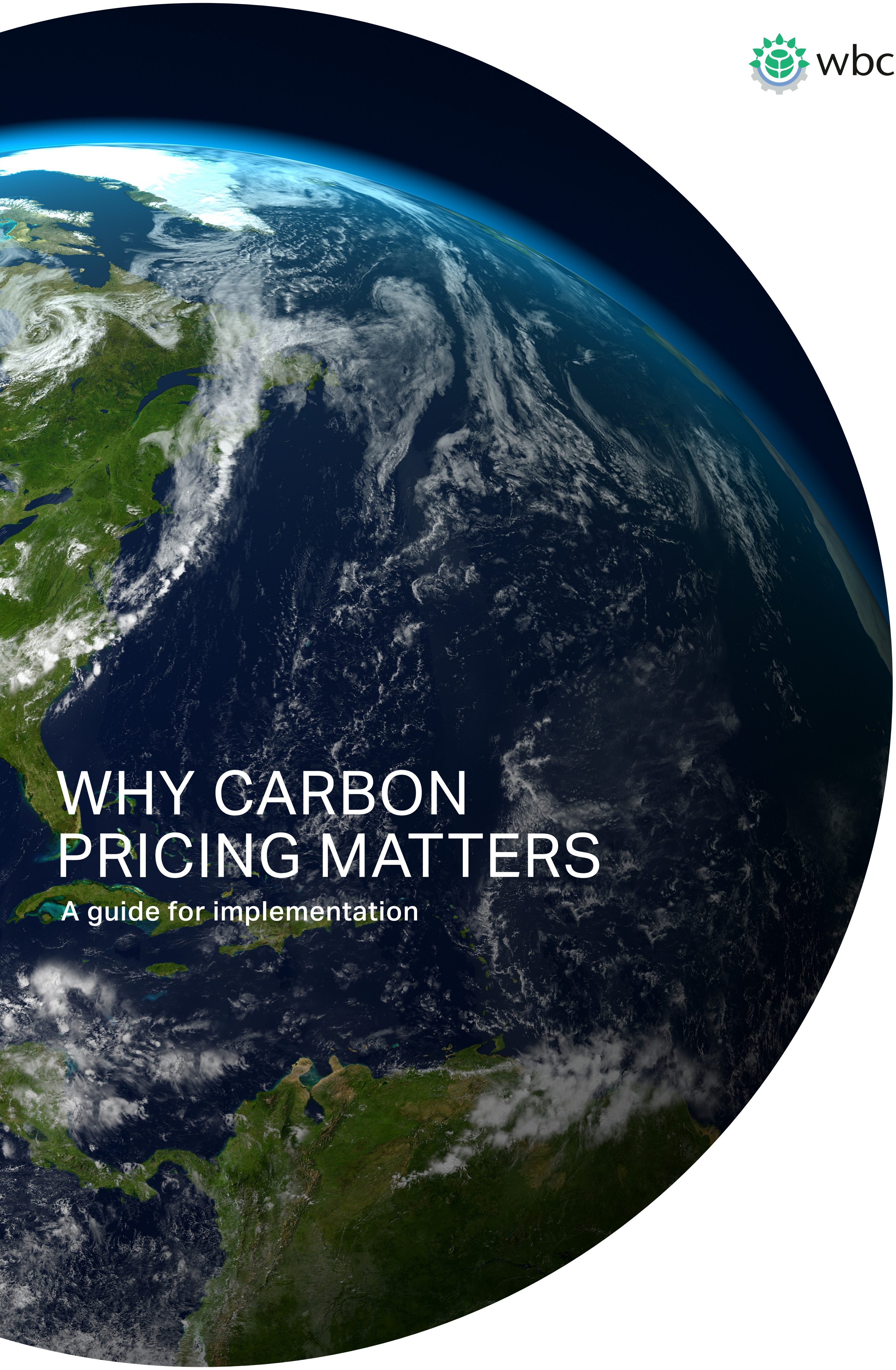


WHY CARBON PRICING MATTERS

A guide for implementation

Content

Why carbon pricing matters

Preface 4

1. Introduction 5

What it is (and what it is not) 6
Why it is needed 8
Long-term signals 8
Ex-post analysis of the impact of carbon pricing 9

2. Implementation of carbon pricing 10

3. Key design considerations 13

Competitiveness 14
Social impacts and revenue use 14
Offsets and carbon pricing 15
Interplay with other policies and implied carbon costs 15

4. Future directions 17

Building a global trading structure 18

5. Conclusion - Why is pricing the preferred instrument of choice for addressing carbon emissions? 19

Acknowledgements 20

Preface

Carbon pricing is an accepted concept for managing carbon emissions and many jurisdictions are looking to implement one instrument or another. Many resources describing different carbon pricing mechanisms exist. However, they tend not to be comparative and are relatively high-level.

WBCSD and its members believe that carbon pricing is now regarded as one of the most efficient means of driving the transition to a low-carbon world. As an increasing number of jurisdictions have adopted or are considering adopting carbon pricing, this document focuses on the "what" and "how" rather than the "why."

Policymakers need to choose the most suitable carbon pricing instruments and design them appropriately. This document aims to guide policymakers who are considering carbon pricing mechanisms in their choice of instruments and some key design principles.

In the process, this document hopes to stimulate further and more detailed discussions between policymakers and business leaders on how best to implement the carbon price so that it can incentivize low-carbon innovation and investment, create a global level playing field and support the attainment of the UNFCCC 2°C goal in a sustainable way.

1. Introduction

1. What it is (and what it is not)

A carbon price is a monetary cost put on the emission of carbon dioxide into the atmosphere from anthropogenic activities, such as the use of fossil fuels or process emissions. It must be implemented by governments[1] through legislation.

Some governments are already leading the way. At the same time, carbon pricing alone is insufficient for delivering a low-carbon society; other policy tools such as research, development and deployment (RD&D), support for innovative technologies are necessary to complement carbon pricing.

The idea that a carbon price is needed can be traced back to the work of Arthur Cecil Pigou, a University of Cambridge economist who published *The Economics of Welfare* in 1920. In this book, Pigou introduced the concept of externality and the idea that external problems could be corrected by the imposition of a charge. By "externality," Pigou meant the indirect economic impact of an activity that happened outside the immediate system where the activity was occurring. The externality concept remains central to modern welfare economics and is at the heart of environmental economics.

