Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

# Emissions Trading

## Basic Principles and Experiences in Europe and Germany

# Content

# 1 Introduction

Addressing climate change has become a key challenge for policymakers around the world in the 21st century. Both scientific and economic evidence provide grounds for taking decisive action as soon as possible[1] in order to stabilise "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (Art. 2, UNFCCC). While climate change is unequivocal, in order to be able to adapt to the adverse effects of a changing climate, consensus has emerged that the average global temperature increase should be limited to below 2° Celsius, compared to pre-industrial levels.

Internationally, the negotiation process established under the United Nations system led to the establishment of the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the Paris Agreement. While the UNFCCC provides the basic framework for global action on climate change, the Kyoto Protocol originally specified binding greenhouse gas (GHG) emission reduction targets for developed countries for the period 2008 to 2012. These commitments were extended for some parties through to 2020. The Paris Agreement, which entered into force 2016, sets the international agenda for addressing climate change for the period after 2020. Under the agreement, all countries will make contributions to address climate change. What form these contributions take is left up to the individual country.

Domestically, a wide range of policy instruments can be used to mitigate emissions: market-based instruments (e.g. tradable permit systems or environmental taxes), regulatory instruments (e.g. command-and-control regulation for emissions or efficiency and technology standards), and information-type policy instruments (e.g. labelling, awareness raising through campaigns, education and training).

Under the Kyoto Protocol, the European Union collectively agreed to an emission reduction target of 8% from 1990 levels by 2012. In 2008, the EU moved beyond its commitments in the Kyoto Protocol and agreed to a domestic emission reduction goal of 20% from 1990 levels by 2020. The Paris Agreement does not prescribe percentage reductions from a base year, but parties submit nationally determined contributions that can also be expressed in other forms like reductions from a business-as-usual trajectory or indirect targets like an increase in energy from renewable sources. The EU low carbon roadmap foresees a reduction of 80-95% below 1990 levels by 2050. In the mid-term, the EU has committed to reduce its emissions by at least 40% below 1990 GHG levels by 2030. The German long-term reduction target is in line with the EU's ambitions and as Europe's largest economy and emitter; Germany plays an important role in reaching these goals.

1) For details, see for example the Fifth Assessment Report: Climate Change 2013 – The Physical Science Basis of the Intergovernmental Panel on Climate Change (2013) and the Stern Review on the Economics of Climate Change (2006).

The EU's primary climate policy tool is the market-based instrument of emissions trading, which allows the trading of allowances between companies within the European Union Emissions Trading System (EU ETS).

The EU ETS has been operational since 2005 and covers Europe's major economic sectors, including energy utilities and industry. Other countries and jurisdictions such as New Zealand, South Korea, Switzerland, Tokyo, Saitama, China, California, Quebec, and collectively, various states in the Northeastern United States, have followed the EU's example and established (or are in the process of establishing) emissions trading systems of their own. While these systems may differ in the details of their designs, they operate on the same basic principle of cap and trade. This paper explores this principle and its benefits, presents key design elements, and provides insights into how emissions trading works in practice. The EU ETS and Germany's experience will be used to highlight and show how the system works.

