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Financing Solutions for Sustainable Development

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Carbon Markets

Regulate and establish carbon markets

Carbon markets aim to reduce greenhouse gas (GHG, or “carbon”) emissions cost-effectively by setting limits on emissions and enabling the trading of emission units, which are instruments representing emission reductions. Trading enables entities that can reduce emissions at lower cost to be paid to do so by higher-cost emitters, thus lowering the economic cost of reducing emissions.

Key words: Climate change, greenhouse gases; GHGs; carbon pricing: carbon tax; market mechanism; carbon markets; cap and trade; emissions trading system; ETS; covered entities; emission units, allowances, offsets; reporting period; banking; safeguard; polluter pays; externalities

How does it work?

By putting a price on carbon emissions, carbon market mechanisms, as well as other carbon pricing mechanisms such as carbon taxes, help to internalize the environmental and social costs of carbon pollution, encouraging investors and consumers to choose lower-carbon paths. There are two main categories of carbon markets: [Emissions Trading Systems](#) (ETSs) and a new voluntary scheme defined in the [Paris Agreement, article 6.2](#). In the latter, voluntary cooperation in the implementation of the countries' [Nationally Determined Contributions](#) (NDCs) allows for more ambitious mitigation actions. Countries will be able to use [Internationally Transferred Mitigation Outcomes](#) (ITMOs) towards their [NDCs](#) on a voluntary basis. This entry will focus on the working modalities and establishment of [ETSs](#).

An [ETS](#), also known as a cap-and-trade mechanism, sets a mandatory limit or cap on [GHG emissions](#) on a predefined set of emission sources. Tradable allowances (tradable emissions permits issued, representing the right to generate a metric tonne of carbon dioxide equivalent (CO₂e)), are allocated to the emitters covered under the cap. At the end of a specified reporting period, the covered entities must surrender allowances equivalent to the [GHG emissions](#) they produced during the period. Entities whose emissions exceed their allocations may purchase excess allowances or other eligible instruments to fill the gap, or pay a fine. Caps can be tightened over time to promote further emission reductions. [ETSs](#) exist at regional, national and sub-national levels:

- The [European Union \(EU\) ETS](#) encompasses all EU and three EEA-EFTA (Iceland, Liechtenstein and Norway) countries. It is the largest [ETS](#) for GHGs, covering 2 GtCO₂e of emissions;
- Apart from the EU, four countries have enacted national-level GHG [ETSs](#): [New Zealand](#); [Switzerland](#) (2008); [Kazakhstan](#) (2014) and the [Republic of Korea](#) (2015);
- A number of other countries have announced plans for a national [ETS](#): China has announced that it will launch one in 2017; Thailand, Turkey and Ukraine are exploring design options for an [ETS](#); and 13 other countries are exploring carbon pricing mechanisms (see [Partnership for Market Readiness](#));
- Subnational [ETSs](#) exist in Canada (e.g. Quebec), China (e.g. Guangdong) and the USA (e.g. California).

In an [ETS](#), [tradable allowances](#) are issued to covered entities (i.e. an entity required to comply with the emissions cap) that are required to comply with emission limits. Though the concept is relatively simple, establishing an [ETS](#) requires substantial preparation, including the following steps:

- Establishing a governing authority or other administrative body as a central secretariat for implementing and operating the mechanism, and enacting legislation and regulations mandating participation by covered entities, empowering the governing authority, and specifying the programme rules, including monitoring, reporting and verification (MRV) requirements.
- Implementing a credible [GHG reporting system](#), with detailed methodologies for quantifying and reporting emissions. Legally-mandated emissions reporting programmes are fundamental to the functioning of an [ETS](#). Reporting is mandatory for covered entities (under the legal/regulatory framework noted above) and requires them to report their emissions at specified intervals.
- Benchmarking, or determining baseline emissions, based on an *ex ante* [GHG emissions inventory](#) of the covered entities in accordance with MRV rules.
- Defining the scope and applicability of the [ETS](#) and, notably, which gases, sectors, geographic areas and types of entities will be bound by the mandatory emissions limits under the cap. [ETSs](#) generally cover large,

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industrial emitters, particularly large-scale fossil-fuel thermal facilities, given the level of administrative cost. Some programmes have expanded their scope over time:



Related SDG



Related Sector



- o The EU-ETS initially covered CO₂ emissions from a subset of EU emitters—power plants, specified industrial sectors and combustion facilities with a thermal input of greater than 20 MW. As of 2013, nitrous oxide (N₂O) from the production of nitric and other acids and PFCs from the production of aluminium were added;
- o The [Regional Greenhouse Gas Initiative](#) (RGGI) covers CO₂ emissions from fossil-fuel-powered generators with a capacity of 25 MW or greater in nine north-eastern US states;
- o The scope of China's seven provincial pilot programmes varies somewhat: all seven cover power and chemical facilities; most cover iron/steel and cement; coverage of other sectors (e.g. paper, textile, and non-ferrous metal production) varies by [ETS](#);
- o China's national [ETS](#) will cover key industrial sectors such as iron and steel, power generation, chemicals, building materials, paper-making, and nonferrous metals;
- o The Republic of Korea's [ETS](#) covers 23 subsectors, including power generation, steel, cement, petro-chemicals, refineries, buildings, waste and aviation;
- o California's and Québec's [ETSs](#) recently expanded their [GHG emissions](#) coverage to transportation fuels, increasing the proportion of [GHG emissions](#) covered from 35 per cent to 85 per cent.
- Specifying the length of each reporting period, and whether banking or borrowing of allowances from one year or period to another is allowed. Reporting periods can be as short as a year (RGGI) but are typically longer to offer covered entities some flexibility in compliance. The EU [ETS](#) established a three-year pilot trading period (2005-07) and five-year subsequent trading periods; the second period (2008-12) was chosen to align with the first commitment period of the Kyoto Protocol, with which it was linked. The EU-ETS effectively allows year-ahead borrowing within a trading period. No banking or borrowing was permitted between the pilot and second trading periods, but inter-period banking is allowed from the second period onward. The rationale for this decision was that, given that the pilot-phase caps were loose (as this phase focused on building [ETS](#) infrastructure and emissions data) and hence there were surplus emissions, allowing the use of pilot-phase allowances would have depressed prices in phase 2. Given tighter caps from phase 2 onward, banking is allowed in order to smooth out prices across trading periods and to facilitate investment planning.
- Determining the level of the cap, how allowances will be allocated (how many permits per entity per crediting period, and whether they will be distributed at no charge or auctioned), whether/how the cap will be tightened over successive periods, and specifying penalties for non-compliance. Typically, in the pilot phase of an [ETS](#), the cap is set close to current emissions, and allowances are distributed for free based on reported baseline emissions. Given that in this situation supply would, by definition, be close to demand, prices in these pilot phases tend to be low. RGGI, for example, initially gave out allowances to covered entities. It started tightening the cap and auctioning allowances. The cap set for 2015-2020 declines by 2.5 per cent per annum, enabling covered entities to plan how they will comply. RGGI charges a penalty for non-compliance of three times the market price. Similarly, the EU [ETS](#) "cap" tightens by at least 1.74 per cent a year in the current phase to restrain 2020 emissions to 21 per cent below their 2005 levels. Each country determines how its EU allowances will be distributed; the [UK, for example](#), has decided to auction at least 50 per cent of its Phase III allowances.
- Specifying "linking" provisions, i.e. whether allowances or offsets from other systems may be used towards compliance. Linking provides flexibility in meeting obligations, helps stabilize prices, and can lower compliance costs.
 - o Under its [Linking Directive](#), the EU [ETS](#) allows covered installations to use eligible [CERs](#) toward compliance, up to specified limits. (Eligible [CERs](#) are limited to those generated by projects that reduce CO₂, e.g. renewables and energy efficiency, and were registered under the [CDM](#) before 2013, unless they are from least developed countries or can be swapped for these. Limits are cumulative across [Phase II and Phase III of the EU ETS](#), and, broadly, allow covered entities to use international credits for up to the greater of 11 per cent of their allocation during the period from 2008 to 2012, or 4.5 per cent of their verified emissions in 2013-20. To date, covered installations have used 1.5 GtCO₂e of [CERs](#) towards compliance.
 - o Switzerland's [ETS](#) allows companies to use international offsets to meet up to 8 per cent of their compliance requirements. EU allowances are tradable and bankable against Swiss allowances; the Swiss and EU are discussing linking their [ETSs](#).
 - o The Republic of Korea's new ETS allows the use of Korean offsets, including Korean [CERs](#), to fulfil up to 10 per cent of compliance obligations.
 - o RGGI allows offsets from certain categories of projects, including energy efficiency, landfill methane, sulphur hexafluoride reduction from power transmission, and CO₂ sequestration from qualifying forest projects.