In the case of climate change, the externality is the release of carbon dioxide into the atmosphere and the future social and economic impact caused by the consequent increase in the surface temperature of the planet.

Pigou argued that activities associated with a negative externality should be penalized to the extent of the impact, such that their real economic value can be assessed. This penalty is widely known as a Pigouvian Tax. The Pigouvian Tax is consistent with the polluter-pays principle, which under international and domestic environmental laws, recognizes the need for the party that pollutes or creates environmental degradation to pay for the damage done.

Figure 1: Carbon dioxide versus green house gases

Although there are a number of greenhouse gases (GHGs), carbon dioxide is the principal determinant of the peak temperature the climate system will reach.	Gases such as methane, which are relatively short-lived in the atmosphere (lasting about 12 years) compared to carbon dioxide (up to hundreds of years), have an important impact on short-term warming due to their high-warming potential. As the reference gas, carbon dioxide has a global warming potential (GWP) of 1 whereas methane is estimated to have a GWP of 28 over 100 years.	Limiting short-term warming and managing long-term peak temperature constitute different policy objectives and therefore should be managed through different mechanisms. A simple interchange between them by applying the same policy instrument (e.g. a carbon price) may be counterproductive. For this reason, we refer to carbon pricing being applied to carbon dioxide only.

[1] In this document, the term "government" includes national and subnational governments (e.g. province, state, city) of any jurisdiction.

Assessing what level of carbon tax would be needed to limit climate change to well below 2°C is extraordinarily difficult. Many commentators and institutions have attempted to do this since and results vary widely.

In 2006, the UK Treasury asked their Chief Economist Nicholas Stern, formerly Chief Economist at the World Bank, to lead a major study on the economics of climate change. In the study, he estimated the social cost of carbon at USD $85 per w, assuming continued business-as-usual emissions of carbon dioxide, or a much lower USD $30 per ton for a pathway that sees atmospheric stabilization of carbon dioxide at 550 ppm.

Rather than basing all of our actions on a near-impossible assessment of the social cost of carbon, the real cost of emitting carbon dioxide that has evolved in recent years is more typically a result of the policy process that determines what an emitter is required to do. This will include the type of policy framework put in place by government to attempt to reduce emissions and some medium-term objective associated with it.

One common objective should be to bring some economic order to what might otherwise be a chaotic and expensive process of reducing emissions within the economy. Carbon price-based approaches are designed to do this. Carbon prices are also technology-neutral, in that they do not favor one type of low-emissions technology over another.

Many companies and governments manage the economic risks associated with carbon-pricing policies by applying a shadow valuation of carbon, which typically mirrors some external development. This is often loosely referred to as a carbon price, but more correctly is an internal carbon value.

Some observers have concluded that the internal carbon value should operate as an actual cost of carbon emissions within respective businesses, such that the business behaves as if it were subjected to an external carbon tax operating at the same value. This would be done in the absence of an external carbon price driver, therefore acting as a stand-in for the lack of government action. This approach is not being applied consistently.

Companies are using different approaches to set a shadow carbon price. At the same time, some companies have taken a carbon fee approach while others have used a mix of these two[2].

The internal carbon value, also referred to as a shadow carbon value or carbon screening value, is normally a mechanism used to manage the future regulatory risk that parts of the company or a future project may be exposed to. For example, potential investments are tested against a variety of possible future conditions, which could include an eventual cost incurred by the expected emissions of carbon dioxide. Although the project may not immediately be exposed to such a cost, the introduction of climate legislation could bring about exposure, which in turn, could threaten the future viability of the asset. Applying a shadow carbon value when the investment proposal is being assessed allows the investor to reconsider the project, change the scope, modify the design or accept the level of risk and proceed.

[2] WBCSD, Emerging practices in internal carbon pricing: A practical guide (2015): http://www.wbcsd.org/Projects/Education/Resources/Emerging Practices-in-Internal-Carbon-Pricing-A-Practical-Guide

2. Why it is needed

According to an analysis by the International Energy Agency (IEA), limiting the rise in global average temperature to well below 2°C requires an energy transition of exceptional scope, including a doubling of annual average energy-related investments. This global energy transition will be the result of changes in technology, increased concerns around energy security, energy pricing and concerns about climate change. Of these, energy pricing remains a key driver following several years of USD $100+ per barrel of oil and its impact on the energy complex overall.

Despite significant progress made with the Paris Agreement, the need to bring emissions to net-zero later this century is not yet reflected in the overall transition picture. The current pause in emissions is more attributable to outside factors rather than definitive climate action.Should the climate factor not be material, then a significant energy transition would likely still emerge, but may not trend towards net-zero emissions. We could see a major shift in the global energy mix, but as the energy system expands to meet growing demand, emissions[3] may not fall to the very low levels required to stabilize surface warming.

But investment and energy system turnover guided by a carbon price can help reach net-zero emissions globally over the course of this century.

The higher and more pervasive that price becomes, the earlier net-zero emissions can be reached, and therefore, it becomes more likely that the ambition of the Paris Agreement can be achieved.

Carbon pricing is growing as a policy tool, but it operates in less than a quarter of the global economy at levels, for the most part, between USD $5-15 per ton. By contrast, the 5th Assessment Report of the Intergovernmental Panel on Climate Change estimated that a carbon price range of USD $40-70 per ton of CO_2 in 2020 is needed to limit the rise in global average temperature to 2°C. Similarly, the Carbon Pricing Leadership Coalition (CPLC) High-Level Commission on Carbon Prices concluded that the explicit carbon-price level consistent with achieving the Paris temperature target is at least US$40–80/t$CO_2$ by 2020.

3. Long-term signals

Carbon pricing is an economic signal in place to drive behavioral change. To do so, the signal needs to be credible and predictable to provide the degree of certainty that agents need to implement new behavior criteria, new investment strategies or new business lines.

These qualities require a defined pricing trajectory or corridors covering the short, medium and long-term. They also require the flexibility and ability to adjust the mechanism to account for technology developments, policy performance or other external shocks.

As the CPLC High-Level Commission on Carbon Prices highlights, “the announcement of price ‘corridors’- that is, price ranges that will prevail in the future - provides a way to balance commitments, high prices and flexibility in policy making… But most important of all may well be to choose a carbon-price trajectory that people believe will be politically durable.” Longer term, the CPLC High-Level Commission on Carbon Prices also concluded that a suitable carbon price range is at least USD $50–100/t$CO_2$ by 2030.