## 2 → Basic Principle and Benefits of Emissions Trading

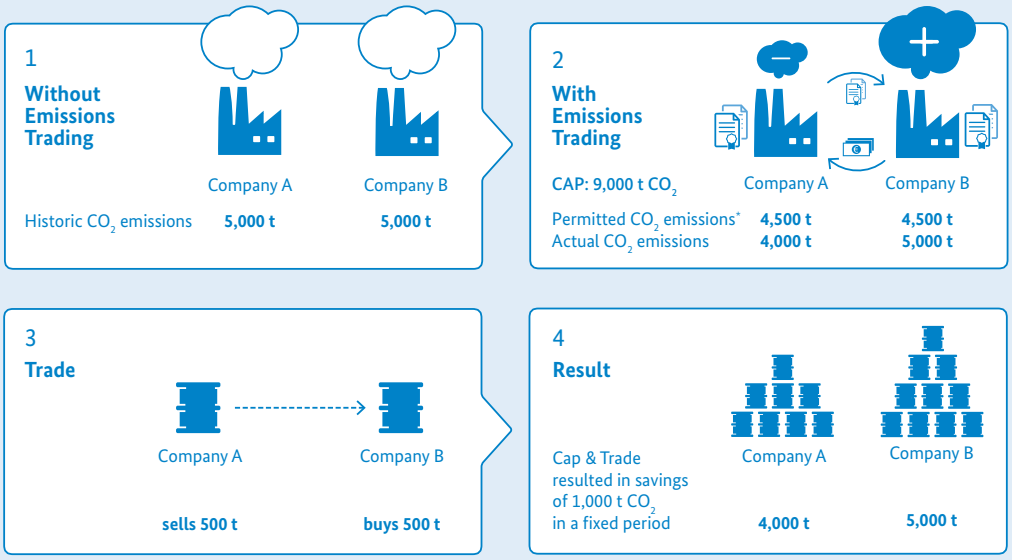
### BASIC PRINCIPLE OF EMISSIONS TRADING

The basic principle of emissions trading is fairly straightforward and can be explained by the illustration of a "cap and trade" system. In such a system, given the emissions of a country, jurisdiction, or industrial sector, an upper limit or "cap" is set on a group of entities for a given period of time. Based on the limit set by the cap, participating entities can buy and sell allowances to meet their needs as long as they surrender sufficient allowances to cover their emissions by the end of each compliance period. If an entity holds more allowances than it needs, the surplus can be sold. Conversely, if it has more emissions than allowances, more must be bought from other system participants or on auctions by governments.

## Box 1: The Principle of Cap and Trade

**Cap:** In this example, the previous annual emissions of 10,000 $tCO_2$ from company A and B must be reduced by 10% to 9,000 $tCO_2$. Each company is allocated 4,500 emission allowances.

**Trade:** Using improved technology, company A reduces its emissions from 5,000 to 4,000 $tCO_2$. Since it only needs 4,000 allowances to cover its emissions, the extra allowances can be sold on the market. For company B, cost of emission-reducing technology would be more expensive than purchasing the additional 500 allowances it needs on the market. In the end, the 10% reduction goal is met.




Source: DEHSt 2014: Fact Sheet - Emissions Trading (adapted)

Thus, the limitation on the right to emit provides a financial incentive for covered entities to invest in emissions-reduction measures. Depending on a variety of factors, some entities may be able to reduce their emissions now and benefit financially from having lowered their production cost or being able to sell excess allowances; others may buy allowances now and invest in a different sector or at a later date. Emissions trading therefore combines the certainty of an overall cap while offering covered entities the flexibility to reduce emissions in the collectively most cost efficient way possible. As a market-based instrument, an emissions trading system (ETS) accounts for external environmental costs of economic activities and, as such, is an instance of the “polluter pays principle”.

## BENEFITS OF EMISSIONS TRADING

Emissions-trading systems usually cover key sectors of an economy, most importantly, energy and industry. Such a system should be considered as a primary policy instrument to address climate change, within a comprehensive policy mix. It may also work alongside other complementary measures.

**Among the key benefits of emissions trading are:**

- **Emissions trading guarantees environmental effectiveness:** By setting an absolute cap and thus controlling the actual quantity of emissions, environmental targets in terms of emission reductions are achieved with a high degree of certainty. In this regard, an ETS provides advantages compared to other policy instruments. For example, in the case of a carbon tax, the regulator achieves price certainty, but cannot be sure of the total emissions in the system. Likewise, instruments such as subsidies, standards, and regulative legislation mostly affect emission intensity with varying and uncertain results. In contrast, an ETS controls the total amount of emissions and thereby guarantees that the intended emission reductions are achieved.

