can differ significantly. Much depends on the extent of knowledge sharing and transfer across borders, and how coordinated efforts are in pushing the boundaries of research topics. Innovation is not without politics and may be coloured by the vested interests of research funders and governments. Competition can help to accelerate innovation in companies seeking a first-mover advantage. However, an overly competitive environment with open knowledge sharing and limited Intellectual Property (IP) rights can disincentivise risky investments.²³

- **Creative commons:** Free sharing of knowledge across institutions and disciplines accelerates innovation for climate solutions. International organisations guide research with citizen scientists contributing, thereby fostering innovation. However, focus may be skewed towards priorities set by international organisations.
- **Divergent discoveries:** Geopolitical competition drives research that is focused on national self-reliance and strategic interests. Restricted knowledge sharing slows down broader innovation but enables faster breakthroughs in targeted areas. Competition creates a “Space Race” effect for specific technologies, fragmenting advancements.²⁴
- **Independent innovation:** Developed countries lead research with advanced solutions, while developing nations struggle to keep pace. Strict IP rights restrict knowledge transfer and technology access for developing countries. Developing countries develop localised solutions but risk falling further behind due to limited resources.

PLAUSIBLE FUTURES

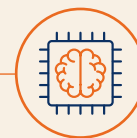
²³ International Monetary Fund (2021): *Competition, Innovation, and Inclusive Growth*.

²⁴ The Space Race was a competition between the U.S. and the Soviet Union post World War II to achieve superior spaceflight capability, which led to significant advancements in technology and science.

3. Examining Critical Uncertainties

Plausible Futures (continued)

Technology



Funding for technologies

Commercialising technology-based climate solutions is not an easy task, especially for newer technologies. Given the nascency of the carbon market, the revenue stream is not easily discernible. This makes it difficult to attract financing to scale up projects. Governments have an important role to play in subsidising critical technologies and encouraging adoption. The landscape of technology funding will depend on the risk appetite of investors, and the extent of regulatory support.

- **Motivated risk-takers:** Environmentally conscious investors prioritise high-impact, high-risk climate technologies, leading to boom-and-bust funding cycles. Although it diverts resources from short-term solutions, this approach has the potential to deliver significant breakthroughs for deep decarbonisation at scale.
- **Government-led:** Public grants de-risk early-stage climate tech investments, attracting private funding and accelerating technology development. While grants are susceptible to political pressures and miscalculations that result in suboptimal decarbonisation pathways, there is an iterative learning process that drives steady innovation.
- **Conservative investors:** Investors prioritise proven technologies with predictable returns, limiting funding for potentially transformative but unproven innovations. This focus on incremental improvements strengthens established players and achieves near-term results, but stifles disruptive technologies and hinders long-term progress.

PLAUSIBLE FUTURES

State of climate tech

A comprehensive approach to developing climate solutions is key to ensure deep decarbonisation. Currently, there is a mismatch in early-stage investments for climate tech, where funding for sector-specific solutions does not match the sectors that have the largest emission.²⁵ Technologies should not be assessed in isolation. Rather, potential overlaps and synergies with other technologies should be factored in. When considering the state of climate tech, the degree of coordination will affect the speed and scale of emissions reductions achievable.

- **Reach for the sky:** Rapid funding fuels development of expensive, advanced solutions like direct air capture and storage, and engineered timber, leading to deep emissions cuts. Cutting-edge technologies disrupt industries, but neglecting lower-tech options slows initial progress and creates stranded assets. High costs and initial deployment in developed countries create an equity gap with developing countries.
- **Competitive advantage:** Countries compete for technological supremacy, directing funding towards areas of natural resource advantage. Climate tech becomes a political tool, used for trade deals and economic dominance, escalating global tensions. Focus on national advantage could hinder global collaboration needed for effective climate action.
- **Defensive pivot:** Investment shifts towards climate resilience technologies like regenerative agriculture and biochar. Community-driven innovation thrives but limited market size hinders wider adoption due to lack of large-scale funding. Overall climate tech funding decreases, potentially hampering progress.

PLAUSIBLE FUTURES

²⁵ PwC (2023) State of Climate Tech 2023.

3. Examining Critical Uncertainties

Plausible Futures (continued)



MOONSHOT TECHNOLOGY BREAKTHROUGHS



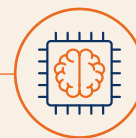
Moonshot technologies hold the potential to leapfrog existing solutions and address sustainability challenges at an unimagined scale. They are excluded from our scenario analysis as they would result in a dramatic shift in outcomes. Nevertheless, we acknowledge the potential of these groundbreaking solutions to disrupt the status quo and significantly accelerate progress towards a sustainable future. Examples of such technologies include:

- **Nuclear Fusion:** Imagine replicating the process that powers stars right here on Earth. Nuclear fusion promises a clean, virtually limitless energy source. International collaborations like ITER are making significant strides. While technical challenges remain, successful fusion reactors could be a game-changer by the 2050s, generating enough clean electricity to power millions of homes with a single unit.
- **Advanced Geothermal:** Geothermal energy utilises heat from the Earth's core, a clean and reliable source. However, traditional methods are limited by geography. Advanced geothermal concepts, like Enhanced Geothermal Systems (EGS), aim to access deeper, hotter rock formations, unlocking vast geothermal potential in regions previously considered unsuitable. Successful development of EGS could significantly expand the reach of clean geothermal power.
- **Artificial Photosynthesis:** Plants capture sunlight and convert it into energy through photosynthesis. Artificial photosynthesis aims to replicate this process, using sunlight, water, and carbon dioxide to directly produce clean fuels like hydrogen. While still in its early stages, this technology holds immense promise for sustainable fuel production and a future free from fossil fuels.

3. Examining Critical Uncertainties

Plausible Futures (continued)

Technology



Energy transition pathways

How countries navigate the energy transition can have wide-ranging impacts on their decarbonisation pathways. Strategies can differ significantly based on the availability of domestic resources, trade and geopolitical relationships with other countries, and access to clean energy supply chains. A collaborative environment can facilitate smoother transition pathways. Expanded electricity networks allow better placement of renewable energy resources and reduces the amount of storage and generation capacity required.²⁶

- **Borderless transition:** A globally integrated grid connects diverse renewable energy resources across regions, maximising their potential and minimising storage needs. Collaboration fosters multilateral infrastructure projects and geographic optimisation of clean energy resources. This interconnected approach facilitates a faster and smoother transition towards a clean energy future.
- **Clean resource race:** Geopolitical competition intensifies as nations race to secure access to critical minerals for clean technologies. Alternative supply chains emerge within alliances, potentially increasing costs but reducing reliance on existing dominant players. National interests supersede economic efficiency, potentially slowing progress but offering greater security over energy resources and technologies.
- **Safeguarding independence:** Countries prioritise self-sufficiency, maximising domestic resource utilisation of both fossil fuels and renewables to reduce reliance on energy imports. Security concerns limit cross-border cooperation, potentially slowing the adoption of renewables and electric vehicles in some regions. This focus on national control shapes decarbonisation pathways.

