Capturing the growing opportunities in Carbon Capture Utilisation and Storage (CCUS)

Perspectives for policymakers

June 2025

The better the question. The better the answer.
The better the world works.

EY Parthenon

Shape the future with confidence

Contents

This is the first instalment in a series of articles focusing on the global development of CCUS. Reach out to the contacts within this document to **learn more about how EY can help you on your journey in the sector.**

Foreword

In an era where the urgency of climate action collides with the imperatives of economic growth, Carbon Capture, Utilisation, and Storage (CCUS) is emerging as a pivotal policy lever. As governments grapple with the dual challenge of reducing greenhouse gas emissions while ensuring job security and industrial competitiveness, CCUS stands out as a beacon of hope. The Intergovernmental Panel on Climate Change (IPCC) underscores this sentiment, asserting that without commercial-scale CCUS, the ambitious targets set by the Paris Agreement remain out of reach.

However, the path to widespread CCUS adoption is fraught with challenges. The sector's growth hinges on robust policy support, yet a cohesive global consensus remains elusive. As we witness a surge in captured carbon volumes, projected to soar from 66 million tons per annum (mtpa) to 446mtpa by 2035, the need for decisive government intervention becomes increasingly clear. Countries must compete for private capital, fostering environments that mitigate investment risks and encourage innovation.

This article delves into the multifaceted opportunities presented by CCUS, from safeguarding industrial competitiveness to creating jobs in a transitioning economy. It advocates for tailored execution models that align with each nation's unique circumstances, emphasising that success is not a one-size-fits-all approach.

> "As we stand at the crossroads of climate policy and economic strategy, the time for action is now.

The time lag from policy development to shovels in the ground means that governments must be authoritative and decisive, if goals are to be met. Embracing CCUS not only positions nations as leaders in the carbon economy but also paves the way for a sustainable future.

Key contacts

Authors

Asif Sheikh
Director
Global CCUS Hub Co-Lead

Geoff Baldwin
Director
Corporate Finance CCUS Lead

Key contributors and Global CCUS Leads

Paul Rees Jones
Partner
Strategy & Execution, UK

Nicholas Evans
Director
EMEIA Sustainability Lead, Switzerland

Graham Beal
Partner
Corporate Finance, UK

Andrea Romano
Senior Manager
Strategy & Execution, UK

1.0 The case for CCUS as a policy lever

1.1 Reframing the challenge

Governments worldwide face the dual challenge of combating climate change whilst fostering economic growth and ensuring job security. A fast growing and preferred solution to achieve this balance is the deployment of CCUS. Indeed, the IPCC emphasises that without commercial-scale CCUS, reaching the Paris Agreement goals will be unattainable.

Momentum in the CCUS sector is increasing, primarily due to policy side support.

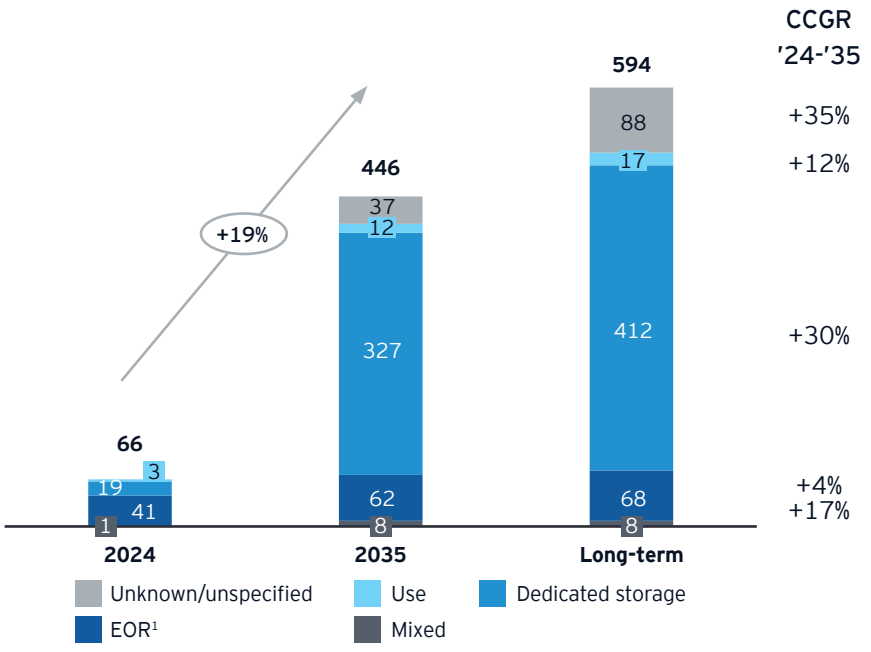
Only last week, the EU formally adopted the Net Zero Industry Act (NZIA), mandating oil and gas producers to develop 50mtpa CO_2 storage capacity by 2030; a legally binding target that marks a pivotal shift in scaling cross-border CCUS infrastructure and unlocking industrial decarbonisation across Europe.

EY anticipates that the main destination for captured carbon will be permanent storage, although many projects currently focus on enhanced oil recovery (EOR) and budding utilisation pathways are also emerging.

By the end of 2024, 66 mtpa of CO_2 were being captured. Taking into account current potential CCS projects that could be supported by policy intervention, projections indicate a 19% compound annual growth rate (CAGR) to reach 446mtpa by 2035. The IEA CCUS database also identifies 175 additional projects, which could contribute another 175mtpa of CO_2 in the medium-to-long term. Figure 1 outlines EY's view of capture volume growth based on current announced policy and project pipeline.

Figure 1: Global carbon capture volumes by end use

Global carbon capture volumes by end use (Mton/year)



Key takeaways

- Carbon capture volumes are growing at a +19% CAGR 2024-2035 and +33% absolute from 2035 onwards
- EOR[1] is currently the most developed carbon destination, owing to mature technologies used (i.e. gas injection, thermal technologies and chemical injection
- Dedicated storage is increasing at a +30% CAGR (2024-35) driven by countries pursuing carbon capture and storage at scale. Storage sites are largely disused oil and gas reservoirs and saline aquifers
- Broader utilisation is still at an early stage but expected to increase. Economics remain challenging and will benefit from growing policy support

Source: EYP analysis informed by Global CCS Institute, IEA data and proprietary data

[1] Enhanced Oil Recovery

[2] Long term refers to projects with operating date beyond 2035 or without a published operating year

Despite viable projects coming forward and the potential growth, a global consensus on CCUS policy remains elusive. The sector is still costly, requiring government intervention to address its economic challenges. Ongoing uncertainties in global carbon prices, uncertainty on the prospects for the US market, and a fragmented regulatory landscape also all threaten to undermine progress and hinder the burgeoning CCUS sector.

Consequently, governments are competing for private capital, with corporations favouring jurisdictions that offer funding and support to mitigate investment risks.

This article puts forward a case for CCUS by highlighting economic opportunities beyond decarbonisation, emerging support models and strategies for governments to develop effective CCUS systems.

EY argues that immediate action is beneficial and that policymakers possess the tools to navigate the risks and uncertainties associated with scaling CCUS, turning the potential we see in projects coming forward into the reality of a new developing industry.