[3] Net-zero emissions or carbon neutrality can be achieved by balancing the amount of carbon released with the amount that is sequestered or offset, or the number carbon credits purchased.

4. Ex-post analysis of the impact of carbon pricing

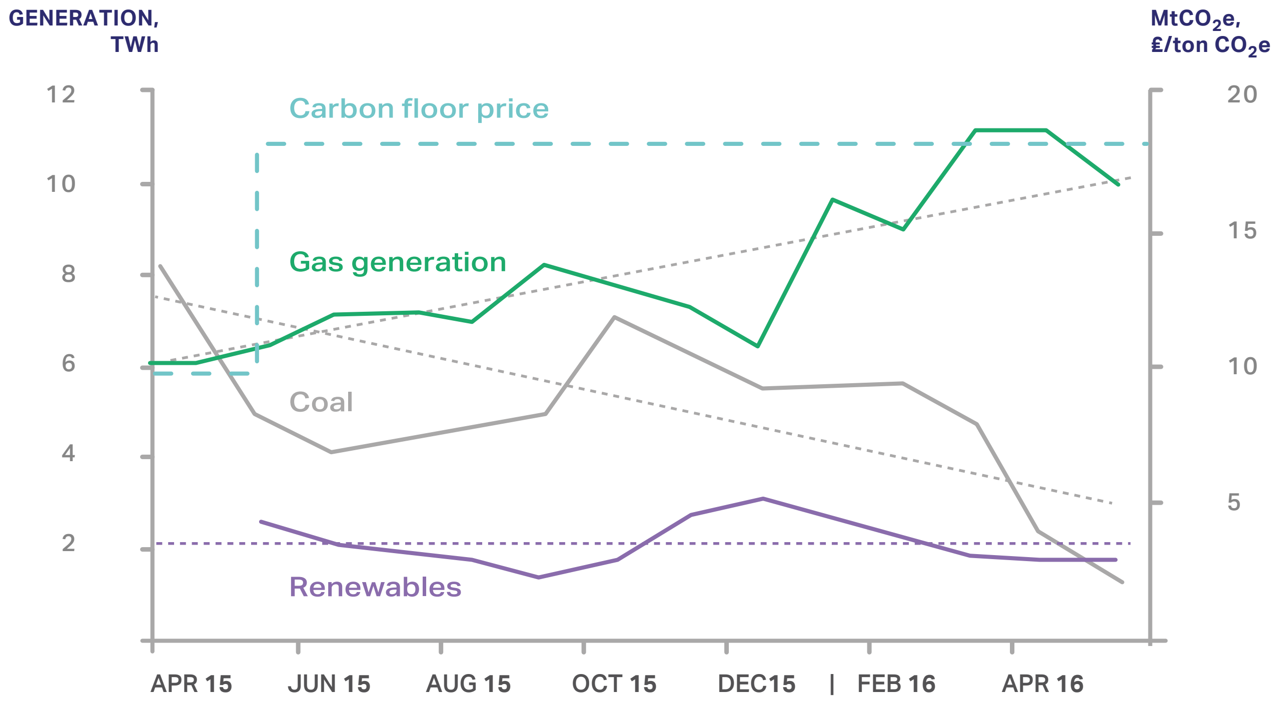
Ex-post analysis of polices is critical for evaluating the performance and effectiveness of policies, including ones on carbon pricing. For instance, overlapping climate policies influence a carbon price and marginalize the impact of the price. The econometric analysis of EU-ETS between 2005 and 2012 shows that national policies in accordance with EU Renewable Directive and Energy Efficiency Directive, in addition to economic downturn, were key factors in emissions reduction in the period, resulting in a limited role of explicit carbon price[4].

Nevertheless, data exists to illustrate the profound impact that a clear and robust carbon price can have. For example, by introducing a carbon tax on the purchase and use of fuels in 2008, the Canadian province of British Columbia (BC) became the first jurisdiction in North America to adopt an economy-wide carbon tax. The tax covers about 70% of the province's GHG emissions. Starting from CAD $10 per ton of carbon dioxide equivalent emitted in 2008, the carbon tax has now reached the current rate of CAD $30 per ton of carbon dioxide emitted in 2012.

From 2007 to 2014, BC has seen a 5.5% decrease in emissions, despite an 8.1% increase in population[5]. During the same period, the province's GDP increased by 12.4%. Revenue-wise, between 2008/09 and 2015/16, the carbon tax generated about CAD $7.3 billion and provided offsetting tax reductions of about CAD $8.9 billion. By taxing carbon emissions, not only has BC been able to generate a net benefit for its taxpayers, but also the government has been able to reduce taxes on employment, investments and economic growth.

In addition, the United Kingdom has introduced a carbon price floor (CPF) to support the EU ETS carbon price. In a briefing paper by the UK House of Commons on the Carbon Price Floor, "generation from coal fell by 25%, as a number of plants closed or switched to burning biomass. [...] Coal generation produces around twice the carbon dioxide per unit of electricity generated as gas and is therefore particularly affected by the carbon price floor. The increase in April 2015 of the carbon price support from GBP £9 to GBP £18 is one of the factors which has accelerated the reduction in 2016[6]."

Figure 2: Impact of a carbon price floor on the UK generation mix



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[4] Olivier Gloaguen and Emilie Alberola (2013). Assessing the factors behind CO2 emissions changes over the phases 1 and 2 of the EU ETS: an econometric analysis, CDC CLIMAT RESEARCH WORKING PAPER, 2013-15.
[5] British Columbia's Revenue-Neutral Carbon Tax, http://www2.gov.bc.ca/gov/content/environment/climate-change/planning-and-action/carbon-tax.
[6] UK House of Commons, Briefing paper, "The Carbon Price Floor, 2016."