PLAUSIBLE FUTURES

²⁶ TransitionZero (2023): Cables to change the world: *The benefits of transmission to decarbonise global electricity supply.*

3. Examining Critical Uncertainties

Plausible Futures (continued)

Environmental, Social, and Governance (ESG)



Rise of media scrutiny

As climate change gains traction globally, it attracts growing media attention. This results in sharper scrutiny on carbon projects, standards and decarbonisation efforts. Traditional and new media are powerful forces with the ability to shape public narratives. The different ways that media engages with stakeholders will have a significant impact the evolution of climate action.

- **Radical transparency:** Intense media scrutiny focuses on every aspect of climate action. A “clickbait critic” approach by the media means that any imperfection could potentially evolve into a sensational headline, attracting widespread criticism. In turn, the reputational risks associated with carbon projects and decarbonisation efforts result in corporates shying away from investing in these areas.
- **Vigilant watchdog:** Increased media scrutiny fuels public pressure on corporations and governments for environmental responsibility. Investigative journalism tackles greenwashing and exposes environmental misconduct, promoting transparency and accountability. Heightened awareness fosters public engagement and drives demand for change towards sustainable practices, but stifles corporate risk-taking.
- **Divided perspectives:** Media coverage becomes polarised, focusing on local narratives and pushing preferred solutions based on national interests. This reinforces existing biases and hinders understanding of global climate challenges and collaborative opportunities. Disparate narratives on decarbonisation pathways emerge, hindering international cooperation.

PLAUSIBLE FUTURES

3. Examining Critical Uncertainties

Plausible Futures (continued)

Environmental, Social, and Governance (ESG)



Role of civil society

Civil society has an important role to play in the pursuit of sustainability. NGOs help to raise public awareness, hold governments and companies to account, and advocate for sustainable practices. Activists bring attention to marginalised groups, expose misconduct, and organise protests to pressure governments. Trade unions advocate for a just transition that is well-managed and contributes to the goals of decent work for all (i.e. social inclusion and poverty eradication).²⁷ The different ways that civil society engages with governments and industry will have implications on climate action.

- **Aggressive advocacy:** Social media fuels aggressive activism, leading to greenshaming, boycotts, and disruptions hindering constructive dialogue. Environmental NGOs and trade unions demand significant concessions, potentially stalling progress due to a combative environment. Constant negativity and pressure create an atmosphere that discourages innovation and risk-taking by businesses.
- **Give and take:** Despite ideological differences, both activists and industry acknowledge the need for pragmatic solutions. NGOs provide technically sound proposals for reforms within the existing system, and trade unions accept necessary changes. Civil society, industry, and government work together to manage the pace of the transition, balancing climate action with other imperatives.
- **Localised influence:** International activism weakens as national priorities take precedence, but NGOs remain relevant domestically. Local NGOs and trade unions focus on specific community needs and collaborate on small-scale solutions. Deep understanding of local contexts facilitates targeted solutions aligned with national priorities.

PLAUSIBLE FUTURES

²⁷ International Labour Organization (2016) Guidelines for a just transition towards environmentally sustainable economies and societies for all.

3. Examining Critical Uncertainties

Plausible Futures (continued)

Environmental, Social, and Governance (ESG)



Corporate sustainability

Trends in corporate sustainability influence how companies act on climate. Sustainability reporting regulations increasingly require companies to disclose emissions, but the stringency, scope, and approach to measuring and reporting can vary significantly. Scrutiny of investors over ESG risks, strengthened by new technologies, could pressure corporations to act. Where companies need to establish and implement a sustainability strategy, do they fully integrate sustainability within their business, or do the bare minimum required by regulations? Strategies will be influenced by how corporate sustainability credentials are viewed by stakeholders and the value it brings to the company.

- **Social licence:** Sustainability becomes essential for business operations. Companies face pressure to meet ambitious goals and risk public backlash for non-compliance. International organisations act as de facto regulators of best practice. There is a litigious environment for sustainability misconduct.
- **Rising tides:** Leading companies set ambitious sustainability targets and reporting practices, creating benchmarks, and driving wider market adoption. Standard-setters offer flexibility but gradually raise expectations for disclosure and progress. Consumer preferences and market demand incentivise companies to improve their sustainability profiles.
- **To each his own:** Lack of global standardisation leads to inconsistent reporting frameworks and limited cross-border collaboration. Companies prioritise meeting local regulations, and greenwashing occurs in the absence of transparency and clear standards. While fostering innovative solutions for specific contexts, this fragmented approach hinders collective progress towards sustainability goals.

PLAUSIBLE FUTURES

3. Examining Critical Uncertainties

Plausible Futures (continued)

Environmental, Social, and Governance (ESG)



Just transition and equity

A just and equitable transition is a critical objective for many governments so that no one is left behind in the journey towards sustainability. However, it requires trade-offs with speed and scale. Just transition elements in projects (i.e. retraining, upskilling) take time to be negotiated and are likely to result in higher project implementation costs.²⁸ There is also the risk of projects being held up by protracted negotiations. The ability of parties to implement balanced projects is key. External support is essential as developing countries lack the capital and capacity needed to overcome inherent barriers.

- **Shared responsibility:** Global cooperation fosters a collective approach to sustainability. Businesses collaborate with communities, ensuring equitable distribution of benefits and empowering local participation in carbon projects. Concerted international support accelerates a just transition for developing nations.
- **Negotiated support:** Governments prioritise inclusivity but face challenges in securing international aid and navigating contrasting visions of a just transition. While lengthy negotiations may delay projects, compromise eventually paves the way for implementation.
- **All by myself:** Lack of international support leaves developing countries struggling financially to implement a just transition. Domestic carbon projects offer limited solutions, and hydrocarbon producers face difficulties transitioning their workforce. Forced implementation of projects without community buy-in worsens social inequities in the short term.

PLAUSIBLE FUTURES

²⁸ The IPCC defines just transition as: "A set of principles, processes and practices that aim to ensure that no people, workers, places, sectors, countries or regions are left behind in the transition from a high-carbon to a low-carbon economy."