- o California and Québec linked their Cap and Trade programmes in 2014; Ontario has announced its intention to implement an ETS linked with theirs.
- Establishing other mechanisms to limit price volatility. Predictability of carbon prices is important in making informed investment decisions and in securing financing—but market prices, by definition, fluctuate. Banking of allowances and linking to other carbon markets help to reduce price volatility. In addition, some ETSs have incorporated additional price stabilization mechanisms to improve price predictability:
 - o In response to a growing surplus of EU allowances in the market, the EU ETS is postponing (“back-loading”) the auctioning of 900 million EU allowances from the early years of Phase 3 to the end. It will also implement a “market stability reserve” for Phase 4, using allowances deducted from future auction volumes;
 - o The Korean ETS also provides for an allowance reserve that can be used to relieve price pressure.
 - o The California Cap-and-Trade Program provides a soft floor and soft ceiling for allowance prices.
 - o Fixed penalties for non-compliance set an upper limit on prices. Under the Swiss ETS, the penalty is quite high –SwF125/tCO_{2e}—but sets a firm maximum price.
- Developing an MRV system (related to the initial inventory noted above) as well as processes for registering, trading and tracking allowances;
- Establishing, or engaging the private sector to establish, electronic trading platforms (i.e. exchanges) that enable market participants to execute trades and participate in auctions. For example, the California Cap-and-Trade Program established a market tracking system, the Compliance Instrument Tracking System Service (CITSS) to establish accounts for market participants (of California’s as well as potential linked ETSs) to hold and retire compliance instruments and to conduct transactions with other account holders. The CITSS performs the following services: Registers all entities participating in the California Cap-and-Trade Program; Issues allowances and compliance offsets; Tracks the ownership of compliance instruments; Enables and record compliance instrument transfers; Facilitates emissions compliance; and Supports market oversight.

Once the ETS is in place, the governing authority oversees the issuance of allowances, enforces the established rules, and makes adjustments as needed. Market participants may engage in carbon contracts that stipulate the terms of purchase and sale, including forward purchase (over a period agreed by the parties) and the pricing, for example fixed or floating prices, floor and/or ceiling prices, and derivatives which allow buyers or sellers the option to “put” (sell) or “call” (buy) allowances at a specified exercise price. These contracts further improve price predictability and enable market participants to plan and finance lower-carbon investment better. Emission Reduction Purchase Agreements (ERPAs)- where terms are determined by the parties over are long-term, fixed-price provisions-can be standardized as a means of specifying the terms and conditions for the purchase and sale of emission reductions between a specific buyer and seller.

Stakeholders

- **Regulator:** the Government entity (or entities) mandated by law to regulate and govern the carbon market. Functions include establishing the parameters for the market and its regulation, including defining the scope of the market and the rules for creating and distributing emission units, establishing registries, issuing credits, and setting rules for enforcement, trading, and accrediting certain types of market participants such as auditors. The regulatory role includes: conducting inventories; establishing the cap; allocating allowances; setting and enforcing penalties; and in some cases, establishing linkages with other ETSs and/or offset mechanisms.
- **Covered Entity:** an entity required to comply with the emissions cap.
- **Seller:** a primary or secondary seller of allowances. In the “primary” market, a covered entity whose emissions are lower than its allocation may sell excess allowances. After the initial purchase and sale, “secondary” market participants may buy or sell emission units on the market, subject to established rules. Sellers must demonstrate legal ownership, which they transfer to the buyers.
- **Buyer:** a purchaser of allowances. This can be for compliance, market-making, speculation, or voluntary purposes.
- **Traders / market makers:** entities offering trading platforms for allowances, execution of trades on behalf of buyers and sellers, and/or the purchase or sale of allowances on their own account or on behalf of others.
- **Other stakeholders:** In addition, public and private stakeholders may include government negotiators, government agencies, public and/or private auditors, financial institutions, technology vendors, the community affected by the activities of a covered entity/project, Non-Government Organizations (NGOs) and consultants.

Potential in monetary terms

An ETS can generate revenues for the government through the sale/auctioning of allowances, and for covered entities through the sale of excess allowances. For allowances to have value, however, the cap must be binding (because demand from covered entities is what creates value for allowances). This was demonstrated in the trial phase of the EU ETS, where the cap was set somewhat higher than actual emissions levels (due principally to over-reporting of baseline

emissions). Prices dropped from €30/tCO₂e in early trading to nearly zero by mid-2007. Adjustments were made so that, in the second phase, the cap was binding and an increasing share of EU allowances were auctioned—4 per cent in phase 2 (2008-12), about 48 per cent in 2013, and at least 80 per cent expected by 2020. As a result, prices recovered to €7-8/tCO₂e. Auction proceeds from [ETSs](#) can be substantial. For the EU ETS, proceeds were €3.6 billion in 2013 alone, of which around €3 billion is being used for climate and energy related purposes. RGGI holds quarterly allowance auctions that have generated over \$2 billion in proceeds to the participating states. The September 2015 auction, for example, auctioned 25 million allowances at US\$6.02/tCO₂e.