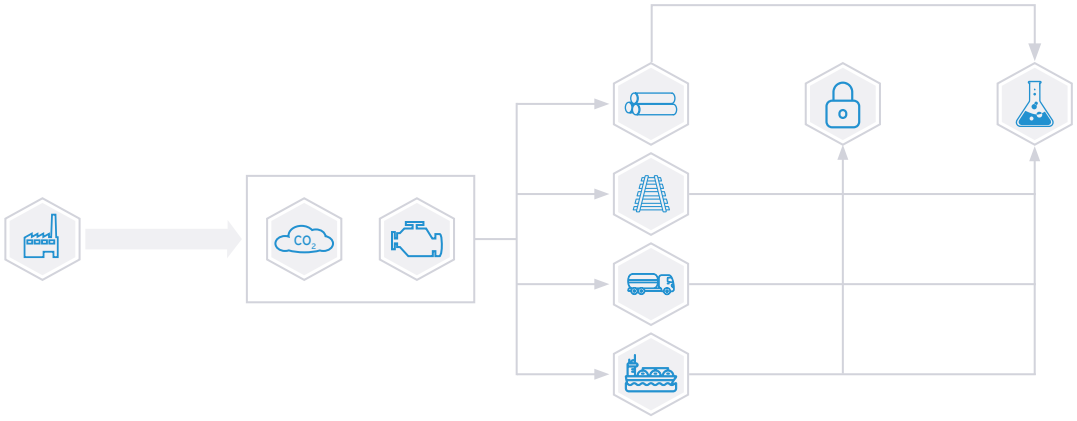
As the carbon economy evolves, countries will vary in their capacity to leverage these new economic opportunities and cross-border carbon markets will develop and deepen, strengthening the case for carbon capture and creating new industrial opportunities.

Critically, there is no silver bullet or one-size-fits-all policy solution, and success will depend on crafting a tailored execution model aligned with each country's unique circumstances, strategic goals and resources.

Governments are looking to scale CCUS for different reasons

CCUS is often narrowly perceived as a tool for enhanced oil recovery (EOR) in upstream operations. This has its place, but as the sector develops, we expect to see a shift in focus to permanent sequestration of carbon and the economic benefits that can come with promoting this. Whilst its role in achieving decarbonisation targets is gaining recognition, there are broader opportunities for governments to create value.

Figure 2: The CCUS value chain



Value chain	**Emissions source** Industrial emitters of CO_2	**Capture technology** Capturing or separating CO_2	**Transport and storage** Transporting CO_2 from source to storage or utilisation	**Utilisation** Using CO_2 for a period of time before emitting to atmosphere
Type	■ Heavy industry ■ Steel ■ Cement ■ Chemicals ■ Glass ■ Hydrogen production (SMR) ■ Power generation (fossil fuels)	■ Industrial carbon capture from high CO_2 concentration flue gases ■ Capture of emissions when organic matter is burned, which can be carbon negative (BECCS[1]) ■ Direct Air Capture (DAC) of CO_2 ■ Separating CO_2 through reactions, cooling or filters	■ Transport ■ Permanent pipeline infrastructure (can refit legacy oil & gas pipelines) ■ Rail, truck, ship ■ Import / export ■ Permanent storage ■ Onshore or offshore geological storage, into which CO_2 is stored permanently	■ CO_2 incorporated into a chemical or product, which may release CO_2 back into atmosphere at a later point

Source: EY-Parthenon analysis

[1] Bioenergy with Carbon Capture and Storage

1. Protecting and enhancing industrial competitiveness

CCUS can protect domestic production in hard-to-abate industries, such as steel, cement, and chemicals, which face increasing public scrutiny and rising domestic carbon prices as well as carbon border taxes where goods are exported.

By implementing CCUS, governments can help these companies remain competitive whilst reducing emissions. This is especially important for multinationals, as retaining them prevents carbon leakage and preserves domestic control over key industries, whilst extending the productive life of existing assets.

2. Capturing early share in a large and growing market

Countries that act now can establish expertise and capabilities in CCUS and adjacent growing sectors, such as blue hydrogen and sustainable aviation fuels. This early mover advantage can enhance future export capabilities.

Depending on their asset base, certain countries may also be able to command different value chain plays. For example, leveraging favourable geology to offer storage capacity for international partners, creating revenue opportunities in an emerging sector.

3. Job creation

CCUS presents significant job creation potential across the value chain. As fossil fuel industries decline, CCUS offers a pathway for transition. The overlapping skill sets allow countries with traditional oil and gas sectors to mitigate job losses. While the economic benefit of oil and gas reserves is unlikely to be replicated by CCUS, and can ensure a future to countries and regions currently dependent on fossil fuel extraction.

Barriers to scaling

As already flagged, CCUS remains costly and carries intrinsic risks that necessitate careful management and some degree of government intervention in the short-to-medium term.

1. Technological challenges at scale

Whilst the technologies supporting CCUS have been tested in various applications for years, scaling them remains underdeveloped. Capture technologies are advancing rapidly, particularly as the sector shifts away from traditional amine-based solutions. However, transportation and storage (T&S) remain a challenge economically, especially as the transition from pipeline-to-geological storage begins to include non-pipeline transport as an option.

2. Underlying economics are uncertain

The economics of CCUS depend heavily on carbon prices and capture costs. EY does not foresee a steep decline in costs of traditional capture and storage over time, although innovation and scale may yield some benefits. Without government support, corporate investments will likely be delayed until a break-even point is reached. Furthermore, governments are cautious about overpaying, as long-term investments require subsidies that may need to extend into a future with potentially higher carbon prices.

The situation is further complicated by the existence of both compliance markets (like the EU Emissions Trading System – EU ETS) and voluntary markets that some projects can access. Agreements at COP29 indicated a growing trust in voluntary markets, suggesting a future where compliance and voluntary carbon markets could become interoperable. This would allow emitters, such as bioenergy plants, to profit from carbon credit markets whilst avoiding carbon taxes.

3. Cross-chain risks constrain individual actors

Storage solutions typically cater to a single or small number of emitters, and emitters typically have constrained choices in how they transport and store carbon. The performance of one segment of the chain is critical to the others; emitters require reliable storage solutions, whilst T&S providers depend on consistent revenue from a limited customer base. Effectively managing these cross-chain risks is essential for scaling CCUS.

4. Cross-border frameworks

While the issues associated with the London Protocol have now been solved, there is no regulatory framework agreed on a bilateral or multilateral basis to support the export and storage of carbon. Frameworks exist – for instance within the EEA – where there is a common carbon price (and indeed UK ETS is expected to align in the future), but in other jurisdictions such as the Middle East and Asia, new agreements and frameworks will need to be developed. Corporates will invest where they can clearly assess risks and see a supportive economic framework. This necessitates co-ordinated movement across different parts of the value chain, highlighting the need for government involvement. This is true not only of emitters and T&S providers, but even more acutely for new industries such as hydrogen or sustainable aviation fuels.