4. Structuring Scenarios

Imagining Future Worlds

Distilling plausible futures into coherent scenarios. Looking across the multiple drivers of change and how they could play out differently, the contours of a range of distinct scenarios for future carbon markets can be discerned. It also becomes apparent that there are several underlying dynamic forces at play that shape each future. To explore a range of possibilities, three distinct, logically consistent scenarios are identified and detailed with narratives in this section.

- **Green New World:** Climate Theocracy
- **Sustainably Divided:** Climate Diplomacy
- **Resilient Islands:** Climate Autonomy



		Green New World Climate Theocracy	Sustainably Divided Climate Diplomacy	Resilient Islands Climate Autonomy
Secular Trends				
Intensifying disasters		Physical climate change effects worsen in 2020s		
Geopolitical tensions		A tense geopolitical environment persists until the 2030s		
Population growth		Emerging economies drive steady population growth till 2050		
Economic development		Economic development remains an essential policy objective		
Climate-conscious youth		Younger generations see climate change as a growing problem		
Critical Uncertainties				
 Macro & Geopolitics	Global geopolitical order	Small world after all	Strategic rivals, climate allies	Global fragmentation
	Economic development	Inclusive green growth	Bifurcated development	Security first
	Sociodemographic trends	Climate revolution	Green connection	Decarbonisation polarisation
	Climate cooperation	Unite as one	Ambition outruns action	Climate clubs
 Nature	Politics of nature	Cooperative efforts	Nature traders	Green guardians
	Champions for nature	Enlightened enterprises	Supportive governments	Catalytic enablers
	Quality standards	Tower of excellence	Steady standardisation	Flexible approach
	Nature as green growth	Communities first	Economic powerhouse	Selective investments
 Technology	Innovation collaboration	Creative commons	Divergent discoveries	Independent innovation
	Funding for technologies	Motivated risk-takers	Government-led	Conservative investors
	State of climate tech	Reach for the sky	Competitive advantage	Defensive pivot
	Energy transition pathways	Borderless transition	Clean resource race	Safeguarding independence
 ESG	Rise of media scrutiny	Radical transparency	Vigilant watchdog	Competing narratives
	Role of civil society	Aggressive advocacy	Give and take	Localised influence
	Corporate sustainability	Social license	Rising tides	To each his own
	Just transition and equity	Shared responsibility	Negotiated support	All by myself

4. Structuring Scenarios

Imagining Future Worlds (continued)



Green New World: Climate Theocracy

Climate catastrophe catalyses global collaboration

Humanity unites against climate disasters in the late 2020s. There is consistent news flow of climate refugees, sinking island states, widespread natural disasters, and severe disruptions to food supply chains. Faced with the stark reality that climate change is a tangible and urgent problem, the world is shocked into action in the late 2020s and countries band together to prioritise climate action.

By the early 2030s, the climate agenda completes its rapid ascent to the pinnacle of global concerns.

Countries and businesses take concrete steps to reduce their emissions, driven not only by public pressure, but their own deeply-held convictions. The desire to decarbonise quickly and at scale fosters strong partnerships and a rapid implementation of cross-border climate solutions.

A global grid accelerates renewable energy deployment

Geographic optimisation further unlocks the potential of solar and wind. Cross-border electricity transmission projects are piloted in the late 2020s and proliferate in the late 2030s. Improved utilisation of solar and wind helps to facilitate the early retirement of coal-fired power plants by 2040.

Low-cost renewables help developing economies to leapfrog fossil fuels. Grid interconnections boost capacity factors of solar and wind, lowering costs. A portfolio approach for renewables helps to mitigate dispatchability concerns and circumvents the need to develop hydrocarbon-based energy.





Green New World:
Climate Theocracy

4. Structuring Scenarios

Imagining Future Worlds (continued)

Green initiatives proliferate as climate-conscious consumers drive sustainability practices

In the late 2020s, a green “sea change” sweeps across all corners of society. Civil society and media are given loud voices, and closely scrutinise every aspect of decarbonisation. Sustainability is judged in the court of public opinion, led by advocacy groups and NGOs. Climate-conscious consumers are in tune with the latest sustainability trends and actively call out greenwashing attempts.

Corporates face pressure to meet sustainability standards and are rewarded for going above and beyond.

They develop sophisticated sustainability teams to support due diligence, manage reputational risk, implement impactful decarbonisation initiatives, and make green claims. Those that cannot meet climate targets face trade restrictions and consumer boycotts. By the early 2030s, most corporates voluntarily go beyond regulated requirements and leverage their green credentials as a branding strategy.

International organisations drive harmonised frameworks

The fragmented sustainability frameworks of today undergo rapid harmonisation in the late 2020s. A permissive environment for international collaboration and a broad-based bottom-up desire for climate action result in the emergence of global sustainability standards.

International organisations become de facto sustainability regulators. They provide guidance on emissions accounting, sustainability reporting, and green claims. Local regulators reference these global standards, driving implementation in their respective jurisdictions towards a harmonised standard.

Corporates and countries are increasingly measured against these best practice guidelines. By the early 2030s, most corporates operationalise a decarbonisation process of reporting Scope 1 to Scope 3 emissions, setting science-aligned climate targets, pursuing internal abatement, and neutralising residual emissions. Countries also face pressure from the ground and revise their NDC targets to align with 1.5°C pathways.

A very high-quality bar emerges for climate solutions

There is constant pressure for international organisations to raise the bar for quality. As authority vests in international organisations to set best practice guidelines, civil society continuously identifies imperfections in climate solutions and pushes for higher standards.

Carbon markets coalesce around an extremely high bar for integrity. Carbon markets are recognised as a critical lever for decarbonisation, but adopters are cautious of the dangers of greenwashing and over-stating climate impact. Regulators and standards are focused on weeding out imperfections. By the early 2030s, they impose stringent requirements for supply, demand, and system-level integrity for the entire carbon market.

Nature and community projects struggle to scale up

Projects using estimates to measure climate impact face challenges in meeting narrow quality standards. These include NBS (e.g. avoided deforestation) and community projects (e.g. clean cookstoves) as they adopt methodologies that incorporate counterfactuals and estimations vis-à-vis absolute measurements to quantify climate impact.

Despite best efforts, nature conservation and community projects are unable to realise their full potential. There remains strong interest from corporates and countries to develop project types that benefit local communities. However, the use of estimates and counterfactuals to quantify impact makes it hard to meet perfect quality standards. This eventually becomes a roadblock to translating interest into financing flows. Nature conservation and community projects are phased out of the carbon markets by the mid-2030s, and projects will increasingly have to rely on other financing channels (e.g. biodiversity credits, debt-for-nature swaps) for support.



