



International Carbon  
Action Partnership



## **Emissions trading and the role of a long-run carbon price signal**

Achieving Cost-effective Emission Reductions under an Emissions Trading  
System

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## Summary for Policymakers

Emissions trading is now a well-established tool for reducing greenhouse gas (GHG) emissions in an effort to mitigate the impacts of global climate change. By the end of 2017, Emissions Trading Systems (ETSs) will regulate more than seven billion tons of CO<sub>2</sub>e, with 19 systems operating worldwide. This paper is concerned with market or regulatory imperfections that could disrupt the dynamic cost effectiveness, i.e. achieving reductions at least cost over time, of an ETS and examines options for how these imperfections may be addressed.

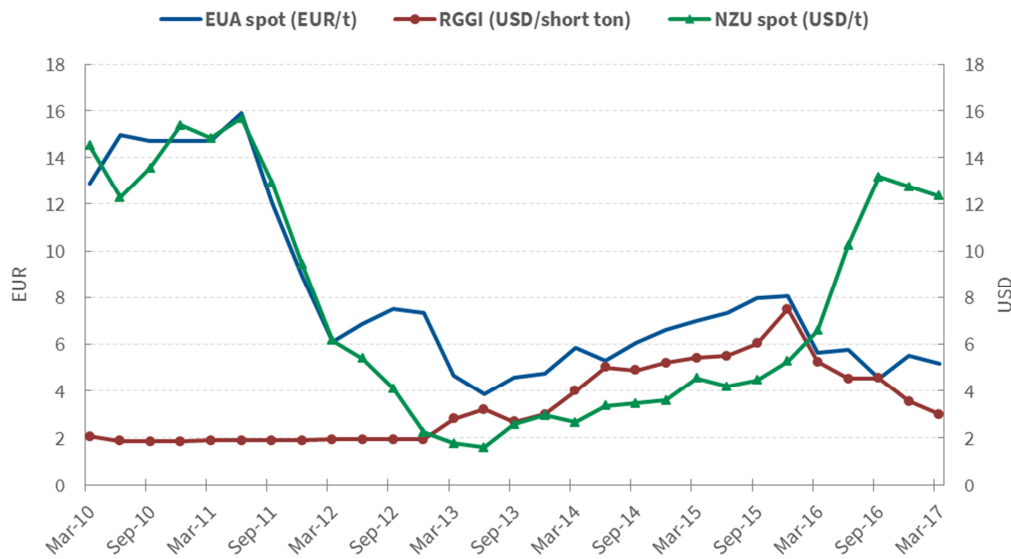
### **Objectives of an ETS and the role of the allowance price**

The economic rationale for applying an ETS to achieve emission reduction targets is well established. By allowing flexibility over where emission reductions take place, least cost options are taken up broadly across the economy. By providing flexibility as to when emission reductions take place, firms can make choices about the timing of investments -- whether to abate now, or to compensate another firm to abate now while delaying abatement at their own facilities to a later point in time. Importantly, an ETS allows market participants to form expectations about future carbon prices, connecting today's investment decisions with expected future carbon prices and abatement costs.

In theory, an ETS achieves cost effectiveness for any chosen reduction target. Crucially, this depends on classical economic assumptions -- that decision-makers are rational and operate with perfect foresight, that information about prices and costs is complete, and that the program has unlimited banking and borrowing. The economic mechanism behind this is that marginal abatement costs, the costs for an additional unit of emissions avoided, converge across the covered entities as the market discovers the cheapest possible options for the respective reduction target. The same mechanism works across time as discounted marginal abatement costs converge for future time-points. Under such conditions, a clear allowance price emerges. It represents the intertemporal marginal cost of abatement. The resulting price over time (which increases at the social discount rate) is referred to as the dynamic cost-effective abatement pathway.

### **What might preclude an ETS from achieving cost dynamic effectiveness?**

Shocks such as economic crises, technological developments, or complementary policies, for instance promoting energy efficiency or renewable energies, can decrease demand for allowances, resulting in lower allowance prices. Low prices, below levels anticipated in the initial program design, have been common in some emissions markets, leading newer ETSs to directly protect themselves against price drops with a reserve price at auction or other minimum price controls (See Figure E.S. 1).