2.0 How to build a winning CCUS ecosystem

Governments that recognise and embrace the potential of CCUS can reap environmental benefits alongside significant economic gains. For proactive governments, this presents an opportunity to lead globally, not just as climate champions but as architects of a sustainable future.

The key question is how to act decisively to seize these opportunities. EY believes this requires governments to address two fundamental questions .

Figure 3: Key considerations for CCUS ecosystem development

Who are you and what do you want to be?

Defining a baseline

- What is your emission base?
- What industries do you have and want to protect?
- What capabilities do you have?
- Are there domestic stores with sufficient capacity?
- Could storage be offered to other jurisdictions?

Setting an ambition

- What role do you want to play in the value chain?
- What is the scale and scope of your CCUS ambition?
- What funding could you allocate to CCUS?

How do you tailor your execution model?

Choosing a deployment model

- Point to point solutions
- Cluster models
- Hub and spoke systems

Allocating risk effectively

- Who is best placed to manage various risks?
- How should risk be allocated to minimise overall costs for the system?

Designing the appropriate policy framework

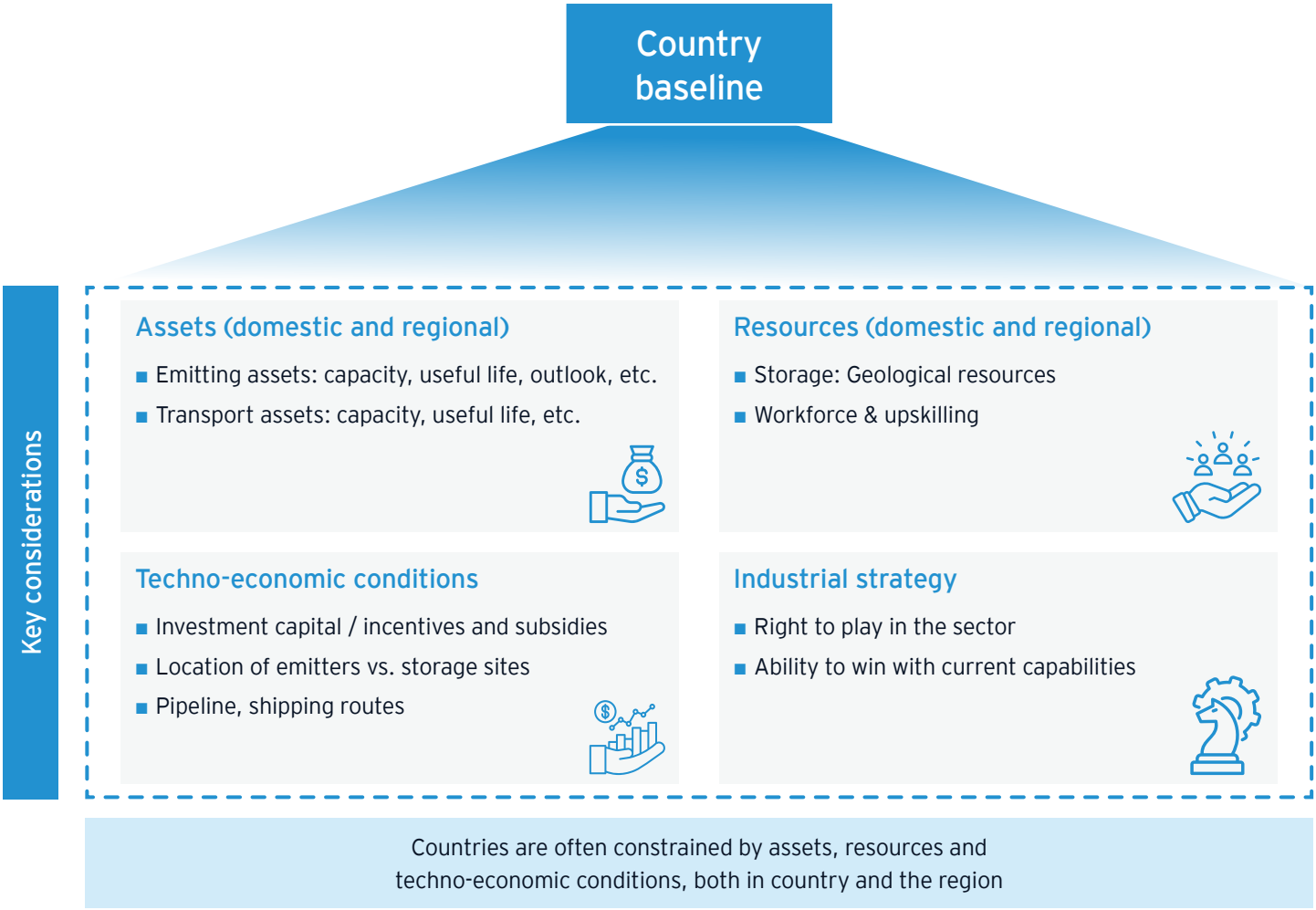
- Which market mechanisms would be most suitable to drive demand? E.g. carbon pricing
- What regulatory frameworks should be adopted to ensure effective implementation of CCUS?
- Which financial incentives are best suited for stimulating investment? E.g. Tax incentives, capital grants, CfDs

2.1 Who are you and what do you want to be?

To deploy CCUS effectively, governments must first establish a baseline. Countries are limited by their domestic assets, resources, and techno-economic conditions, both nationally and regionally. Understanding this baseline is crucial in defining a compelling CCUS ambition that aligns with a broader industrial strategy and reflects the country's capabilities and competitive position.

The figure 4 below illustrates the considerations a government must evaluate when defining its baseline. Typically, governments will weigh CCUS against other initiatives. A robust baseline allows for informed assessments before determining the 'type' of CCUS player a government aspires to be.

Figure 4: Key considerations for country baselining



Understanding the baseline will enable a country to work out where it needs to concentrate efforts and what type of regulatory and commercial model to adopt.

2.2 How do you tailor your execution strategy?

Different countries will pursue various paths. Tailoring the execution strategy is critical to realising a country's potential. Governments and corporates have complementary yet competing priorities, making it essential to balance their needs for successful sector scaling.

Governments must address three critical questions in designing an appropriate execution response:

1. **What is the right regulatory framework** for assuring storage of carbon?
2. **What is the most suitable deployment model**, and what is the Government's role in bringing together different parts of the value chain?
3. **How should emitters be incentivised** to act?

1. What is the right regulatory framework?

A robust regulatory framework is vital for the safe and effective implementation of CCUS projects. Governments must establish clear guidelines for the capture, transport and storage of CO_2, addressing potential risks and liabilities.

Regulatory oversight is crucial, with governments needing to develop frameworks that outline stakeholder responsibilities, including guidelines for monitoring and verification of CO_2 storage, and oversight of T&S operations.

All countries involved in CCUS will need a clear regime around measurement of carbon, where and when metering takes place, and who has title and ownership of carbon at different points in the process (and hence who is responsible for losses when they occur).

Where countries have stores, they will need a regulatory regime around permitting stores as suitable, and overseeing exploration, assurance, use, decommissioning and long-term monitoring. Anyone storing carbon will need confidence in those arrangements so that they can gain access to the incentives / green premia that low carbon production might offer.