2. **Implementation of carbon pricing**

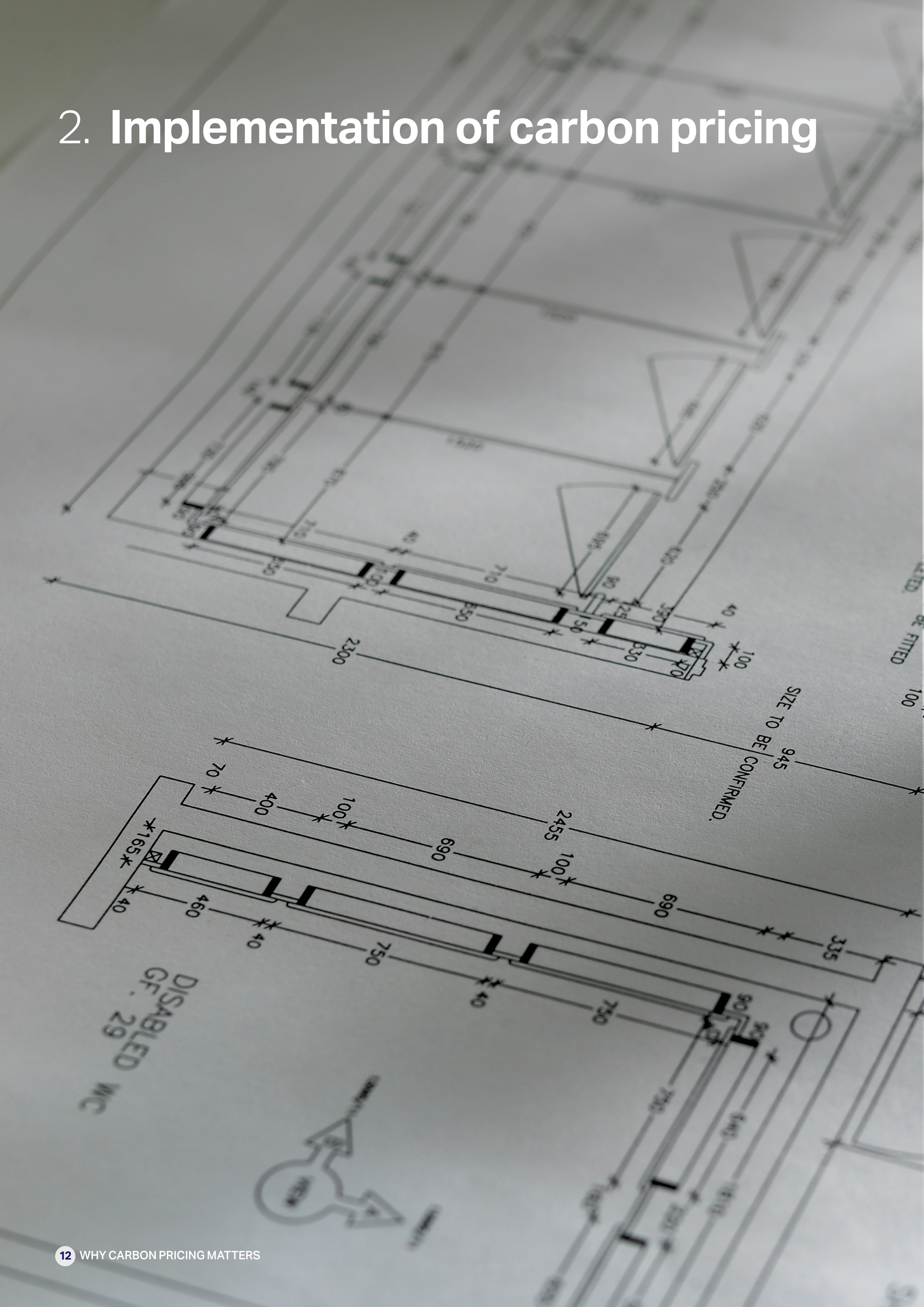
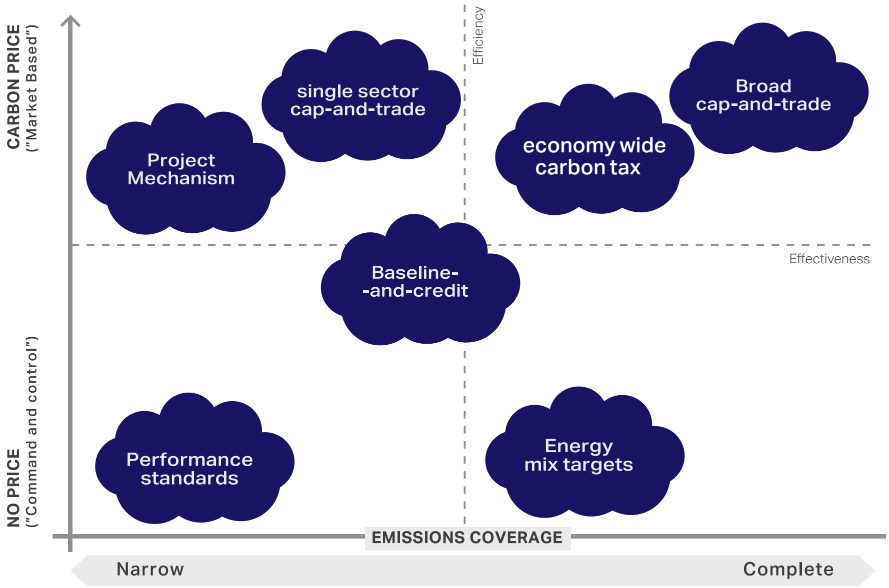


Figure 3: Comparing direct and indirect carbon pricing approaches on the basis of coverage



Adapted from David Hone (2017), "Putting the Genie Back: Solving the Climate and Energy Dilemma".

Comparing approaches and policies is difficult, but in general, the various mechanisms can be shown as the above figure. The most cost-effective approach is an economically feasible carbon price applied across as much of the economy as possible, but implementing this is the big challenge. Lost opportunities and inefficiencies creep in as the scope of approach is limited, such as in a project mechanism or with a baseline-and-credit approach, neither of which tackle fossil fuel use in its entirety.

The chart includes non-price-based mechanisms, also called an indirect-carbon-price approach, such as performance standards and energy mix targets, but these tend to be less cost-effective than a direct carbon price. Some policy makers favor these approaches because they can be designed to benefit certain sectors and address certain market failures, but their overall effectiveness in reducing the carbon emission stock is uncertain and they do not necessarily deliver the lowest-cost opportunities first. They may also have unexpected consequences; for example, an efficiency measure may result in improved production and therefore lower costs, but this could drive up overall emissions as demand for a cheaper product increases.