Green New World:
Climate Theocracy

4. Structuring Scenarios

Imagining Future Worlds (continued)

A strong focus on quality directs carbon finance towards breakthrough technologies

Technology solutions that deliver high-quality emissions reductions attract large sums of financing. The market is willing to pay high prices for quality climate solutions, driven by demand from corporates and consumers especially as the pressure to decarbonise rises rapidly in the late 2020s.

Carbon markets help to finance risky but high-potential climate solutions. As high sustainability standards come into force by the early 2030s, existing solutions can no longer deliver sufficiently robust emissions reductions at scale. The market needs new technologies that can deliver direct, verified, and permanent carbon removal. In the 2030s, these projects are financed through carbon markets, but only a few manage to scale up to their promised potential.

There is vibrant trading between standardised carbon markets

Carbon market standards are harmonised around a high quality bar. Shared sustainability principles drive strong alignment in carbon market implementation. Even locally implemented jurisdictional compliance markets exhibit similarities with each other. Global carbon market standards converge in the early 2030s.

Standardisation facilitates robust trading in a high-quality carbon market. Market participants align on what a benchmark carbon credit is. By the mid-2030s, a global carbon market emerges with clear linkages between voluntary, jurisdictional compliance, and international compliance markets.

4. Structuring Scenarios

Imagining Future Worlds (continued)

Summary of Driving Forces in Green New World



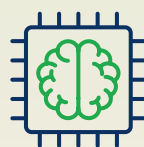
1. Macro & Geopolitics

- **Small world after all:** A lost decade of instability pushes nations towards collaboration due to climate disasters and resource scarcity.
- **Inclusive green growth:** Younger generations prioritise sustainable development, leading to investments in renewable energy and community-driven solutions.
- **Climate revolution:** Youth-led action drives behavioural change and empowers consumers to demand truly sustainable products.
- **Unite as one:** Devastating climate impacts catalyse global mitigation efforts and stricter policies, paving the way for a net zero economy.



2. Nature

- **Cooperative efforts:** Global cooperation fosters ambitious conservation projects that benefit both communities and ecosystems.
- **Communities first:** Local communities regain control of their lands and resources, ensuring equitable benefit-sharing and cultural respect.
- **Enlightened enterprises:** Private sector investments flow towards NBS, driven by transparency and social safeguards.
- **Tower of excellence:** Stringent quality standards raise the bar for NBS but may exclude near-term projects and widen equity gaps.



3. Technology

- **Creative commons:** Open knowledge sharing and collaboration make innovation accessible to all, accelerating the advancement of new technologies.
- **Motivated risk-takers:** High-risk, high-reward investments fuel the development of cutting-edge climate technologies.
- **Reach for the sky:** Advanced technologies achieve deep emissions reductions but may neglect incremental improvements and create transition challenges.
- **Borderless transition:** A globally integrated grid optimises clean energy generation by harnessing diverse renewable resources across regions.



4. ESG

- **Radical transparency:** Media hones in on imperfections and missteps, ignoring progress and constructive corrective efforts as they are unable to achieve a net-zero world in one fell swoop.
- **Social license:** Consumers demand high standards of corporate sustainability, with stringent reporting standards pressuring rapid and verifiable decarbonisation.
- **Shared responsibility:** Shared ownership, community empowerment, and equitable distribution of benefits drive collective action towards sustainability.
- **Aggressive advocacy:** Social media empowers consumers to expose greenwashing and hold corporations accountable, but negativity hinders constructive dialogue.

4. Structuring Scenarios

Imagining Future Worlds (continued)



Sustainably Divided: Climate Diplomacy

Climate action is coloured by geopolitical contestation

Despite climate disasters, geopolitical struggles still take centre stage. Climate action remains high on the global agenda but is seen through the lens of geostrategic competition. Intensifying climate disasters are a cause for concern, but do not provide sufficient impetus for the world to shift towards reglobalisation.

East-West contestation intensifies and plays out on the global stage. The Western bloc, led by the US and Europe, seeks to strengthen relationships with traditional allies in Northeast Asia and Oceania. The Eastern bloc, led by China, supports the rise of Brazil, Russia, India, China, and South Africa (BRICS). There remain non-aligned countries which straddle the middle ground.

Intra-bloc climate relief efforts are used to gain influence over countries. Superpower countries in each bloc provide support to their allies by investing in climate-resilient infrastructure, sharing technologies, and providing aid for climate refugees. Recipient countries are expected to reciprocate by showing political goodwill.

Ideological differences hinder adoption of global standards

International best practices help to build mindshare on critical issues. The UNFCCC and standards organisations help to facilitate dialogue on principles for sustainability and decarbonisation. These are developed in close consultation with civil society and thought leaders.





Sustainably Divided: Climate Diplomacy

4. Structuring Scenarios *Imagining Future Worlds (continued)*

Deep ideological differences hinder the global harmonisation and implementation of standards. There are fundamental disagreements between the East and West blocs as they each try to push for a favourable outcome for themselves. While global standards exist, implementation at the local level varies significantly between the two blocs.

Decarbonisation and economic development pathways diverge

The green economy looks different in each bloc, leveraging strategic interests and resource endowments.

The blocs have a different take on climate action and embark on separate decarbonisation pathways by the late 2020s. These are influenced by the technologies and resources that are available within each bloc, with a view to being self-reliant and globally competitive.

Friendshoring and nearshoring of supply chains are here to stay. Countries implement policies to gain strategic access to critical minerals and technologies. By the early 2030s, alternative supply sources are developed, albeit at higher cost, and these partnerships are cultivated for the long term. There is a decreased reliance on suppliers in opposing blocs.

Multiple narratives develop for corporate sustainability

Divergent regulations in different blocs result in multiple sustainability standards. The two blocs act independently to address emissions and implement their own set of regulations. Climate reporting, disclosure, and corporate green claims are similarly bifurcated across the blocs.

High-ambition corporates remain voluntarily aligned with international best practice. Despite being in different blocs, high-ambition corporates are aligned on key sustainability principles. They adopt the recommendations from international organisations, going above and beyond local regulatory requirements.

An ideologically-bifurcated carbon market emerges

Striving for perfection in integrity, the Western bloc focuses on developing high-tech solutions (Integrity Fixators). Market participants reject all but a handful of NBS projects due to the uncertainties around quantifying carbon and permanence. Carbon costs are extremely high, and companies and countries are increasingly forced to look for alternatives.