This is particularly important for those countries whose ambition is more focused on developing storage than subsidising domestic emitters to store carbon, but there is a need for bilateral and multilateral co-operation for that to work.

Countries may not be in control of the overall regulatory framework – for instance in the EEA, the EU directives on CCUS and on the ETS determine much of the structure. Elsewhere, countries such as Indonesia and Australia, and individual states in the US are developing frameworks to allow carbon to be stored. In the future, cross border arrangements will need to be developed outside of common carbon trading areas in Asia and the Middle East.

2. What is the most suitable deployment model?

Countries must evaluate the most effective approach to capture, transport, and store carbon emissions. The choice of deployment model significantly influences the efficiency, cost-effectiveness, and scalability of CCUS. The most suitable model will depend on the baseline established in terms of emitters, access to domestic or foreign stores, and the level of ambition. These models will need to support the management of cross-chain risk that acts as a barrier to deployment of CCUS.

Three primary deployment models have emerged, as detailed in the figure 5 below.

Figure 5: CCUS deployment models

Deployment models	Advantages	Challenges	Examples
Point-to-Point projects ■ Focused on **individual emission sources** that transport captured CO_2 **directly to designated storage sites**	■ **Simplicity:** Direct connections between specific emitter and storage site, streamlining project development ■ **Targeted solutions:** Technologies can be tailored to bespoke needs of emitter and storage site	■ **High costs:** Dedicated infrastructure required for each emission source; barrier for smaller emitters ■ **Limited collaboration:** Limited collaboration and knowledge sharing	Australia Gorgon Norway Sleipner
Regulated cluster models ■ Implemented in geographic regions with **multiple emission sources, located near storage sites**	■ **Cost efficiency:** Shared infrastructure (pipelines & storage), reducing costs ■ **Enhanced collaboration:** Encourage knowledge sharing and innovation, developing best practices ■ **Scalability:** Bring on additional players	■ **Complexity:** Multiple connections and reliance on multiple participants ■ **Transition:** harder to move to fully market model when CCUS market more highly developed	UK ECC Liverpool Bay
Open contracting model ■ **Different pipelines and stores compete,** with multiple emission sources and storage, transport & utilisation points possible	■ **Flexibility:** Accommodate variety of emission sources ■ **Cost efficiency:** Shared infrastructure i.e. pipelines & storage, reducing overall costs	■ **Restrictive:** ownership and control means only some parties can join, excluding key emitters ■ **Lack of certainty:** cannot support certain emitters or plan for long term	US

Countries must implement models that maximise efficiency, cost-effectiveness and scalability

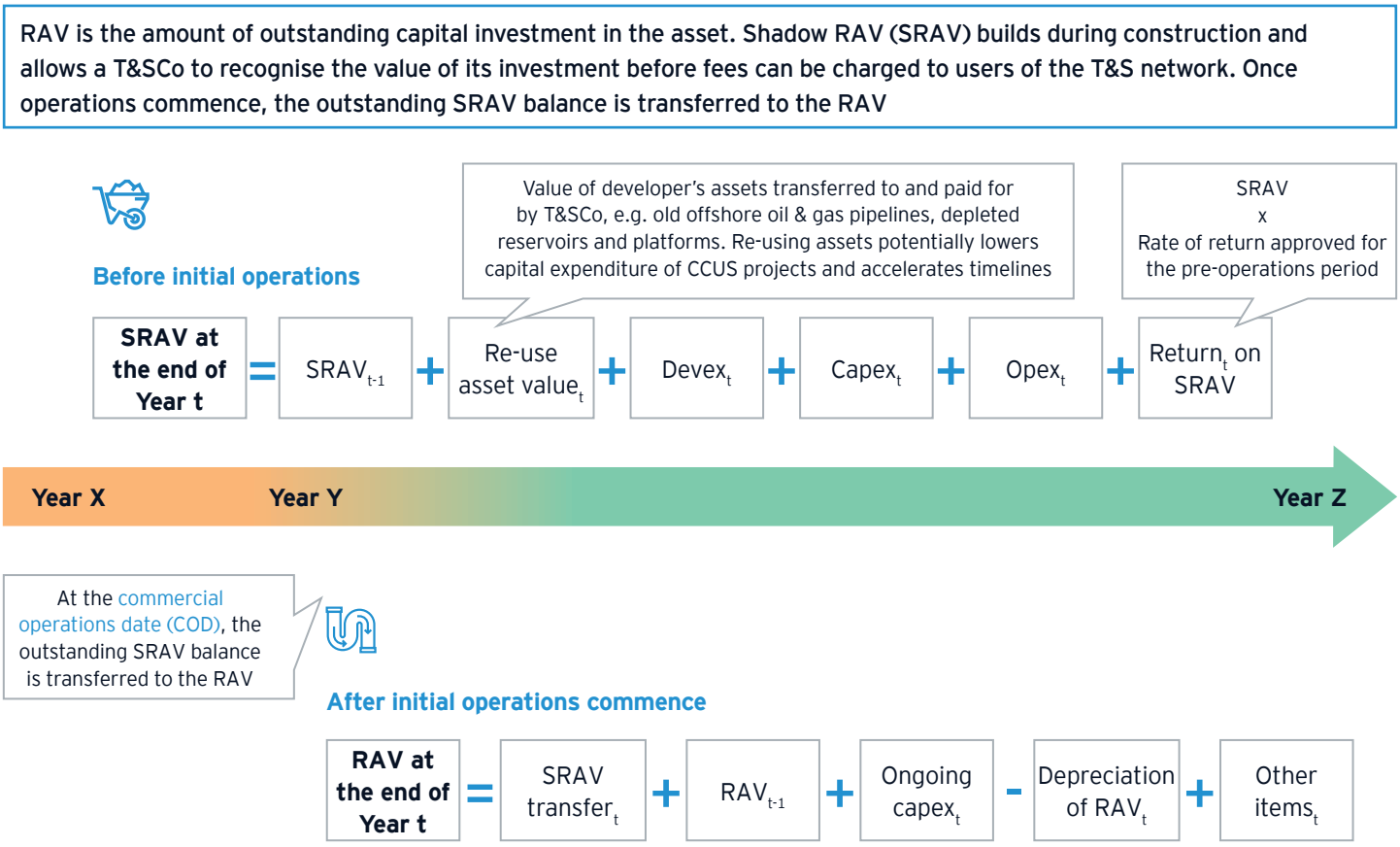
The costs and performance of the storage network needs to be assured and managed so that emitters are able to invest. This can happen in different ways – for point-to-point projects, this occurs within a single corporate or JV. For markets systems, these risks are managed within a private contracting framework. For cluster and hub models, regulators and government intermediaries (such as the Low Carbon Contracts Company in the UK) work together to manage the risks.

Countries will need to decide how involved they wish to be in determining the relationship between emitters and transport and storage of carbon, and where they want the risk allocation in the relationship to lie.

Given cross-chain risks associated with CCUS, governments may need to intervene to create certainty for emitters by contracting with T&S providers, which can involve direct contracts or public-private partnerships.