The most effective mechanisms for managing carbon dioxide emissions are those that directly impact the price of goods and services within the economy, but this can also act as a deterrent to implementation due to complexity in implementation. These price changes permeate the entire economy, creating a change in the market that begins to differentiate between various goods and services based on their carbon footprint (or the total impact on emissions because of the purchase of the good or use of the service).

The carbon cost is initially experienced by the emitter or fuel provider (e.g. by paying a tax or purchasing allowances from government) and may be passed through to consumers. Pass-through results in an increase in the absolute market price of most goods and services based on the carbon emissions within their respective supply chains, which leads to a new value ranking within the economy. This will influence the purchasing decisions of consumers.

Products with a high carbon footprint will be less competitive, either forcing them out of the market or driving manufacturers to invest in projects to lower the footprint. The overall increase in cost for the consumer can be addressed by the government through return of the collected carbon revenue. This might result in a reduction in other taxes or charges that a consumer would normally bear (see above example on fuel tax in BC, Canada).

The chart clearly shows carbon taxation and cap-and-trade competing for the top spot as the most efficient mechanism for delivering the carbon price into the economy and driving lasting emission reductions. Both approaches work, so differentiating them almost comes down to political preference.

Deep decarbonization of the economy to net-zero emissions will require an economy-wide approach, including consumers' behavior and demand for lower carbon products and services. The current levels of embedded carbon price in consumer products and services do not incentivize a demand for lower carbon products from life cycle perspectives. Future carbon pricing mechanisms, be they explicit or implicit, should result in a price differential for end-consumers, accelerating the demand for lower carbon products, compared to more costly, higher carbon alternatives.

Figure 4: A comparison of the four main carbon pricing approaches

	Description	Operation
Cap-and-trade system	The desired environmental outcome, expressed as a cap for the sectors covered by the system, is translated into allowances. The only obligation on an emitter operating within the system is to surrender one allowance for each ton of CO_2 emitted. Allowances are introduced into the economy by the government, with the total number created being limited to the desired outcome. The allowances are transferable through trade and have a value – the carbon price.	It delivers a specific environmental outcome through the overall cap; in theory at the lowest overall cost to the economy as participants progressively implement projects from left to right across the abatement curve. Allowances are typically auctioned by the government into the market. Early on, as the economy begins adjusting to the carbon pricing mechanism and sometimes to prevent carbon leakage, the government may allocate some allowances for free.
Carbon tax	The government imposes a fixed tax on CO_2 emissions at some point in the economy. This may be at the source of the emissions, or upstream of the actual emissions (e.g. at the point of sale from a coal mine). The level of tax is the carbon price. Like a cap-and-trade system, the carbon tax approach requires measurement, reporting and verification of CO_2 emissions across the sectors covered by the policy.	A tax-based approach is favored by many economists. It is a relatively simple approach to understand and implement, but requires significant analysis with regards to the setting of the tax level to achieve a specific environmental outcome. This can only come from a clear understanding of the abatement opportunities present in the economy.
Baseline and credit approach	The government establishes a baseline emission for each sector, typically on a CO_2/unit of production basis. This is also called an intensity based approach. The participants earn credits by exceeding the baseline, or surrender credits if they fall short. The credits are tradable and can be banked, as in the cap-and- trade approach.	Baseline-and-credit requires accurate benchmarking across different sectors. Because of the trade of credits, benchmarks should also represent an equivalent effort when comparing sectors, i.e. y tons CO_2/t cement equivalent to x tons CO_2/t of steel. If not, sectoral economic distortion results. Importantly, the environmental outcome in terms of absolute emissions is uncertain, as it depends on the level of production. This approach does not generate additional revenues to the government because allowances are not sold.
Project mechanism for crediting purposes	A project is developed and emissions are compared with a baseline, which may represent best available technology or typical practice for a country. For example, if coal is the usual fuel for similar projects, then this would be used to calculate the baseline. If the project emission reductions are better than the baseline, credits are issued. These credits are tradable, and may be bought directly by governments, or used as compliance instruments in cap-and- trade systems.	Like the baseline-and-credit approach, a project mechanism requires a high level of oversight, including baseline determination and measurement, reporting and verification. The mechanism typically requires an assessment panel of some description, such as the Executive Board of the CDM. This may introduce a level of subjective decision-making into the process. As an opportunity mechanism, rather than an imposed mechanism, the price signal is not transmitted through the economy particularly well.

Examples	Characteristics
• Power and industry sectors in the EU • Power sector in the US north-east states. • New Zealand economy, but in stages • California Cap-and-Trade Program • Korean ETS	• It assures achieving emissions reduction targets • Incentivizes efficiency • Can generate revenue for government when emissions allowances are auctioned • Generates government revenue that can be affected to mitigate carbon price impacts • Compliance strategy flexibility • Promise of lowest overall costs • Uncertainty in the price signal • Challenges in terms of carbon leakage • Does not encourage reductions beyond the emissions target • Complex new mechanism needs to be established and maintained
• Fuel tax in British Columbia • Oil and gas tax in Norwegian offshore facilities	• Certainty and stability in the price signal • Emission reductions encouraged up to costs equaling the tax level, not up to a volumetric target • Generates government revenue that can be affected to mitigate carbon price impacts • Predictable costs • Could be built into existing tax code • Uncertainty on the amount of achieved emission reductions (difficult to link to volumetric targets) • Challenges in terms of carbon leakage
• The Alberta Specified Gas Emitters Regulation • The Low Carbon Fuel Standard in California incorporates aspects of baseline-and-credit	• It encourages efficient sectorial behaviors • Less competitiveness concerns for internationally exposed energy intensity industries • Uncertainty in achieving targets for emission reductions, due to the lack of an absolute fixed limit on emissions • Administrative costs under a base line and credit scheme are likely to be higher • Higher complexity (setting baseline reference and verification of emissions intensity) • Consumers do not face any incentive to reduce their demand for emissions intensive goods • Revenue generation through the sale of credits falls back on compliant companies
• The Clean Development Mechanism • Various voluntary carbon reduction schemes use project mechanisms for offsets • REDD+ payments for better management of forests in some countries, (e.g. Indonesia, Ghana)	• Compatibility with previous approaches • Encourages technology transfer • Needs sound demonstration on emissions reductions additionality and environmental integrity • Robust schemes can have high transactions costs

3. Key design considerations

1. Competitiveness

Industrial competitiveness is one of the core national policies in every country; hence, various measures must be taken to minimize the impact of the cost of carbon on domestic industries' competitiveness. A series of ex-post analysis indicates no clear evidence of carbon leakage of energy-intensive industries in EU region[7]. The analysis suggests that many other factors, including energy cost, product differentiation and the margin of products, affect shorter-term market shares.