Emphasising scalability and pragmatism, the Eastern bloc uses carbon markets to facilitate nature- and community-based climate solutions (Quantity Maximisers). Carbon markets are viewed as a tool to channel finance into underfunded sectors, with nature and local communities as the main beneficiaries. Quality is still important, but the focus is placed on rapidly scaling up low-cost solutions. Many projects are developed and supply is abundant. Several technology-based solutions with broader developmental benefits such as biochar continue to be pursued.



Sustainably Divided:
Climate Diplomacy

4. Structuring Scenarios

Imagining Future Worlds (continued)

Economic and sociodemographic forces spur climate collaboration

Inter-bloc trade is initially limited but becomes more compelling as options run dry within each bloc.

By the late 2030s, the blocs run up against the limits of addressing climate change on their own. Once the lower-hanging fruits are all utilised, the Integrity Fixators find it extremely costly to achieve climate targets. Higher-cost options within the Quantity Maximisers present themselves as good opportunities to efficiently allocate resources for abatement.

Intensifying climate disasters provide a strong catalyst for climate collaboration. Physical climate change intensifies and is expected to get worse unless urgent action is taken. By the mid-2030s, vulnerable countries require vast sums to deal with climate change – more than global superpowers are willing to provide. Despite deep-rooted differences elsewhere, the blocs agree to address climate change collaboratively.

Important bridging role for carbon markets to facilitate East-West partnerships

Carbon markets are a tool to operationalise inter-bloc climate collaboration. There may be several high-level statements demonstrating the intent to collaborate, but execution will be challenging amidst broader geopolitical contestation. Nevertheless, carbon markets are well-placed to overcome political barriers and translate into actual projects.

Global carbon trading occurs at the quality floor of the West. In order for carbon credits from the Quantity Maximisers to be accepted by the Integrity Fixators, they need to be of a minimum acceptable quality as defined by the buyer.

The premium market in the West encourages higher quality projects in the East. Projects in the East are able to realise a significant price premium by selling to buyers in the West. However, projects need to deliver high-integrity carbon credits that meet the quality criteria in the West.

4. Structuring Scenarios

Imagining Future Worlds (continued)

Summary of Driving Forces in Sustainably Divided



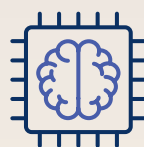
1. Macro & Geopolitics

- **Strategic rivals, climate allies:** Alliances shift as East and West battle climate change, cooperating despite rivalry.
- **Bifurcated development:** Innovation drives growth, but trade and technology transfers are limited by geopolitical alignment, resulting in suboptimal resource allocation.
- **Green connection:** Social media facilitates collective action across borders, elevating international organisations to be authoritative voices on climate.
- **Ambition outruns action:** Ambition outruns action, with COPs falling short and nations prioritising resilience.



2. Nature

- **Nature traders:** Capital-rich nations negotiate with nature-rich nations to exchange capital investments for shared emissions reductions.
- **Economic powerhouse:** The nature sector becomes a key driver of economic growth through the development of carbon projects where credits are exported internationally.
- **Supportive governments:** Governments initially take the lead on funding nature, but eventually run up against fiscal constraints and shift gears to attract private investors.
- **Steady standardisation:** A sizeable share of NBS meet quality benchmarks. Projects of lower quality are weeded out as benchmarks are enhanced and refined.



3. Technology

- **Divergent discoveries:** Strategic competition drives innovation and breakthroughs, hindering broader collaboration.
- **Government-led:** Grants de-risk early-stage climate tech, but allocation is influenced by politics resulting in developed solutions differing widely across countries.
- **Competitive advantage:** Countries race for technological supremacy in climate tech, using it for political influence.
- **Clean resource race:** Competition for critical minerals leads to diversification and nearshoring of supply chains, and countries willingly pay higher prices for energy security.



4. ESG

- **Vigilant watchdog:** Media scrutiny holds corporations and governments accountable, promoting responsible practices.
- **Rising tides:** Ambitious targets raise the bar for corporate disclosures and sustainability reporting.
- **Negotiated support:** Superpowers negotiate financial aid for equitable transitions, but differing visions cause delays.
- **Give and take:** Activists compromise with industry on key principles to find pragmatic solutions despite ideological differences.

4. Structuring Scenarios

Imagining Future Worlds (continued)



Resilient Islands: Climate Autonomy

Climate disasters deepen rifts and strain political relationships

Adverse weather events significantly disrupt the global geopolitical order. Climate disasters damage infrastructure, impact economies, and amplify political divides. The devastation wrought by extreme weather events exacerbates pre-existing political tensions as nations grapple with resource scarcity, mass displacement, and differing priorities for climate change adaptation.

Finger-pointing and resource competition cause geopolitical fragmentation. Nations play the “blame game” in matters pertaining to historical emissions, and responsibility for loss and damage funding. Competition for essential resources like water and arable land intensifies, further fracturing relationships.

Nationalist mindsets hinder climate cooperation

The desire for climate action is influenced by nationalistic tendencies. Countries look to grow their green economy sectors but adopt a protectionist stance. Carbon is seen as a resource to be monetised. Domestic and international policy positions are influenced by the desire of countries to ensure their local communities and companies benefit from climate change interventions.

The prioritisation of national interests over global challenges creates an environment of distrust. Countries hesitate to commit to international initiatives that are perceived to disadvantage their domestic industries. By the late 2020s, the reluctance to compromise causes negotiations to stall on crucial issues like emissions reduction targets, decarbonisation pathways, and climate finance.





Resilient Islands: Climate Autonomy

4. Structuring Scenarios *Imagining Future Worlds (continued)*

Countries take climate action into their own hands

Frustrated by multilateral processes, countries lose faith in international climate cooperation. International agreements were historically a strong driver for climate action. However, the persistently slow pace of global negotiations and the lack of concrete actions cause countries to doubt the effectiveness of global climate cooperation.

Climate action is shaped by domestic rather than international forces. Without centralised oversight and pressure, domestic narratives and concerns feature more strongly in the climate agenda. By the early 2030s, countries refocus their efforts towards designing and implementing domestic climate policies.

Autonomy yields mixed results for climate action

With limited oversight, sustainability initiatives are fragmented. In the absence of external pressure, not all countries are expected to increase or even maintain their climate ambition. Some countries ramp up while others dial back their climate ambition.

A bottom-up approach could be agile at the national level, but complex at the global level. Unburdened by lengthy negotiations, countries experiment with innovative solutions tailored to their specific circumstances. However, the lack of global harmonisation creates a complex regulatory landscape for multinational corporations operating across diverse regions.