An alternative to a purely contractual model is to apply economic regulation to T&S networks, as seen in the figure 6 UK. Here, regulators determine appropriate capital and operational expenditure, ensuring costs are controlled whilst providing T&S providers with confidence that properly incurred costs will be accounted for.

Figure 6: Structure of UK T&SCo Regulated Asset Base model



T&S providers face risks from demand fluctuations and potential emitter exits. Governments can implement revenue support mechanisms, such as take-or-pay contracts, to provide financial stability. Additionally, governments may act as "insurers of last resort" for early T&S projects, covering risks where commercial options are unavailable.

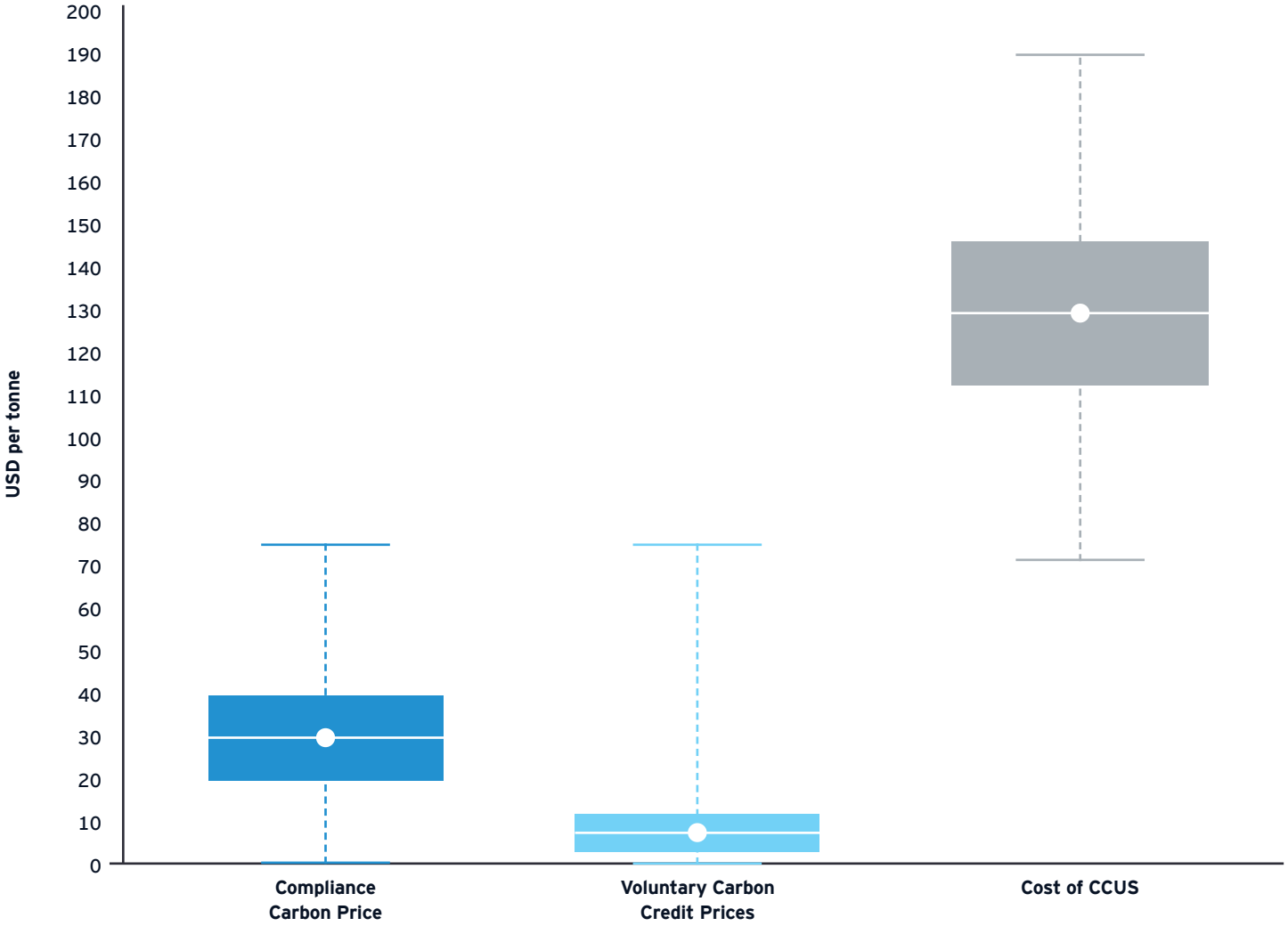
A regulatory model or a contractual model that takes some of the same features where a government body can sit between emitters and transport and storage allows governments to give more confidence in risk management between the different parts of the value chain and incentivise investment.

3. How should emitters be incentivised to act?

When supporting domestic emitters, governments must find a means to contract and support the private sector financially, as current carbon markets won't support deployment.

Figure 7 below depicts the challenge faced by participants in the absence of government intervention. All-in capture, transport and storage costs currently breach (in almost all instances) the prevailing carbon price. The cost of CCUS noted here considers traditional point source capture to permanent geological storage and does not consider alternative pathways such as DAC - which will experience greater cost run downs but are, in absolute terms, far more expensive than those outlined here. Therefore, the fact still remains that the delta is currently too great to incentivise emitters without certainty of support.

Figure 7: Key challenges



Market mechanisms

Market mechanisms are essential for creating financial incentives that encourage investment in CCUS. By establishing a price for carbon emissions, these mechanisms can drive demand for carbon capture solutions and facilitate the transition to a low-carbon economy.

Carbon pricing is one of the most effective market mechanisms, assigning a cost to carbon emissions, either through a carbon tax (direct levy) or an emissions trading system (ETS) (purchase and sale of emission allowances), in turn incentivising industrial players to reduce emissions and invest in low-carbon technologies such as CCUS.

Developing carbon credit markets can further enhance the effectiveness of market mechanisms. These allow companies to purchase credits for emissions reductions achieved through CCUS projects, creating additional revenue streams for investors. However, the pace of market development is uncertain, necessitating mechanisms to ensure these markets contribute to CCUS success.

Financial Incentives

Financial incentives are critical for stimulating investment in CCUS projects and making them economically viable. Governments can provide support through various methods, each with its own set of advantages and challenges. Key examples include:

- **Tax incentives:** Offer financial benefits for companies investing in CCUS technologies, such as tax credits or deductions. For example, U.S. tax incentives introduced in 2021 allow projects to receive up to $80 per tonne of CO_2 sequestered. Whilst tax incentives can stimulate investment, they also carry risks for governments, as changes in tax policy can impact the long-term viability of projects
- **Contracts for Difference (CfDs):** Stabilise revenues for CCUS projects by agreeing to pay a price for carbon captured, typically the delta between carbon prices and the cost of capture, allowing investors to hedge against market fluctuation. Arriving at an appropriate strike price can be a rigorous process, however this approach ultimately provides certainty for both investors and governments, enabling bankable projects that demonstrate value for money

Figure 8: Contracts for Difference (CfD) overview

Contracts for difference

What are Contracts for difference?

- Contracts for difference provide a mechanism for stabilizing revenues for CCUS projects

How do they work?