**Figure E.S.1: Allowance price development in three longest established ETSs**

Low prices resulting from exogenous shocks would not be a concern under a static perspective, which considers an ETS effective as long as the annual caps are met. However, low prices are problematic when they are the result of market or regulatory imperfections that depress the allowance price. Moreover, when depressed allowance prices are the result of ancillary policies promoting specific technologies under the sources covered by the cap, they erode the additionality of those policies, undermining cost-effectiveness even further. When today's allowance price signal is out of line with long-term objectives, investment decisions are made with disregard for long-term carbon budgets. As a consequence, economies might lock into carbon-intensive infrastructure whose emissions have to be abated at higher costs in the future. Furthermore, lower prices today may slow down innovation and technological learning, making future emission reductions more costly.

However, it is difficult to ascertain whether low prices are associated with external demand shocks, or with inherent market and regulatory imperfections. Making such a distinction is important, as the associated policy response may differ depending on the cause of the low price. More empirical research is needed across different allowance markets to assess the presence and magnitude of market and regulatory imperfections.

The paper starts out by introducing a conceptual framework to assess the dynamic cost-effectiveness of an ETS. This framework is then applied to assess three potential market and regulatory distortions that might hamper intertemporal performance, providing evidence where available. These effects are not mutually exclusive and may interact when multiple market and regulatory imperfections are present.

**1) Myopia:** Myopia is present when participants display a limited time horizon. Kollenberg and Taschini (2015) argue that if participants have insufficient regard for long-term strategies then the allowance price will not be determined by the overall carbon budget,

but rather by short-term conditions. In other words, the unwillingness or inability of market participants to consider the long term leads to allowance prices that disregard expected future costs of compliance. When allowances are relatively abundant in the present compared to the future (depending on the cap trajectory) myopia will induce prices that are too low to be dynamically cost-effective. The extent to which market participants are myopic is difficult to assess, due to a lack of conclusive empirical evidence.

**2) Excessive discounting:** An ETS achieves dynamic cost-effectiveness when the market values future allowances with a discount rate which would be considered socially optimal. Excessive discounting denotes behavior where market participants value future allowances far less than a social planner would. This might be the case because participants are institutionally limited to hold emission allowances beyond those needed for immediate hedging or because risk averse market participants factor in future potential regulatory interventions which may depress allowance price trajectories.

**3) Regulatory uncertainty and political commitment:** A high extent of regulatory uncertainty surrounding an ETS is likely to encourage participants to focus on the short-term or alternatively increase the risk premium, the expected additional benefit for carrying risk, required to bank surplus allowances. Lessons from real options theory (Dixit and Pindyck, 1994) suggest that investors may be better off waiting for additional information on the stringency and design of future climate policy than making costly irreversible investments into low carbon technologies (Blyth et al., 2007; Fuss et al., 2007).

Related, there is evidence that doubts surrounding a system's long-term viability or stringency can dampen prices or invoke speculative behaviour. In a market that is dominated by such dynamics, assuming increasing marginal abatement costs,<sup>1</sup> delayed abatement would result in steeply rising future prices if original (stringent) allowance caps are to be met. Such drastic price increases would put significant pressure on policy makers to intervene either to relax the cap or implement alternative reforms in order to avoid the related societal costs. Such dynamics feed already existing regulatory uncertainty surrounding future targets and might intensify market participants' focus on the short term.

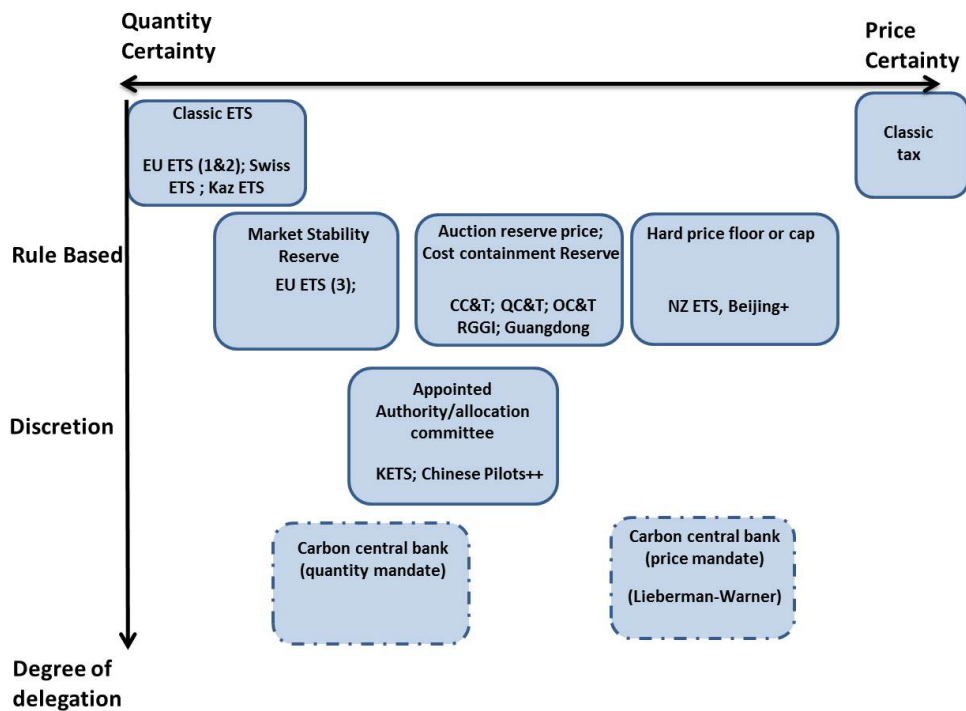
### **Addressing market imperfections: tools to adjust the allowance market**