When is it feasible?

Legal and/or other feasibility requirements

[ETSs](#) require a legal and regulatory framework authorizing the activities outlined above, notably, legal/regulatory acts empowering a programme administrator, specifying the scope and applicability of the programme, mandating participation by covered entities, and specifying the rules, including MRV protocols. The EU [ETS](#), for example, was established by Directive 2003/87/EC26. The directive requires member states to implement the EU [ETS](#) at the national level, and assigns responsibilities to the European Commission for coordinating its implementation. Subsequent Commission Decisions and Regulations specify operational procedures for the EU [ETS](#), e.g. for the auctioning and trading of allowances and the operation of the registry.

Minimum investment required and running costs

Establishing an [ETS](#) requires substantial government investment of time, money and institutional capacity. In addition, covered entities incur costs associated with compliance, including reporting on emissions and purchasing/selling allowances as needed. RGGI, for example, has allocated about 6 per cent of its auction proceeds to administrative and corporate expenses. This includes RGGI's own administrative budget (US\$2.4 million for 2015) as well as that for each participating state. Donor financing may be tapped to defray some of these costs. The [Partnership for Market Readiness](#), for example, provides funding to help countries prepare and implement climate change mitigation policies, and provides a platform to share experience.

In what context it is more appropriate

Establishing a new ETS is complex, costly and time-consuming, and should therefore be considered in light of the host country's implementation capacity and the availability of other alternatives, including through the new provisions embedded in the Paris Agreement (2015) that would contribute to the mitigation of GHG emissions. Given this complexity and the availability of alternatives, only industrialized and large-emitters among emerging countries (e.g. China, Kazakhstan and Republic of Korea) have implemented ETSs so far. Small-scale programmes would face significant challenges. For example, Kazakhstan, which launched its ETS in 2013, had only 35 transactions in 2014, totalling 1.3 MtCO₂e, trading at an average price of US\$2/tCO₂e. The Kazakh ETS is reportedly facing difficulties with verifying emissions under its MRV systems. Experience underscores the importance of:

- Enacting clear and comprehensive regulations well in advance of start-up;
- Establishing robust and transparent MRV systems to generate accurate emissions data on which to base allocations, set targets and monitor emissions;
- Assigning caps that are binding and are progressively tightened, in order to promote emission reductions;
- Providing for mechanisms that smooth out price volatility, including banking and borrowing, multi-year compliance periods, and linking to other ETSs or offset markets.

What are the main risks and challenges?

Pros

- [ETSs](#) have been shown to lower the cost of reducing emissions by internalizing environmental externalities, which incentivizes efficient low-carbon investment. Studies have indicated, for example, that RGGI has helped reduce covered [GHG emissions](#) by 25 per cent.
- Carbon markets can complement other policy instruments such as carbon taxes and energy-efficiency standards.
- Countries can build on existing approaches for [ETSs](#), rather than reinventing the wheel. Developing countries, for example, can build on the robust MRV processes developed under the EU [ETS](#). Using broadly-recognized standards also facilitates linking to other [ETSs](#), which could increase prices for local allowances.
- Concessional finance and other support are available to support carbon market development (see above).

Cons

- Determining which sectors are to be covered under an [ETS](#) cap, the level of the cap (and successive tightening), and how allowances will be allocated to covered entities, can be a slow process fraught with

potential for abuse.

- Allowances have little or no value until emission caps are lowered substantially below baseline levels. Moreover, allowance prices are market-based and therefore unpredictable; as such, they form a poor basis for decisions on investing in emission-reducing technologies. Price volatility also makes these investments difficult to finance, as lenders require credible financial forecasts.
- Allocating allowances for free confers windfall gains on covered entities if their emissions are below the cap.
- Coverage may not be comprehensive: it is difficult for a carbon market mechanism to capture all GHG emissions, e.g. from transportation and other sectors where most emissions are at the end-user level. For example, 55 per cent of EU [GHG emissions](#) are not covered under the EU [ETS](#) cap. Other mechanisms such as fuel-economy standards and fuel taxes may be used to constrain emissions in these sectors.
- As opposed to carbon taxes whose prices are stable, carbon prices are affected by many rather unpredictable factors, notably the level of commitment to reducing [GHG emissions](#), and economic cycles, which can cause spikes or drops in demand for allowances.
- Other approaches such as carbon taxes can provide longer-term clarity about carbon prices, which can facilitate the financing of low-carbon investments. These other approaches can be used in combination with carbon markets, as in many EU countries.