- Governments agree to pay a **subsidy,** represented by the difference between the **price of carbon** and **cost of capture**

What are its challenges?

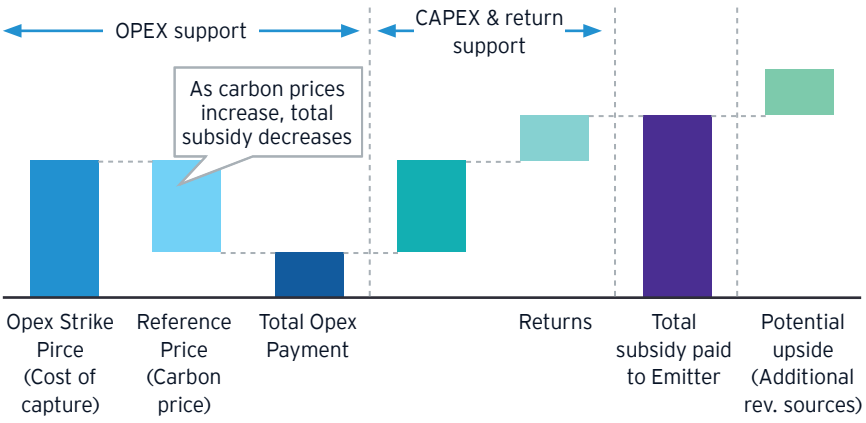
- A rigorous process is required to arrive at an appropriate, total strike price

What are its benefits?

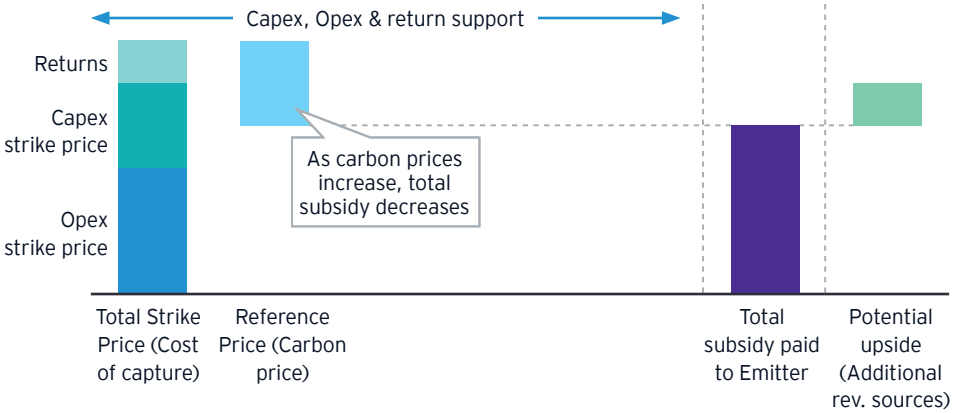
- **Increases in carbon prices reduce required subsidies**
- Contracts can be adapted for individual industry requirements to reflect appropriate depreciation rates, treat costs differently

Contracts for difference payment mechanism examples

'Split Capex & Opex' business model payment mechanism example



'Total strike price' business model payment mechanism example



- **Capital grants:** Provide direct financial contributions to support CCUS project development, particularly effective in stimulating short-term activity by covering initial costs and improving project readiness. However, it is essential to calibrate support to ensure that it does not lead to over-reliance on government funding or create inefficiencies in the market
- **Direct subsidies:** Provide immediate financial support for CCUS projects, helping to bridge the gap between project costs and market revenues. Whilst subsidies can stimulate investment, they must be carefully designed to avoid distorting market dynamics or creating an overdependency on government support

2.3 A framework for policymakers

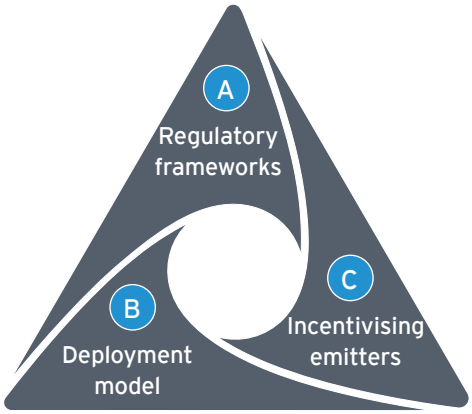
Bringing answers to these three questions together will enable policymakers to move from their baseline understand of circumstances and ambition to deploy CCUS in an appropriate way. Establishing a supportive policy environment must encompass methods that address each country's unique opportunities and challenges.

Policymakers have various levers at their disposal, including market mechanisms, regulatory frameworks, and financial incentives. Each of these can play a vital role in shaping the landscape for CCUS deployment, and their effective combination will depend on a country's specific circumstances and ambitions.

Different countries with different baselines will have a tendency toward certain levers, depending on their appetite for risk. Whilst there are advantages for some models, we believe that success can be achieved in several ways.

The figure 9 below visualises the interplay between emerging policy levers, namely market mechanisms, regulatory frameworks and financial incentives.

Figure 9: Policy environment framework

Policy environment framework		Benefits	Examples
	A	■ **Regulatory Frameworks** ■ Encourage investment in CCUS ■ Allow storage and cross border transport	■ Guidelines and standards for capture, transport and storage ■ Responsibility frameworks ■ Oversight of transport and storage operations ■ CO_2 storage liability frameworks
	B	■ **Linking emitters with transport and storage** - ensure choosing the deployment model that fits with the regulatory framework and how emitters are incentivise	■ Economically regulating networks to control costs and expansion ■ Centrally contracting for the longer term ■ Setting access requirements
	C	■ **Incentivising emitters** help make CCUS projects economically viable	■ Carbon pricing e.g., carbon tax or carbon market approach (ETS) ■ Tax incentives e.g., tax credits or deductions ■ Contracts for Difference (CfDs) ■ Capital grants

A balanced and effective CCUS policy environment will ultimately integrate multiple components. Each lever can be interconnected, meaning that changes in one area potentially impact others. For example, a robust regulatory framework can enhance the effectiveness of market mechanisms by providing clear guidelines and standards for carbon pricing. Similarly, financial incentives can drive investment in market mechanisms, creating a feedback loop that fosters growth in the CCUS sector.

Financial incentives

Risk management

In designing and implementing a policy framework, governments must determine how to distribute risks between public and private entities, ultimately ensuring that risks are allocated to those best equipped to manage them.

Effective risk allocation is essential for attracting investment, fostering innovation and ensuring the long-term success of CCUS.

Governments may absorb certain risks, particularly those too substantial for private entities. We are seeing governments correct for market failures through mechanisms such as revenue support agreements, for example.

Private entities are often better positioned to manage operational risks, such as technology performance, market fluctuations and financial uncertainties. By allocating these risks to private investors, governments can leverage the expertise and efficiency of the private sector.

Governments may also consider implementing shared risk models to balance the distribution of risks. These models can provide financial stability whilst allowing governments to retain oversight where appropriate.

Developing an approach to risk allocation means engaging with the fact that the private sector and governments will have different priorities and concerns. Designing the appropriate deployment framework means working through the right compromise for both sides when working with emitters and with potential transport and storage networks.