- **Emissions trading ensures cost effectiveness:** By ensuring that emissions are reduced where mitigation is cheapest, an ETS can theoretically achieve the defined environmental target at the lowest cost to the economy as a whole. This cost-effectiveness is mainly achieved through flexibility for covered companies regarding the time and place of their emission reductions. Each entity can choose whether it is economically efficient enough to implement its own abatement efforts, or in the event that there are insufficient cost-adjusted abatement options available, the entity can opt to buy allowances on the market. Buying allowances means that a company is helping to finance emission reductions through another company with cheaper abatement options.

- **Emissions trading offers economic flexibility** in that the price for carbon also adjusts to current economic conditions. If the economy grows and emissions rise, the allowance price increases. In an economic slowdown, the price decreases with a reduction in production and consumption. An ETS can be seen as a “breathing” instrument. For example, it gives stronger incentives for abatement when the economy is strong and capable of investments in abatement and low carbon investments. Conversely, it responds to economic slowdowns with a corresponding decrease in the price of emissions.

- Implementing an ETS can further **accelerate the development, diffusion, and deployment of low carbon technologies.** By establishing a long-term cap, emissions trading provides long-term price signals and thus important incentives for private investment in the development and deployment of low- or non-emitting technologies. This lowers the macroeconomic costs of future emission reductions. In addition, a strong price signal spurs the diffusion of such technologies among market participants.

- Emissions trading offers the jurisdictions the **ability to link their system to those of others and cooperate in their mitigation efforts.** By linking systems, larger markets can be formed, thereby helping to expand the number of cost-efficient mitigation options and increase market liquidity.

## 3 Key Design Elements

An ETS functions in that it puts a price on carbon, which is then taken into account in investment decisions. The price of allowances is determined by supply and demand in the market. Once up and running, many aspects of an ETS can be left to market variables. However, there are several necessary key design elements that policy makers must address. Decisions regarding the design of an ETS should consider several features in order to ensure that the environmental objective is reached and to facilitate the efficient operation of a competitive and cost-effective market.

### Box 2: Key Considerations for Setting up an ETS

**There are several lessons that can be learned from the experiences of existing ETSs, which may be helpful when designing and implementing an ETS:**

- Accurate, high-quality data is essential for determining an effective emissions cap. A robust system for monitoring, reporting and verifying (MRV) emissions is therefore vital for the functioning of an ETS. In other words: From the very beginning, it must be ensured that 1 ton of $CO_2$e emitted is 1 ton of $CO_2$e reported.[2]
- Keep it as simple as possible. If the provisions for an ETS are easy to understand, this may help gain political acceptance, simplify enforcement, and minimise transaction costs.
- Consistency and predictability, including measures to address price and supply shocks, help create a long-term price signal, thereby establishing investment certainty. This creates a stable environment in which the carbon price is taken into account in investment decisions for low-carbon technologies.
- To the furthest extent possible, the design of an ETS should be compatible with other ETSs in order to allow for linking in the medium- and long-term. Linking with other ETSs leads to additional efficiency gains and is therefore highly desirable.

## CAP SETTING

Setting the cap is one of the most important decisions when establishing an ETS. It is key for the environmental effectiveness of a system and the principal factor for determining the economic value of an emissions allowance. This involves striking a balance between environmental targets and economic costs. In practice, cap setting involves many political considerations, especially with regard to ensuring the acceptability of implied costs. Increasing the stringency of the cap over time and taking further action as the market matures may help smooth out initial challenges potentially associated with the introduction of an ETS.

The **cap** or **target** can be defined in different ways: It can be an absolute cap in terms of absolute emissions or avoided emissions; or a relative or intensity-based target, for example, a target defined on the basis of the output unit and possibly linked to economic growth or another variable. However, only an ETS with an absolute cap will ensure environmental certainty.