Solutions that support resilience and adaptation are prioritised

Limited progress on global mitigation sees countries increasingly focus on climate resilience. Countries assess that their mitigation efforts are insufficient to move the needle. By the early 2030s, without clear line of sight to coordinated global action, they conclude that temperatures are likely to continue rising, and that their marginal dollar for climate action is better spent on adaptation than on mitigation. Their primary concern becomes safeguarding national security, infrastructure, and economies from the immediate threat of climate change.

Mitigation remains a longer-term objective but is constantly underfunded in the absence of global collaboration. There is global acknowledgement that without reducing emissions, the impacts of climate change will only intensify. However, it is clear to countries that such reductions will only happen with a coordinated global effort – which a tense geopolitical landscape does not favour.

Carbon markets feature in domestic policies but are globally fragmented

Countries look to carbon markets as a way to channel financing towards under-funded climate solutions. Carbon markets remain one of the best ways to put a price on carbon and fund cost-effective emissions reductions. Even without a centralised push, many countries operationalise their domestic carbon market to encourage investments into under-funded sectors that are important for mitigation and/or adaptation. Prices vary significantly depending on how countries balance climate ambition with economic competitiveness and domestic resources.

Without centralised oversight, carbon markets face significant challenges in some countries. Jurisdictions that lack climate ambition and/or governance safeguards prove to be challenging for carbon project developers. Without external guidance to provide honest feedback and to build capacity, some countries struggle to design a good market. Low-quality carbon credits, regardless of whether they are intentionally designed or a result of honest mistakes, do not deliver promised results and cause several local carbon markets to go through boom-and-bust cycles.



Resilient Islands:
Climate Autonomy

4. Structuring Scenarios

Imagining Future Worlds (continued)

Shared quality principles facilitate bilateral carbon trading

Common principles help to keep a fragmented market together. While the carbon market is fragmented overall, there are several countries in which a similar set of principles are applied. Alignment in areas like carbon accounting, emissions reduction targets, and the role of carbon markets in achieving climate targets set the foundation for potential collaboration.

Where principles are aligned, bilateral carbon trading creates a unique platform for collaboration. The logic of carbon markets remains compelling, and the prospect of win-win partnerships is economically attractive to countries. Where geopolitical relationships permit and where principles are aligned, countries may find it appealing to do bilateral deals between their jurisdictional compliance markets. These partnerships will be selective, but hugely beneficial in a world where broader international trade is significantly curtailed.

4. Structuring Scenarios

Imagining Future Worlds (continued)

Summary of Driving Forces in Resilient Islands



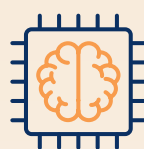
1. Macro & Geopolitics

- **Global fragmentation:** Rising tensions force nations to choose sides, hindering cooperation and climate action.
- **Security first:** Resilience and supply security trump international cooperation, leading to onshoring and trade barriers.
- **Decarbonisation polarisation:** Competing narratives hinder consensus on climate action, leading to diverse and inefficient pathways.
- **Climate clubs:** Regional blocs emerge with varying targets and policies. They struggle to find harmonised approaches.



2. Nature

- **Green guardians:** Countries with high NBS potential demand high value for carbon credits, empowering local communities but complicating project development.
- **Catalytic enablers:** Philanthropy fuels NBS projects but faces concerns due to limited funding and fragmented approach.
- **Flexible approach:** Diverse standards emerge, facilitating local project implementation but challenging international carbon trading.
- **Selective investments:** Despite economic potential, difficulty monetising nature hampers sectoral growth.



3. Technology

- **Independent innovation:** Technology advancements focus on national self-reliance and strategic interests, widening the technology gap.
- **Conservative investors:** Investors favour proven technologies, stifling potentially transformative but unproven innovations.
- **Defensive pivot:** Investment shifts towards climate resilience and dual-purpose technologies, with limited funding for localised solutions.
- **Safeguarding independence:** Countries prioritise energy independence, limiting trade and favouring domestic resource development.



4. ESG

- **Competing narratives:** Fragmented media reinforces national narratives and limits understanding of global climate complexities.
- **To each his own:** Lack of standardisation and cooperation creates a fragmented reporting landscape, hindering investor confidence.
- **All by myself:** Lack of international support creates a financing gap, leading to forced transitions and social inequities.
- **Localised influence:** Domestic priorities overshadow international agreements, with NGOs focusing on local advocacy and collaboration.

5. Key Takeaways

Lessons from the Multiple Futures of Carbon Markets

Carbon markets are likely to remain a key lever for climate action but could look very different depending on how quickly and cooperatively we decarbonise.

Across all scenarios, the demand for climate action steadily increases as climate-conscious younger generations gain influence in society. This places greater pressure on corporates and countries to decarbonise, but real-world constraints are likely to make it difficult for them to impose sufficiently high carbon prices. Carbon markets continue to be an effective way to put a price on carbon, as their flexibility to be implemented at various levels (e.g. international vs national, voluntary vs compliance) make them resilient against economic and geopolitical cycles. It is difficult to imagine a world where there is demand for decarbonisation, but where carbon markets do not exist.

However, flexibility in implementation means that there are multiple pathways for carbon markets to evolve. The scenarios reveal three archetypes of the future carbon market: harmonised and global in **Green New World**, fragmented and local in **Resilient Islands**, and bifurcated but interconnected in **Sustainably Divided**.

In the absence of harmonised quality standards, shared quality principles are essential to accelerate investments and confidence in carbon projects

A global carbon market with harmonised quality standards is a compelling vision of the future, but it is difficult to envision a pathway there. While there is widespread agreement on the importance of integrity, collaboration, and harmonisation, the reality is that countries and companies are likely to prioritise their national and commercial interests and advocate for quality standards that benefit themselves. Harmonising quality standards is possible but requires a strong catalyst, such as the climate catastrophe in **Green New World**.



5. Key Takeaways

Lessons from the Multiple Futures of Carbon Markets (continued)

In the absence of a single global standard, alignment on quality principles is critical to enable market participants to speak a common language and accurately value carbon market instruments. Discussions centred on quality principles enable buyers and sellers to toggle pricing and quality of carbon projects to a level that best serves their mutual interests. This dynamic plays out in **Sustainably Divided**, where inter-bloc carbon trading is initially limited due to competing interests but eventually ramps up as countries and market participants eventually align on key integrity principles. Even in the fragmented carbon markets of **Resilient Islands**, shared quality principles serve as a strong foundation that fosters bilateral carbon transactions.

Carbon markets can provide a neutral platform to facilitate collaboration on climate action even amidst broader tensions.