In the longer term, however, relocating production to a lower or no carbon price region is preferred unless there is policy support for new investment in the energy-intensive manufacturing industry[8].
Approaches taken or proposed in various jurisdictions to counter shorter and longer-term carbon leakage include;

- Distribution of free allowances based on benchmarking of performance
- Tax exemption or tax rebates based on benchmarking
- Border tax adjustments of imports

2. Social impacts and revenue use

Many carbon pricing policies raise revenue – for instance via the auction of allowances or the taxation of carbon emissions. The issues that the revenue collection raises are: what to do with it, how those that pay it are affected and what they get in return. Government already has a long-established process for making these choices. Revenue collection is targeted across certain parts of society, money flows into the national treasury and spending and social welfare provisions are set through the annual budget. Carbon-based revenue has challenged this model. Collection might come from those less able to pay, and many have argued that the money should be used for specific purposes designed to encourage the transition to a near-zero emissions economy. But it is good fiscal practice that revenue collection and spending are two distinct and separate processes. This distinction is also true for large companies, where capital investment on new projects is aligned with future strategy and not decided by the business unit within the company that happened to generate the most cash in a given year. Technology development must be part of the policy approach required for the energy transition, and therefore, the government should support energy technology research. In fact, supporting research is an essential element of good climate policy and will mean an increase in government spending.

But collecting carbon revenue and the fiscal needs of technology support en route to a much lower emission state may not follow the same trajectory. In the early years of a low-carbon transition, government expenditure on RD&D and direct support to encourage nascent low-carbon technologies may require very significant funding, particularly for large-scale demonstration. Problematically, at this stage of price implementation the revenue may be quite low as the government chooses to introduce a new carbon emissions tax at a modest level or to give the bulk of cap-and-trade system allowances away for free to address competitiveness concerns and encourage interest and support by industry groups.

By contrast, looking ahead, carbon revenue may be sizeable and more than the transitional needs of new technologies. In this case, forcing the use of a large revenue stream on specific energy system objectives may become a market distortion. After all, it is the job of the underlying mechanism (e.g., carbon tax, cap-and-trade, energy pricing) and the market it creates to drive deployment. This then means that the bulk of the money should flow into general revenue, although the government must not bypass the need to support technology development. Consumers will be out-of-pocket because of the implementation of the pricing mechanism and will look to government for compensation. In the shorter term, higher carbon prices could lead to a rise in the cost of living, such as heating and lighting of houses, transport and food. The policy design of carbon pricing mechanisms should include compensating measures for low income households to prevent economic disparity[9]. With additional revenue from the carbon price now in national accounts, the government can potentially offer compensation for the price increases by lowering taxes. This situation has given rise to the concept of the revenue-neutral carbon tax that has become more common in North America.

Another major call on the revenue comes from those who contributed significantly to it – the industrial emitters. Carbon leakage remains a live issue with only partial (but in any case, non-harmonized) implementation of carbon pricing around the world. Free allocation of allowances or taxation rebates can address carbon leakage, absorbing a proportion of the revenue raised. While the above design considerations are common in developed economies, a parallel can be drawn for developing economies whereby the revenue would be created from a reduction in fossil fuel subsidies rather than an introduction of a carbon price.

[9] Dana Krechowicz (2011), The Effect of Carbon Pricing on Low-Income Households, and Its Potential Contribution to Poverty Reduction.
[7] Andrei Marcu, Christian Egenhofer, Susanna Roth and Wijnand Stoefs (2013). Carbon Leakage: An overview, CEPS Special Report, 79.
[8] Grzegorz Peszko (2015), Carbon pricing, Competitiveness and Carbon Leakage: Theory, Evidence and Policy Design, World Bank.

3. Offsets and carbon pricing

Over the past twenty years, largely triggered by the development of the Clean Development Mechanism (CDM) under the Kyoto Protocol, emission reduction projects that take place outside the coverage of the immediate carbon pricing mechanism have played an important role. These are broadly known as offsets, and are used to reduce the exposure to local carbon pricing by an entity that is subject to such a system. An external project is used to produce emission reduction certificates which are then surrendered within the jurisdiction of the carbon pricing mechanism, either to lessen the tax burden or to reduce the need to procure allowances in a trading system.

For the most part, offsets have been used in trading systems, but some carbon tax proposals have included an offset provision (e.g. South Africa, Colombia).

The offset industry has grown significantly over time and now includes voluntary measures to reduce personal carbon emissions, nature based solutions and medium to large scale alternative energy projects in developing countries. But criticism that reductions may not be real, that double counting has occurred or that rent seeking through price arbitrage is taking place means that they're not utilized to their full potential. This has led some policy makers to question the use of offset mechanisms.

Offsets have an important role to play in carbon price and policy risk mitigation. As the Paris Agreement takes hold globally, the accounting rules built into Article 6 should offer new confidence in offset use. These rules will ensure that environmental integrity around the national contributions of both parties involved in an offset transaction is maintained. Further, as national contributions expand to cover all greenhouse gases globally, the risk of mitigation leakage from offset transactions will be minimized.

4. Interplay with other policies and implied carbon costs

Both direct and indirect (explicit and implicit) carbon prices must be carefully considered in designing a national carbon pricing mechanism. Often, implicit carbon prices are much higher than explicit carbon prices[10], resulting in attenuated influence of explicit carbon prices. This is illustrated in the following example[11]. Future trading period targets (T_{P1} and T_{P2}) within an Emissions Trading System (ETS) and the mitigation actions required to deliver them can be described for illustrative purposes using an abatement curve.

That abatement curve will comprise a series of actions and technologies, ordered in terms of cost of implementation. Mature technologies ready to deploy would move first and might include some efficiency projects, fuel switching from coal to natural gas, onshore wind and some solar PV, with the latter depending on the region. The marginal cost of abatement set against the required goal establishes the price as shown in the diagram.

10 Claudio Marcantonini and A. Denny Ellerman (2014). The Implicit Carbon Price of Renewable Energy Incentives in Germany, EUI Working Papers.
11 The types of actions and technologies shown in the figure are broadly illustrative. Note for instance that not all energy-efficiency projects will have negative abatement costs.