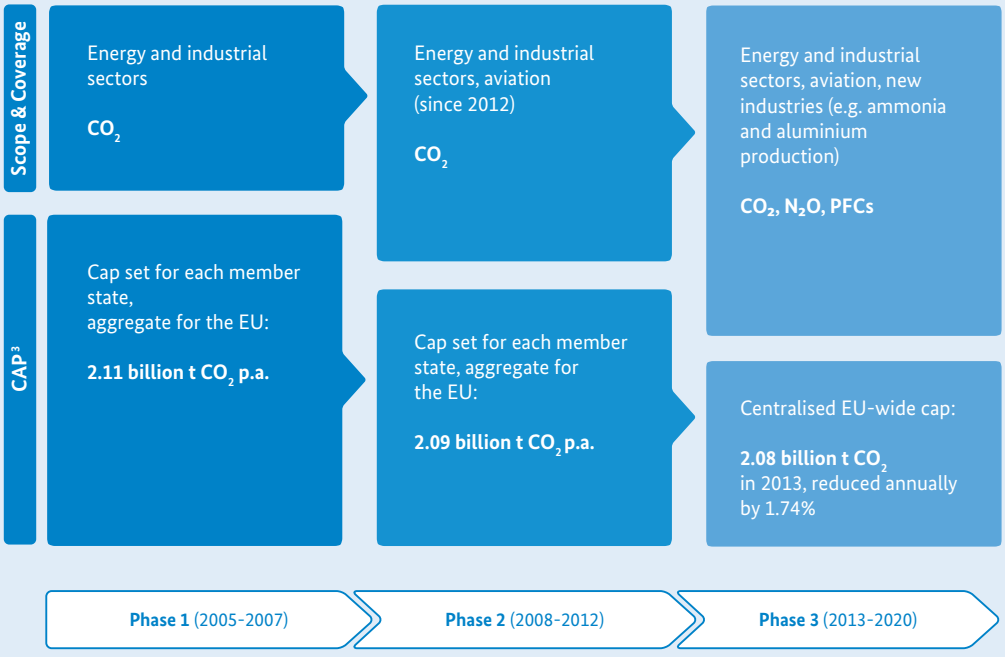
Once the cap is set, an overall emissions budget is divided into smaller units, referred to as emissions allowances or permits. They represent the right to emit a certain amount

2) $CO_2$ equivalent ($CO_2$e) is a unit of measurement of the radiative forcing of an amount of a greenhouse gas or a mix of greenhouse gases expressed in terms of the radiative forcing effect of carbon dioxide. It provides for a comparison of the impact of the six greenhouse gases on the global climate.

of GHG, e.g. 1 ton $CO_2e$, and can be seen as a kind of currency of a certain ETS, traded between market participants. Setting the cap involves further considerations linked to other ETS design issues, such as determining a base year and corresponding baseline, and defining compliance periods and their length. A clearly defined long-term reduction path provides investment certainty for market participants and can thus ensure the effectiveness of a system.

### Box 3: EU ETS – Tightening the Cap, Widening the Scope

The first trading period of the EU ETS was a learning phase. Scope and cap were kept at a manageable level. The second trading period coincides with the first commitment period, of the Kyoto Protocol. In order to meet the given targets, the scope was widened and a more ambitious cap was set. This trend was maintained in the third trading period, as more greenhouse gases and industries were added to the scheme in January 2013. In parallel, the cap decreases every year by a linear reduction factor. In the fourth trading period, the cap will decline at an annual rate of 2.2%.




Source: adelphi

## SCOPE AND COVERAGE

Defining the scope and coverage of an ETS involves (1) determining which gases to include, the sectors to be covered, and thresholds for participation; and (2) determining the point of regulation and specifying the actors in an economy that fall under the scope of the ETS.

3) The cap is calculated for all EU member states and Liechtenstein, Norway and Iceland (since 2008). Adjustments were made to accommodate the expansion of the geographic scope of the system, namely, the accession of Bulgaria and Romania in 2007 and Croatia in 2013.