Governments' needs		Private sector's needs
Governments aim for Value for Money, ensuring fair compensation for capture/store performance and balanced risk transfer.	Costs	Private sector requires certainty on cost coverage and revenue, and protection against cost uncertainty.
Governments seek long-term certainty in CO_2 sequestration to ensure Value for Money and facilitate effective long-term planning.	Time	Private sector prefers shorter timeframes (excl. regulated assets) and incremental investments, but it can benefit from stable frameworks supporting sustained investment.
Governments want long-term commitment on capture/store capacity and the ability to scale such capacity over time.	Scale	The private sector prefers flexibility and staggered capital deployment, avoiding long-term commitments to additional investments.
Governments seek a fair risk allocation and want the private sector to manage risks it is best equipped to handle.	Risks	The private sector seeks safeguards against risks beyond their control, including tail-end risks, but is willing to assume other risks in exchange for a suitable return on investment.

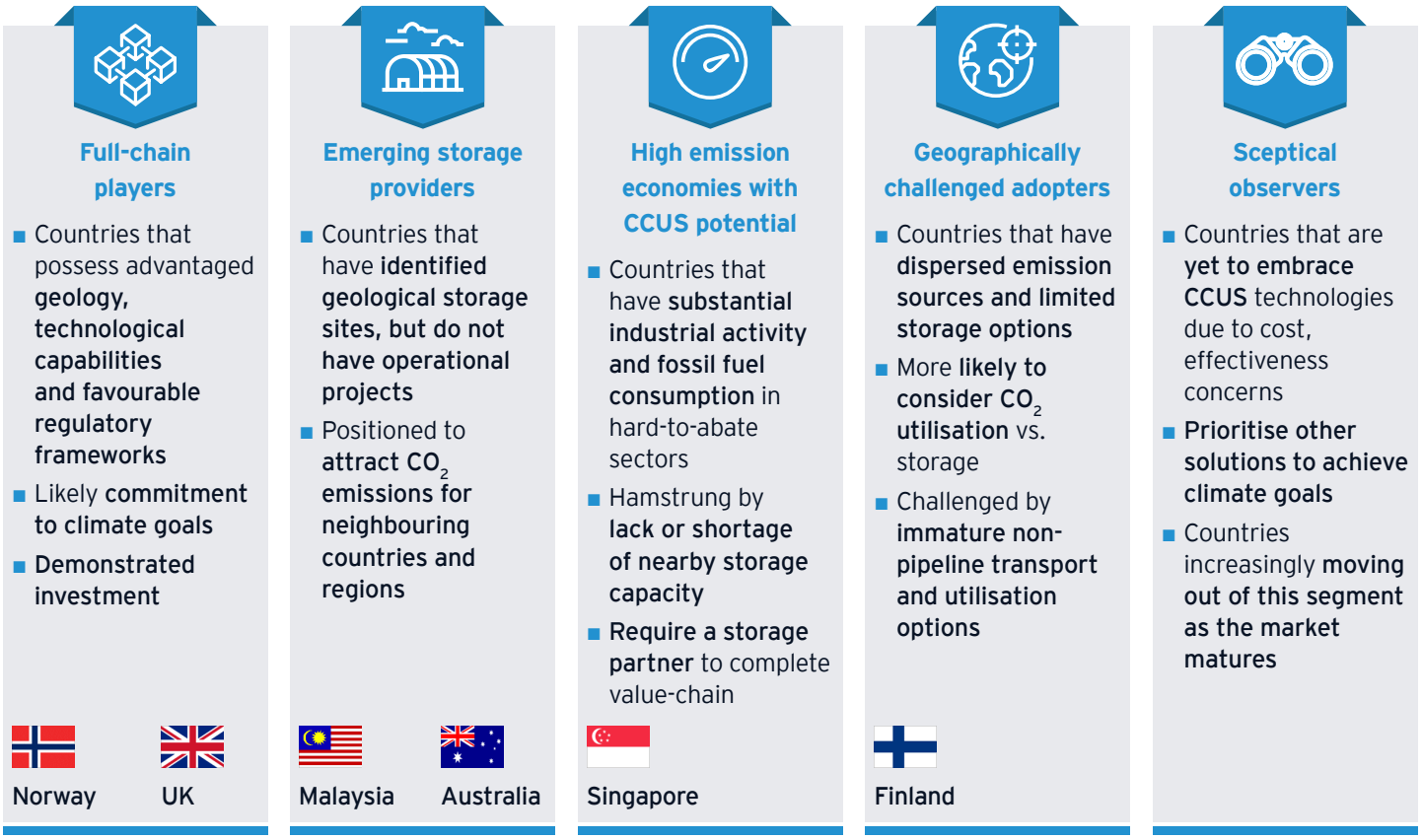
Emerging archetypes

As already outlined, there is currently no global consensus on CCUS policy. However, as countries navigate early policy development, distinct archetypes are emerging. Each archetype has unique characteristics and potential pathways for growth, along with common elements for success, including:

- **High emissions density** in hard-to-abate sectors, creating opportunities for CCUS application
- **Geographical advantages** with concentrated emission sources, facilitating scale
- **Access to storage capacity,** ensuring cost-effective transport and supply certainty
- **Favourable policy and regulatory environments,** encouraging innovation and corporate confidence

The figure 10 below illustrates the archetypes and their key characteristics, along with some example nations aligned to each.

Figure 10: Emerging archetypes



Understanding these archetypes provides valuable insights into the potential trajectories of countries as they navigate CCUS policy development. Each archetype presents unique characteristics and opportunities, shaping the future of CCUS globally.

At a high level, policymakers can use the baselining of their country's capabilities and requirements to understand where they might sit on this spectrum.

The effectiveness of the policy environment will vary based on the archetype of the country implementing it. Different countries will have unique characteristics, and it is essential that these are considered when a government is choosing how to proceed with CCUS initiatives.

Particular considerations against each archetype are as follows:

- **Full chain players:** These nations may favour a combination of robust market mechanisms and financial incentives, leveraging existing resources to implement comprehensive CCUS policy that includes carbon pricing, tax incentives and CfDs
- **Emerging storage providers:** These nations can focus on regulatory frameworks that promote cross-border collaboration and investment. By establishing clear guidelines for T&S, these nations can attract investment whilst ensuring the safe management of carbon storage
- **High emission economies:** These nations may prioritise financial incentives to stimulate investment in a more market driven manner, using tax incentives and capital grants to bridge the gap between project costs and market revenues, in turn encouraging private sector participation
- **Geographically challenged nations:** These nations may need innovative policy approaches that facilitate collaboration and resource sharing, focusing on public-private partnerships and revenue support mechanisms

In conclusion, designing an appropriate policy environment for CCUS requires a multifaceted approach. By considering the unique characteristics and circumstances of their countries, governments can create a supportive ecosystem that fosters investment and drives success.

The effective combination of these models will depend on each country's specific situation, ambitions and risk appetite. As countries advance in their CCUS journeys, lessons learned from emerging risk management and commercial models will be invaluable in shaping the sector's future.

3.0 What does the future hold?

As should now be clear, the future of CCUS is expected to unfold in different ways in different jurisdictions; influenced by their unique circumstances, resources, and policy choices.