As the abatement curve is traversed, mitigation actions will grow to include the first negative emissions technologies projects (e.g. carbon capture, utilization and storage [CCUS]), more advanced renewable energy technologies and then more challenging CCUS applications.

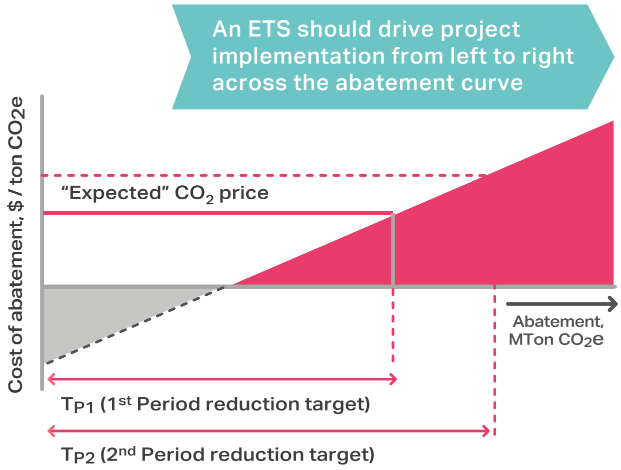
But if a policy intervention forces the order of implementation to change, the carbon price will be impacted, as will the overall cost to society of mitigation.

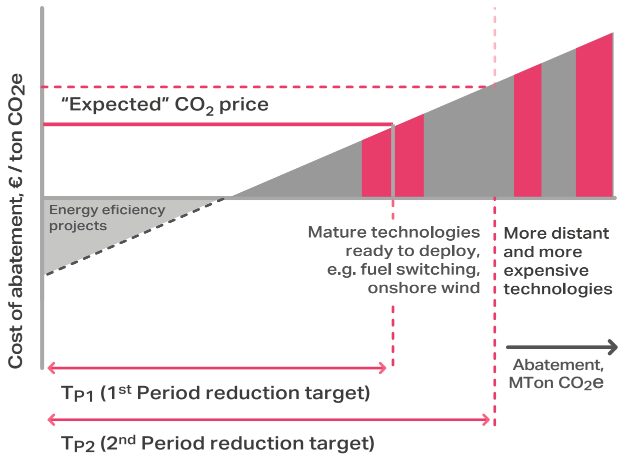
The challenges of policy interaction with carbon price are revealed in the context of EU ETS. An interesting example is provided by the European Commission impact assessment for the Energy Efficiency Directive[12]. It shows a 35% decrease in the carbon price in 2030, from €42/t to €27/t, in response to a strengthened energy efficiency goal (an increase from 27% to 30%).

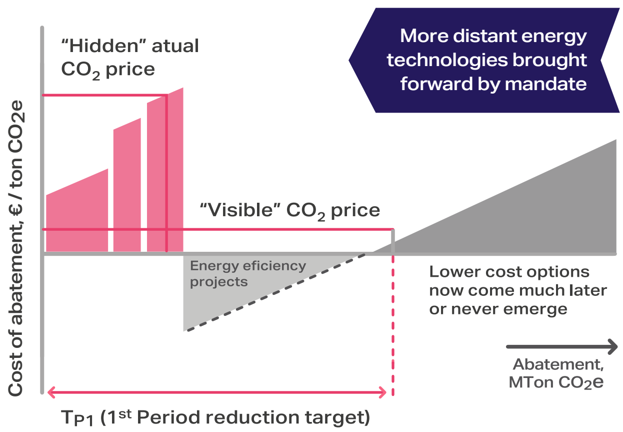
For example, in recent years under the EU ETS, some experiences in the field of renewable energy policy have led to deployment of renewable energy projects irrespective of their position on the abatement curve. As the mitigation targets remain the same, the move reorders the abatement curve as shown. Another example is fossil fuel subsidies that alter the competitiveness of low-carbon technologies. As higher abatement cost projects are shifted left, less costly projects shift to the right and the visible carbon price falls. That price now reflects the remaining abatement job for the ETS to do, rather than the overall abatement for the whole sector.

The overall cost of abatement will rise as a result if projects not originally in scope are brought ahead of less costly opportunities. In addition to implicit cost of carbon from overlapping climate policies, indirect cost of carbon from effective energy tax should be reviewed and reconsidered in designing a national carbon pricing mechanism. Energy taxes differ strongly across countries, ranging from positive to negative, and are many times not well aligned with curbing GHG emissions[13].

Figure 5: Interplay between CO2 price and other policies







[12] Impact assessment accompanying the document Proposal for a Directive of the European Parliament and of the Council amending Directive 2012/27EU on Energy Efficiency. European Commission, November 2016.

[13] OECD (2015), Taxing Energy Use 2015 - OECD and Selected Partner Economies.

4. Future directions

1. Building a global trading structure

While a carbon price is regarded as one of the most efficient means of driving change, it requires widespread use to be effective.

Local implementation of a carbon price skews local economics, which is manageable in the short to medium-term as other locations implement similar pricing. But, over the long-term should others not take similar action, the economy will efficiently regroup around the local distortion. All other factors being equal, activities that are penalized through the action of the carbon price will progressively shift to areas where the penalty doesn't exist. This could be countered through the implementation of carbon-based border adjustments on imports, but that may introduce further complexity. Hence, there is a need for large economies to act in concert to avoid market distortions.

While it is unrealistic to expect a carbon price to emerge globally through the action of a single policy framework such as the Paris Agreement, over time that price must embed itself within the global economy to function effectively.

Arguably, this embedding should be the single objective of a global approach to managing carbon dioxide emissions. A focus of the Paris Agreement is on setting nationally determined contributions (NDCs) of increasing ambition in five-year cycles. This sends a long-term economic signal but does not go so far as to define the role of carbon pricing.