Geopolitical tensions and competing national interests can hinder international cooperation. Nevertheless, climate change is a global issue and there is broad agreement that climate action should transcend broader tensions. Carbon markets are a potential bridge across geopolitical divides to facilitate collaboration on a shared objective. They are flexible by design, allowing countries to determine their level of engagement based on national circumstances and priorities. In **Sustainably Divided**, the economic incentive to trade eventually overcomes political differences, creating a common ground for cooperation. Even in **Resilient Islands**, a desire to connect carbon markets serves as building blocks for broader bilateral partnerships between countries.

Low-integrity projects can have outsized negative impacts and hold us back from delivering sustained impact at scale.

Environmental integrity is critical for carbon projects as it underpins the links between project activity, actual impact, and perceived value of carbon credits. If low-quality projects are not weeded out, it causes consumers to lose faith in the system and buyers to pull back from the market. Carbon markets would then have to go through a cycle of reform, which prevents scale-up and delays climate action. In **Green New World**, poorly executed projects are prime targets for investigative journalism and high-profile litigation, with knock-on effects as buyers pull back from the entire market. Even in a fragmented world like **Resilient Islands**, countries find initial success scaling local carbon markets with lax quality controls, but these markets would eventually have to be reformed as consumers and buyers still want to see their purchases of carbon credits representing actual emissions reductions.

Narrow quality definitions can potentially hinder the development of many carbon project types and the broader carbon markets to incentivise near-term decarbonisation.

When defining quality, there needs to be an appreciation of the practical realities and a desire to implement and scale carbon projects. Many project types, contain inherent leakage and reversal risks that may not stand up to a narrow definition of quality. They face additional pressure to solve for other issues like biodiversity and social impact.

In **Green New World**, even with a macro environment that is supportive of climate action, purist demands negatively impact the speed, scale, and costs of decarbonisation. Corporates end up with limited options for near-term climate action, and some project types do not get developed. **Sustainably Divided** sees carbon markets support the scale-up of existing climate solutions to deliver rapid near-term decarbonisation. Even though there is a risk of overstating impact, the world is less dependent on highly uncertain technology breakthroughs to deliver climate impact.

6. Strategic Imperatives

The Road Ahead for Carbon Market Participants



What is the problem?



What do we need to address it?



How do we get there?

1

Market fragmentation leads to smaller scale carbon markets on aggregate as several markets become uninvestable and inoperable.

Shared quality principles that are resilient against geopolitical and ideological differences.

Interoperable markets that can be connected to one another.

- **Support** regulators and meta-standards to develop a **principles-based** approach.
- **Encourage knowledge-sharing** across borders through **bilateral and multilateral agreements**.
- **Adopt digital solutions** to facilitate **cross-system communication**.

2

Low-quality projects have an outsized **reputational impact** on the entire market.

Establish **robust quality benchmarks** to create a universe of acceptable quality; weed out low-quality projects.

- **Support** the development of **supply-side integrity initiatives**.
- **Enhance due diligence** checks for project developers and implementation partners.

3

Narrow definitions of quality dominate the narrative and **limit the speed and scale** of climate action.

A **broad-based understanding** of the **nuances and inherent uncertainties** in decarbonisation (e.g. NBS, net-zero pathways).

- **Engage constructively** with youth, media, and NGOs.
- **Encourage** corporates and countries to **share the buyers' perspective**.
- **Develop technologies** that provide better data to **reduce measurement uncertainty**.

4

Nationalist and strategic interests compete with climate targets and **hinder project implementation**.

A **clear economic case** for carbon projects with an **efficient risk-reward allocation** between investors and resource owners.

- **Obtain government buy-in** for carbon credit projects.
- **Structure win-win partnerships** with local communities and host countries to align **developmental goals** with **commercial viability**.

5

The **lack of transparency and standardised methodologies** produces easy targets for criticism and **hinders growth** on both supply and demand.

A robust GHG **accounting framework** that **incentivises emissions reductions** and is **backed by** prompt, traceable, and verifiable **data**.

- Push for **advancements** in **carbon accounting, blockchain, and MRV**.
- **Clearly articulate** the **role of carbon credits** in supporting fundamental **decarbonisation**.

6. Strategic Imperatives

The Road Ahead for Carbon Market Participants (continued)

Supporting the development of regulatory oversight in carbon markets.

Greater oversight provides multiple benefits for carbon markets. While compliance carbon markets such as the European Union Emissions Trading System (EU ETS) are already covered by regulations, the voluntary carbon market is unregulated by definition. Amidst rising public interest in carbon credits, multiple initiatives have been launched to improve and harmonise integrity for carbon credits. Article 6 and the convergence between voluntary and compliance markets further drives interest in regulation, with financial and state regulators beginning to weigh in on carbon credits. Oversight from regulators, governments, and meta-standards can be helpful for carbon markets. Key benefits include:

- **Enhancing system-level credibility:** Well-defined regulations ensure transparency, consistency, and environmental integrity in carbon markets and carbon credits. This fosters trust among all stakeholders and protects the market from reputational damage caused by low-quality carbon credits. Clear rules minimise uncertainty for businesses, allowing for more strategic long-term planning and investment decisions.
- **Fostering demand-side participation:** A well-governed market with standardised procedures streamlines transactions, reducing administrative burdens and associated costs. Regulatory oversight weeds out bad actors from the market, minimising the need for buyers to perform complex due diligence for each transaction. Regulators and meta-standards can provide reputational cover for buyers and help to mitigate reputational risk.
- **Increasing supply-side investments:** Investors are more likely to allocate capital to a market with strong regulatory frameworks. Confidence in the legitimacy and quality of the underlying carbon assets de-risks investments and attracts a wider pool of investors. This creates a stable environment for long-term investment in carbon reduction initiatives, fostering innovation and the development of new project types.

It is critical to ensure alignment on key quality principles among various regulators and meta-standards.

Multiple international organisations and regulators are developing guidance independently, each carrying a vision of a harmonised global quality standard for carbon markets. Due to competing interests and ideological differences, it is unclear if such a global standard can ever be achieved. In the meantime, it is critical that there is agreement on the fundamental quality principles. This helps the market to continue scaling up in the interim, avoiding potentially confusing overlapping regulations that send conflicting signals to the market.

It is important to avoid overly prescriptive regulations which can limit the potential of carbon markets.

Quality principles can be applied with some flexibility to account for regional specificities and ecosystem realities. This ensures that projects in diverse contexts can contribute to the market while maintaining environmental integrity.

Regulatory entrepreneurship is a powerful unlock for carbon markets. Thoughtful regulation could significantly catalyse the carbon market by providing firm demand and integrity signals to encourage investment. A relevant case study would be how California's air pollution regulation in the 1960s successfully cleaned up pollution from the road transport sector (see case study on next page).