At least partially in response to these market and regulatory imperfections, of the 18 ETSs operating today, most systems include some mechanism to adjust the allowance market. The theoretical set of options can be mapped in a two-dimensional ETS governance space. The horizontal dimension represents the extent to which the chosen tool to adjust the market targets allowance quantities or prices. At one end of the spectrum is a pure ETS where prices have no limits and the quantity of allowances is fixed. At the other end is a carbon tax. In between are many different hybrid options – for example, ETSs containing

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<sup>1</sup> Marginal abatement costs are generally expected to increase over time as low cost options are exhausted first, leaving more expensive abatement options for later. This however might not be the case if technological progress reduces future abatement costs below current costs.

price floors, corridors, or cost containment reserves. The vertical dimension refers to the institutional arrangements for adjusting the market and the extent to which governance for the ETS has been delegated away from the government. In a textbook ETS, there is no delegation of governance: the government (legislative or executive, depending on the jurisdiction and the nature of the change) implements changes directly. However, the market could also be adjusted in part automatically via a rule-based mechanism or by an independent body.



Note: a box with a solid line denotes a governance model that has been implemented. A box with a dashed line represents one that has been proposed. + As the government is not required to maintain the price floor, this is not a strict hard price floor. ++The regional ETS in China are pilots with the main aim of testing options for the national system. As a result, they operate with more flexibility and less formal procedures. Details regarding the operation of delegated authorities are sparse.

**Figure E.S.2: ETS Governance Space – an empirical mapping of tools to adjust the allowance market, based on Grosjean et al (2014).**

Price instruments explicitly maintain allowances prices within a pre-determined range. Prices are supported either via a reserve price at auction (RGGI, California, Québec, Ontario) or through a hard price floor where the regulator intervenes in the secondary market to support prices (Beijing). High prices are restricted either via a cost containment reserve (RGGI, California, Québec, and Ontario), which releases a limited number of additional allowances from a reserve to the market when certain trigger prices are reached or through a hard price cap where the government guarantees to defend the upper price level by releasing an unlimited number of allowances or charging a fixed fee for emissions at a set price (New Zealand (NZ) ETS).

If credible, price control measures can guide price expectations of market participants and to some extent prevent the distortions resulting from myopia and excessive discounting. Experience with different systems indicates that a price floor may also be set at a level below what is required to induce abatement. However, this still results in a guaranteed abatement “fee” that raises revenues and, at the same time, reinforces government commitment to the longevity of the system until prices rise or further adjustment are made.

Somewhat less directly, quantity control measures automatically add or subtract allowances from the market according to predefined triggers based on the quantity of allowances in circulation in order to indirectly affect price formation. A Market Stability Reserve (MSR) will be implemented in the EU ETS in 2019. As with other market interventions, the levels at which the triggers are set is important. If quantity thresholds are set too low, prices may be bid up beyond what is cost-effective. Conversely, if the thresholds are set too high, they will likely be ineffective (not correcting for myopia and excessive discounting).

Some jurisdictions have delegated control of the allowance market to an independent authority or executive committee (Korea ETS, some Chinese pilots). The relative independence of such a body is meant to shield it from political pressure and should enable it to build a reputation for announcing and enacting its policy on the basis of a clear and transparent framework.