Risks

- Price volatility increases risk. Given the long lead time of low-carbon investments, this volatility makes it difficult for project sponsors to secure financing.
- [ETSs](#) are vulnerable to political lobbying which can delay implementation/tightening of the cap (and hence delay emission reductions) and at worst, deliver windfall gains to covered entities.
- Lack of long-term contracts which are available from some buyers, but typically at a substantial discount to market prices.
- In an [ETS](#), covered entities have an incentive to overestimate baseline emissions. This can lead to over-allocation of allowances, especially in early phases of an [ETS](#), which reduces the potential for an [ETS](#) to promote emission reductions. Accurate emissions inventories and rigorous reporting requirements help mitigate this risk, but they take time to implement. In the pilot phase of the EU [ETS](#), an excess of allowances was issued, and prices fell. The cap was tightened for subsequent periods.

How can the design be ameliorated to improve the impact?

Carbon markets primarily promote investments that reduce [GHG emissions](#). Attributing the impact of [ETSs](#) is a difficult task, for which evidence has been produced only recently, mostly for the EU [ETS](#). In that case, [evaluations](#) record attributable emission savings in the range 40–80 MtCO₂/yr, annual average, i.e. circa 2-4 per cent of the total capped emissions. The latter is bigger than the impact of most other individual comparable policy instruments.

Tightening the cap is the key tool for enhancing the economic and environmental impact of an ETS. The tighter the cap, the fewer allowances and hence the higher their price and the greater the incentive to reduce emissions. The [Paris Agreement](#) promotes such tightening by requiring Parties (both industrialized and developing countries) to “undertake and communicate ambitious efforts” to “hold... the increase in the global average temperature to well below 2 °C above pre-industrial levels,” with the level of ambition showing “a progression over time.” (Articles 2 and 4). It also establishes a voluntary mechanism for emissions trading, with rules to be established (Article 6).

This entry does not provide a review of the vast literature that explain why halting climate change is good for the economy and the people, but it rather focuses on [ETS](#) specifics and measurable impacts. If well designed, ETS can produce local environmental, social and economic benefits, such as biodiversity protection, reduced air pollution (associated health impacts), enhanced energy security and/or access to electricity, and improved land-use management. This [evidence](#) is supported by the results of international mechanisms such as [REDD+](#), which provides compensation for a verified reduction of deforestation and degradation or a verified increase of forest carbon stocks.

Geminal research has analysed the possible negative impacts of [ETS](#) on employment, energy prices and competitiveness. However, [the lack of strength of the theoretical and empirical approaches](#) and of data (only few [ETS](#) implemented, only recently) does not allow the emergence of factual conclusions. In all, these negative impacts-when confirmed-were for the most [not considered large](#) in the EU.

In relation to the possible impact on developing countries (beyond the country of implementation), carbon offset instruments have been criticized over their negative social impact on local communities (land grabs, social conflicts, the displacement of indigenous people). While evidence is limited, the potential negative social impact of offsetting instruments should never be underplayed and strict safeguards should be rigorously applied.

There are also options to track and magnify possible [ETS](#) positive impact, noting that many emission-reduction technologies can benefit the poor (e.g. renewable energy access, lightbulb replacement, biogas digesters) in the short and medium term. Allowing (or additionally prizing with public incentives) offsets from these types of projects to be

eligible for crediting in an [ETS](#) can enhance the poverty-reduction impact of these projects by providing revenues. However, in light of scarce evidence over social impact, additional research and evidence is required to derive recommendations.

Guidelines and Case Studies

Guidelines

Establishing an ETS:

- [Partnership for Market Readiness](#) (repository of guidance and good practices).
- [Participating in the EU ETS](#)

MRV systems:

- China's provincial [ETSs](#).
- [Guide for Designing Mandatory Greenhouse Gas Reporting Programs](#)

Emissions trading:

- [Emissions Trading Worldwide](#)

Carbon prices:

- [State and Trends of Carbon Pricing 2015](#)

Case studies

- [EU ETS and Progress Towards Achieving the Kyoto and EU 2020 Objectives](#)
- [New Zealand ETS](#)
- [China ETS](#)

Our work

[International Guidebook of Environmental Finance Tools](#) null



Sustainable Development Goals



Environmental finance

Our Perspective

09 Jul 2015

We should reach a consensus on the fact that macroeconomic policies in low-income economies need to also jettison the conventional wisdom of undue restrictiveness.