6. Strategic Imperatives

The Road Ahead for Carbon Market Participants (continued)



THE ROLE OF REGULATORY LEADERSHIP IN ENCOURAGING AMBITION

Case study of California Motor Vehicle Pollution Control Board²⁹



California's struggle with air pollution serves as an example of how regulatory leadership can foster ambition and drive successful environmental outcomes. The California Air Resources Board (CARB), established in 1967, played a pivotal role.

- **Early Struggles and Regulatory Entrepreneurship:** By the mid-20th century, California's air quality had become dire, prompting public outcry and the formation of CARB. The Board's early leadership, characterised by "regulatory entrepreneurship", embraced a collaborative approach.
- **Collaboration and Innovation:** Instead of simply imposing strict regulations, CARB worked closely with the automobile industry. This collaboration fostered innovation, leading to the development of the catalytic converter, a technology crucial for reducing vehicle emissions.
- **Setting Ambitious Standards:** CARB did not shy away from setting ambitious standards. California's Zero-Emission Vehicle mandate, the first of its kind in the U.S., required automakers to sell a certain percentage of electric vehicles, pushing the industry towards cleaner technologies.
- **Leadership by Example:** California's stringent regulations have historically been more rigorous than federal standards set by the US Environmental Protection Agency. This leadership by example, along with strong enforcement mechanisms, has pressured the auto industry to improve emissions performance across the nation.

California's fight against air pollution exemplifies how regulatory leadership can be a powerful tool for environmental protection. It demonstrated how working hand-in-hand with industry can foster innovation and expedite solutions. By fostering ambition through collaboration, innovation, and strong standards, CARB has not only cleaned the air in California but also significantly shaped national environmental policy.

²⁹ Carlson (2008); *Iterative Federalism and Climate Change*.

6. Strategic Imperatives

The Road Ahead for Carbon Market Participants (continued)

Providing clarity on the role of carbon markets in decarbonisation pathways.

A clear demand signal is needed to incentivise investment into carbon projects. The link between end-user demand for decarbonisation and the potential supply of carbon credits needs to be strengthened. Concerns around greenwashing raised by civil society can also be addressed by having a robust framework. Having a clear picture of future demand supports the growth of carbon markets. Key factors include:

- **Investment certainty:** When corporates have a better understanding of how carbon markets can support their decarbonisation plans, they are better able to size their demand for carbon credits. Certainty of future demand supports investment into carbon projects, enabling project developers to better align with actual market needs.
- **Market efficiency and liquidity:** Predictable demand fosters efficient price discovery and reduces price volatility. A stable and liquid market attracts new participants and investors.

Clarifying corporate claims is essential to scaling structural voluntary demand for carbon credits. End-user demand for carbon credits must ultimately be backed by benefits that can be claimed by the buyer. To truly scale the market, these benefits must have commercial value. The value typically comes in the form of lowering compliance market liabilities, or branding benefits from making a green claim. To provide a structured framework for corporates to ramp up climate action, it is critical to clarify and define credible claims that they can make with respect to the use of carbon credits. This helps to:

- **Promote transparency and accountability:** Defining the role of carbon markets within decarbonisation pathways promotes transparency in corporate green claims. Companies can articulate a clearer strategy for emission reductions, with carbon credits serving as a complementary tool alongside internal mitigation efforts. This transparency fosters trust with stakeholders, including consumers and investors, who increasingly demand genuine environmental action.
- **Avoid greenwashing:** A well-defined role for carbon markets helps to prevent greenwashing by ensuring companies that utilise offsetting demonstrate a clear commitment to ambitious internal reduction strategies. This fosters a more responsible and accountable approach to carbon neutrality claims.

6. Strategic Imperatives

The Road Ahead for Carbon Market Participants (continued)

Leveraging digitalisation as a tool to enable integrity at scale and restore confidence.

Embracing digital technologies contributes to a more transparent and impactful carbon market. The lack of transparency in verifying emissions reductions has historically been a target for criticism, hindering growth in supply and demand. The entire market will benefit from advancements in MRV technology, especially digital MRV at scale, coupled with blockchain authentication. Transparency further strengthens the link between projects and their underlying climate impact, and incentivises projects to improve and be accountable for their climate outcomes.

- **Enhancing traceability:** Digital technologies like blockchain can create immutable records of carbon credits, tracking their origin, ownership, and retirement. This transparency minimises the risk of fraud and double counting, bolstering trust in the market and ensuring the legitimacy of carbon credits.
- **Improving data transparency and analysis:** Digital tools like digital MRV and remote sensing facilitate the collection and analysis of vast amounts of environmental data from project sites. This allows for more robust verification of emission reductions and quantification of carbon sequestration, strengthening the environmental integrity of carbon credits.

Digital solutions enable scale, efficiency, and interoperability across carbon markets. Conventional practices in the carbon market involved manual processes for monitoring and regulatory functions. As carbon markets are potentially fragmented, interoperability between the various systems is especially important.

- **Reducing monitoring costs:** Remote sensing technologies like satellite imagery allow for cost-effective monitoring of project activities and environmental conditions. This minimises the need for on-site verification visits, reducing costs for both project developers and regulators.
- **Streamlining the carbon credit cycle:** Digital platforms can streamline project development and credit issuance processes. Standardised data collection and reporting protocols enhance consistency and reduce administrative burdens, creating a more efficient market environment.

7. Conclusion

As the world grapples with an escalating climate crisis, carbon markets remain an important tool to accelerate climate action.

Carbon markets are not perfect. What we have today is a result of an iterative learning journey from past experimentation and innovation.

While history is cast in stone, the future remains to be written. Our three scenarios – **Green New World**, **Sustainably Divided**, and **Resilient Islands** – each paint a distinct picture of the future of carbon markets. We hope the takeaways and strategic imperatives explored in this paper will encourage policymakers, carbon market participants, and civil society to stretch their thinking as they navigate a multifaceted world.

There are no-regret actions that can be taken today. This is irrespective of the trajectory of carbon markets, be it towards harmonisation, bifurcation, or fragmentation. These actions include:

1. **Supporting the development of regulatory oversight in carbon markets.**
2. **Clarifying the role of carbon markets in decarbonisation pathways.**
3. **Leveraging digitalisation as a tool to bring integrity at scale and restore confidence.**

The road towards net-zero demands that we innovate and adapt. In this way, we can ensure that carbon markets evolve to effectively address climate change and accelerate the green transition for our planet.



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Catalysing Climate Solutions

6 Battery Road
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