Finally, as alternative to the direct management of the allowance market, Ismer and Neuhoff (2006), Helm et al. (2005), and Pizer (2011) have pointed to the potential of selling government backed guarantees of future carbon prices as a means to restore long-term investor confidence and set a de facto minimum price.

### **Enhancing political commitment - embed the ETS in a long-term policy framework**

Providing certainty over the long-term carbon budget through the trajectory of the allowance cap can reduce regulatory uncertainty, therefore providing a more credible signal for investments in low carbon technologies and infrastructure. At the same time, pre-defined periods (or phases as in the EU ETS) in a trading program can provide a structured and transparent timeline for reviews and interventions, which provide flexibility for policymakers to respond to shocks while still maintaining confidence in the market and maintaining long-term mitigation goals. Hence, the cap setting process including the cap period, the relationship of the cap with long-term climate targets of a jurisdiction, and the institutional setting for changing the cap are key elements through which policymakers can balance the commitment-flexibility trade-off.

### **Building constituencies in support of the ETS**

The introduction of an allowance price will shift consumption and production decisions, making new low carbon products more competitive and carbon-intensive products less so. Similarly, the growth of the green economy will create new interest groups, such as renewable energy or forestry lobbies, that benefit from, and therefore support, ambitious



climate policies. Yet it will also mobilize powerful and organized interest groups that aim to maintain the status quo and keep their assets from becoming stranded.

Understanding and engaging with key stakeholders will be crucial for building lasting support, which in turn will reduce regulatory uncertainty. Following an inclusive, open, and transparent design process and maintaining communication during the operation of the system can help to manage stakeholder concerns and may even create private sector groups with an interest in the longevity of the system. For example, the New Zealand administration applied an inclusive approach by engaging experts and policymakers at an early stage in an interdepartmental working group. At best, extending cross-partisan cooperation on climate policy would help ensure that the policy survives electoral cycles unscathed.

Developing national Long Term Low Emission Development Strategies (LEDS), as stipulated under the Paris Agreement, might also provide important opportunities for building stakeholder consensus surrounding long-term mitigation strategies. Working with industry to determine the technical feasibility and cost of abatement options can foster collective ownership of long-term reduction goals as well as reveal information surrounding abatement costs. For example, by providing independent experts a role in long-term planning and allowing broad consultation, the United Kingdom Climate Change Committee is considered critical to improving consensus and public acceptance of UK climate policy.

Policymakers can also redistribute climate rents in a way that builds long-term support to compensate sectors exposed to emissions-intensive trade or adversely affected groups, to compensate consumers, to achieve tax swaps, to reinvest in low carbon research and development, or to deploy green technologies.

Finally, the political acceptability of an ETS will also depend on how co-benefits for public health, energy security, job creation, and natural resource protection are accounted for and communicated. One strategy to make clear the co-benefits from emission reductions is the very active display of benefits of revenue spending, as implemented by RGGI. Evidence from RGGI suggests that from 2009-2013, the reduction in hazardous pollutants in RGGI states has led to an estimated USD 10.4 billion in health savings from avoided illness, hospital visits, lost work days, and premature deaths.

## **Conclusion**

A framework for understanding dynamic cost-effectiveness of allowance markets has been introduced and applied to show that myopia, excessive discounting, and a lack of political commitment might result in allowance prices that are too low in the short term and too high in the long-run, compared to a dynamically cost-effective price path. It is plausible that these market imperfections are present in operating ETSs. However, their impact on the allowance price is an empirical question for which little evidence exists. Indeed, overlapping ancillary policies, political lobbying and generous allowance supply in early phases of the ETS, as well as innovation and technological development that drives down the marginal cost of abatement, might also impact allowance price formation.

Policy makers in existing ETSs are applying a suite of approaches to reduce uncertainty and enable firms to better make investments that take full account of their carbon costs. For example, tools to adjust the allowance markets are now seen as good practice for an ETS. However, regardless of the approach taken, for market adjustment tools to function properly, they must also be embedded within a credible long-term policy architecture that reduces uncertainty for participants.

This paper explored a number of ways in which this might be done. First, stronger commitment to longer-term targets – for instance, by embedding them in legislation – will reduce uncertainty and improve the conditions for low carbon investment. Establishing long-term decarbonisation plans as prescribed in the Paris Agreement and aligning review cycles to the required ratcheting up of ambition might also bring further credibility to long-term targets. Finally, the distribution of “climate rents,” stakeholder engagement, and making co-benefits visible can assist in building constituencies that support ambitious climate policy, making it difficult to renege on future commitments.

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