Despite significant uncertainties, ranging from technological feasibility to market dynamics, one certainty remains: the CCUS sector will grow. This growth will be driven by several key enablers poised to transform the landscape in the medium-to-long term.

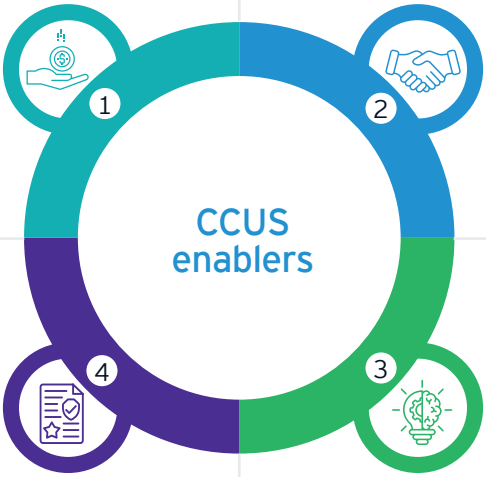
Figure 11: CCUS growth enablers

Carbon price evolution

- Emergence of **robust carbon pricing mechanisms** e.g., interplay between compliance and voluntary markets, creating a more **interconnected global carbon market**, driving investment

International collaboration

- **Activation of international CO_2 shipping** as countries with abundant storage capacity look to collaborate with high-emission economies
- Development of CO_2 shipping infrastructure will **foster a more integrated approach to CO_2 management**



Adaptive policy frameworks

- **Governments will refine approaches**, incorporating lessons from early implementations, **fostering a policy environment that supports investment**

Technological innovation

- Research and development efforts will yield **improvements in carbon capture efficiency, cost reductions and enhanced storage techniques**
- **Expanded applicability across various industries**
- **Improvements in underlying economics of utilisation pathways**

1. Carbon pricing and carbon market integration

A critical factor shaping the future of CCUS is the evolution of carbon pricing and the potential integration of carbon markets. As countries increasingly recognise the need to price carbon, we can anticipate the emergence of more robust carbon pricing mechanisms. This will incentivise emission reductions and foster a more interconnected global carbon market, encouraging cross-border investment in CCUS.

2. International CO_2 shipping

The activation of international CO_2 shipping will also significantly drive change. Countries with abundant storage capacity will look to collaborate with high-emission economies, making the logistics of transporting captured CO_2 increasingly important. Developing infrastructure for CO_2 shipping will enable resource sharing and expertise exchange, promoting a more integrated approach to carbon management. Recent developments, such as the launch of the Project Greensand offshore CO_2 tanker, illustrate this potential.

3. Technological advancements

Broader technological advancements will play a pivotal role in shaping the future of CCUS. Ongoing research and development efforts are expected to yield innovative solutions, improving carbon capture efficiency, reducing costs and enhancing storage techniques. These advancements will not only make CCUS more economically viable but also expand its applicability across various industries.

4. Evolving policy models

The development of supportive policy models will be essential for the growth of the CCUS sector. Governments must refine their approaches, incorporating lessons from early implementations and adapting to the evolving landscape. By fostering a policy environment that encourages investment and collaboration, countries can accelerate the deployment of CCUS technologies.

Conclusion

As we navigate the complexities of the global low-carbon transition, the future of CCUS is becoming increasingly clear. Each country's journey will be unique, shaped by its specific circumstances, resources, and policy frameworks. Policy intervention continues to remain vital in bringing about the commercial viability of projects.

> "Countries must act now, in order to get strategic, long-term competitive advantage and build the business case today.

Frontrunners, such as the UK and Norway have emerged through clear policy intent and coherent risk allocation across the public and private sector. Longer-term development of the sector will be bolstered by increased adoption of prevailing policy tools. Additionally, several key trends are poised to drive the growth of the CCUS sector in the medium to long term.

The evolution of carbon pricing and the integration of carbon markets will play a critical role in incentivising emission reductions and fostering international collaboration. The establishment of robust carbon pricing mechanisms will not only encourage investment in CCUS but also facilitate cross-border partnerships, particularly between nations with high emissions and those with abundant storage capacity.

Technological advancements will further enhance the viability of CCUS, making it more efficient and cost-effective. Ongoing research and development efforts are expected to yield innovative solutions that expand the applicability of CCUS across various industries, ensuring its role as a cornerstone of the transition.

Ultimately, with the right policy signals and strategic intent, CCUS can transition from its nascency to a catalyst for economic resilience and industrial revival. As momentum builds, early leadership in CCUS will not only shape emissions outcomes but also define the future landscape of the carbon economy.

At EY, we are committed to guiding governments and businesses through this transformative journey, leveraging our expertise to empower clients to achieve their sustainability goals while gaining a competitive edge in an evolving market. Reach out to discover how we can support your CCUS ambition.

EY CCUS Global Experts

Mile Milisavlijevic
Partner
Houston, USA

Anna Belz
Partner
London, UK

David Roxby
Partner
London, UK

Francisco Cosa
Partner
Madrid, Spain

Daniel Eisenhuth
Partner
Hamburg, Germany

Jeannette Hannebauer
Senior Manager
Hamburg, Germany

Viktoria Betina
Senior Manager
Berlin, Germany

Christian Grauers
Director
Malmö, Sweden

Helena Nordstrom Ernbo
Partner
Malmö, Sweden

Andrea Powell
Partner
London, UK

Jon Clark
Partner
London, UK

Sanjeev Gupta
Partner
Singapore

Hara Sidiropolou
Partner
Riyadh, Saudi Arabia

Hasan S Shafi
Partner
Riyadh, Saudi Arabia

Marco Duso
Partner
Milano, Italy

Greg Matlock
Partner
Houston, USA

Bill Scanlan
Partner
Perth, Australia

Giovanni Bianchi
Partner
Tokyo, Japan

Dan Wilcox
Director
Bristol, UK

EY | Building a better working world

EY is building a better working world by creating new value for clients, people, society and the planet, while building trust in capital markets.

Enabled by data, AI and advanced technology, EY teams help clients shape the future with confidence and develop answers for the most pressing issues of today and tomorrow.

EY teams work across a full spectrum of services in assurance, consulting, tax, strategy and transactions. Fueled by sector insights, a globally connected, multidisciplinary network and diverse ecosystem partners, EY teams can provide services in more than 150 countries and territories.

All in to shape the future with confidence.

About EY-Parthenon

Our unique combination of transformative strategy, transactions and corporate finance delivers real-world value — solutions that work in practice, not just on paper.

Benefiting from EY's full spectrum of services, we've reimagined strategic consulting to work in a world of increasing complexity. With deep functional and sector expertise, paired with innovative AI-powered technology and an investor mindset, we partner with CEOs, boards, private equity and governments every step of the way — enabling you to shape your future with confidence.

EY-Parthenon is a brand under which a number of EY member firms across the globe provide strategy consulting services. For more information, please visit www.ey.com/parthenon.

XXXXX-XXXGbl
ED MMYY

[Optional environmental statement — refer to The Branding Zone]

ey.com