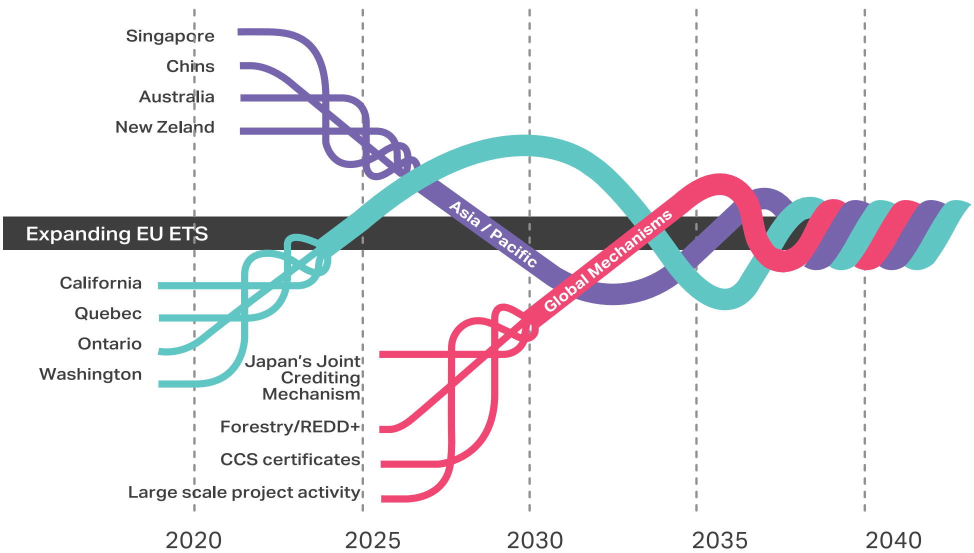
This was attempted through the trading mechanisms of the Kyoto Protocol, but its reach was never broad enough. Nevertheless, a legacy has remained and emerged in the form of Article 6 of the Paris Agreement even though the article does not include the word market.

Article 6 introduces the prospect of carbon unit trading through its internationally transferred mitigation outcomes (ITMO) and emissions mitigation mechanism. Trading fosters price discovery, competition to provide the lowest cost goods and services and cross-border investment. The combination of these applied on a widespread basis to carbon emissions mitigation can lead to the development of a global carbon market, comprised of links between emission trading systems and transfer of carbon units.

The Paris Agreement is built on a foundation of NDCs, a structure that applies to all participants. Any transfer that may take place between Parties to the Agreement is subject to the double counting provisions of the Paris Agreement, which clearly state that such activities cannot be used to demonstrate achievement of the host Party's NDC if used by another Party to demonstrate achievement of its NDC. This means that if a trade is enacted, the selling Party must maintain the integrity of its emission reduction pathway, meaning that an equivalent but lower cost reduction must be found domestically to balance the sale. The simplest way to achieve such an outcome is to apply more widespread carbon pricing throughout the economy based on some form of emission allowance or credit.

Grouping of regional carbon markets into so-called "carbon clubs" is seen by many observers as the quickest and most effective route to an eventual global market. This is illustrated in concept below. While regional and eventually global markets can be seen as an important end-point, it is clear that the first and most urgent step is for an increasing number of individual jurisdictions to implement carbon pricing mechanisms.

Figure 6: Conceptual view of the evolution towards a global carbon market



[14] Andrei Marcu (2016), Carbon Market Provisions in the Paris Agreement (Article 6), CEPS Special Report No. 128.
[15] Illustration provided by Royal Dutch Shell

5. **Conclusions** – Why is pricing the preferred instrument of choice for addressing carbon emissions?

Economists have argued the case for over two decades, and now the business community overwhelmingly supports government efforts to put a price on carbon.

We recognize that policymakers may struggle with the choice of the most suitable instrument as well as key design principles for local circumstances. This document aims to stimulate further and more detailed discussions between policymakers and business leaders on how best to implement the carbon price so that it can incentivize low-carbon innovation and investment, create a global level playing field and support the attainment of the UNFCCC 2°C goal in a sustainable way.

While we believe the time for debating the need for carbon pricing is over, it is time for the business community to reiterate the case for policies that place a direct cost on carbon dioxide emissions. Based on company experience and the discussions outlined above, there are five key reasons for policymakers to adopt carbon pricing:

The lowest-cost pathway

- A carbon price steers the economy towards the lowest-cost pathway for reducing emissions, which also minimizes the burden on industry and people in society
- Action on climate in some form or other is an inconvenient but unavoidable inevitability. Direct standards-based regulation can be difficult to deal with, offer limited flexibility for compliance and may be very costly to implement. The business community is ideally placed to respond to a market price; it does it all the time.

Technology neutrality

- A carbon price offers technology neutrality. Business and industry are free to choose a path forward in response to the carbon price rather than being forced down a prescribed route or having market share removed by decree.

Flexibility

- A direct cost for emitting carbon dioxide, either through taxation or a cap-and-trade system, offers broad compliance flexibility and provides the option for facilities to avoid the need for immediate capital investment while still complying with the requirement.
- Pricing systems offer the government flexibility to address issues such as cross border competition and carbon leakage (e.g., tax rebates or free allocation of allowances). The EU has a proven track record, with trade-exposed industries receiving a large proportion of their allocation for free.

Transparency and even burden-sharing

- A cost for emissions is transparent and can be passed through the supply chain, either up to the resource holder or down to the end user.
- A well-implemented system to deliver a cost for emitting carbon dioxide ensures even economic distribution of the mitigation burden across the economy.
- This is important and often forgotten. Regulatory approaches are typically opaque when it comes to the cost of implementation, so that the burden on a sector may be far greater than initially recognized. A carbon-trading system avoids such distortions by allowing a sector to buy allowances instead of taking expensive mitigation actions.

Long-term signals encouraging development

- A cost associated with emissions of carbon dioxide encourages fuel switching in the power sector, initially from coal to natural gas, but then to critical alternatives such as wind, solar and nuclear.
- A carbon price encourages the development of technologies such as biological and geological sequestration, a societal must-have over the longer term to achieve net-zero emissions.

Business looks forward to dialogue with policymakers to find the most suitable and expedient path to establishing carbon pricing and steps towards a global carbon market.

Acknowledgements

About WBCSD

The World Business Council for Sustainable Development (WBCSD) is a global, CEO-led organization of over 200 leading businesses and partners working together to accelerate the transition to a sustainable world. WBCSD helps its member companies become more successful and sustainable by focusing on the maximum positive impact for shareholders, the environment and societies.

WBCSD member companies come from all business sectors and all major economies, representing combined revenues of more than $ USD 8.5 trillion and 19 million employees. The WBCSD global network of almost 70 national business councils gives members unparalleled reach across the globe. WBCSD is uniquely positioned to work with member companies along and across value chains to deliver impactful business solutions to the most challenging sustainability issues.

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