Theoretically, in order to achieve maximum environmental effectiveness and economic efficiency, all emission sources, sectors, and emissions should be covered by an ETS. In practice, however, this may be difficult to achieve due to various factors, including the capabilities and costs involved in measuring emissions, the availability of control options to ensure compliance, and administrative burdens in system management. An ETS may therefore only cover part of the overall emissions of an economy or jurisdiction, which is the case for most existing systems.

The Kyoto Protocol covers six **greenhouse gases**: carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride ($SF_6$). These gases vary both in terms of their contribution to the greenhouse effect (based on their concentrations in the atmosphere), and in terms of their global warming potential.[4] The gases an ETS includes will generally be determined by their sources/emitting entities and the extent to which they can be effectively and efficiently measured, monitored, and reported. Usually, ETSs cover $CO_2$ emissions, since these have by far the highest share of concentration in the atmosphere (about 80% of all GHGs).

Determining the **point of regulation** relates to defining what actors participate in the system. This is achieved by specifying who has to surrender allowances. Systems can use upstream regulation (where fossil fuels enter the economy), downstream regulation (where fossil fuels are used and GHGs are emitted into the atmosphere), or a hybrid with large sources regulated downstream and other sources upstream. The upstream approach covers fuel producers or importers: the number of participants is comparatively small, and the entire market for fossil fuels is thereby covered. The downstream approach covers emitters directly, such as operators of power plants, who are responsible for the emissions of their products, services, or consumption. This approach generally leads to a higher number of participants and a larger number of abatement options, with positive effects for market liquidity and a more stable and functioning market. In an extreme case, this approach could include private households, but this would likely lead to excessively high transaction costs and administrative burden. Therefore, usually only large point sources above a certain threshold are covered with the downstream approach. Hybrid models that cover large sources downstream and other parts of the value chain upstream, such as the transport sector, are also an option.

In terms of **sectoral coverage,** economy-wide coverage would provide the largest number of abatement options and could thereby maximise the cost-effectiveness of the ETS. ETSs generally aim to cover as many emissions as possible with the smallest administrative burden. In practice, major emitters like the energy sector and energy-intensive industries are usually covered by an ETS first. Other sectors may only be included over time

4) See 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 Guidelines).

or are better covered by complementary policy measures. The fossil fuel power sector and energy-intensive industries are particularly well suited for ETS coverage due to their large point sources. With the aim of lowering administrative costs, ETSs generally only require installations to comply with the system once their emissions reach a certain threshold.

### ALLOCATION OF ALLOWANCES

Allocation refers to the distribution of allowances to market participants once the cap is set and the once scope, coverage, and point of regulation of an ETSs has been defined. Since allowances have a market price, their overall value is significant. How allowances are distributed can be a highly political process and involves many considerations. There are two basic mechanisms for distributing allowances: **free allocation** and **auctioning**. Allowances can be distributed for free either on the basis of historic emission levels during a specified baseline period (grandfathering) or on the basis of benchmarks, in which case the number of allowances is determined by performance measures for a certain product group or sector. Auctioning allows governments to solicit bids for allowances. This provides a primary price-discovery mechanism and generates revenue for governments that can be used either for further climate protection measures or to compensate consumers for costs incurred due to a price on carbon.

**Free allocation** may help address competitiveness concerns such as carbon leakage and may mitigate the economic impacts of the carbon price for consumers. Allocating free allowances according to various benchmarks can help reward early action: an installation that is already very efficient will receive a higher share of free allowances than an installation that is not. **Auctioning** allows for price discovery of an emissions allowance and ultimately ensures transparency in how allowances are distributed. In theory, auctioning is the most efficient and environmentally effective allocation method, as it provides a better signal of actual abatement costs and the true price of carbon, thereby also making investment decisions easier. Furthermore, it is very difficult to design free allocation in such a way that no competitive distortions occur between sectors.

### DATA GATHERING AND MONITORING, REPORTING AND VERIFICATION (MRV)

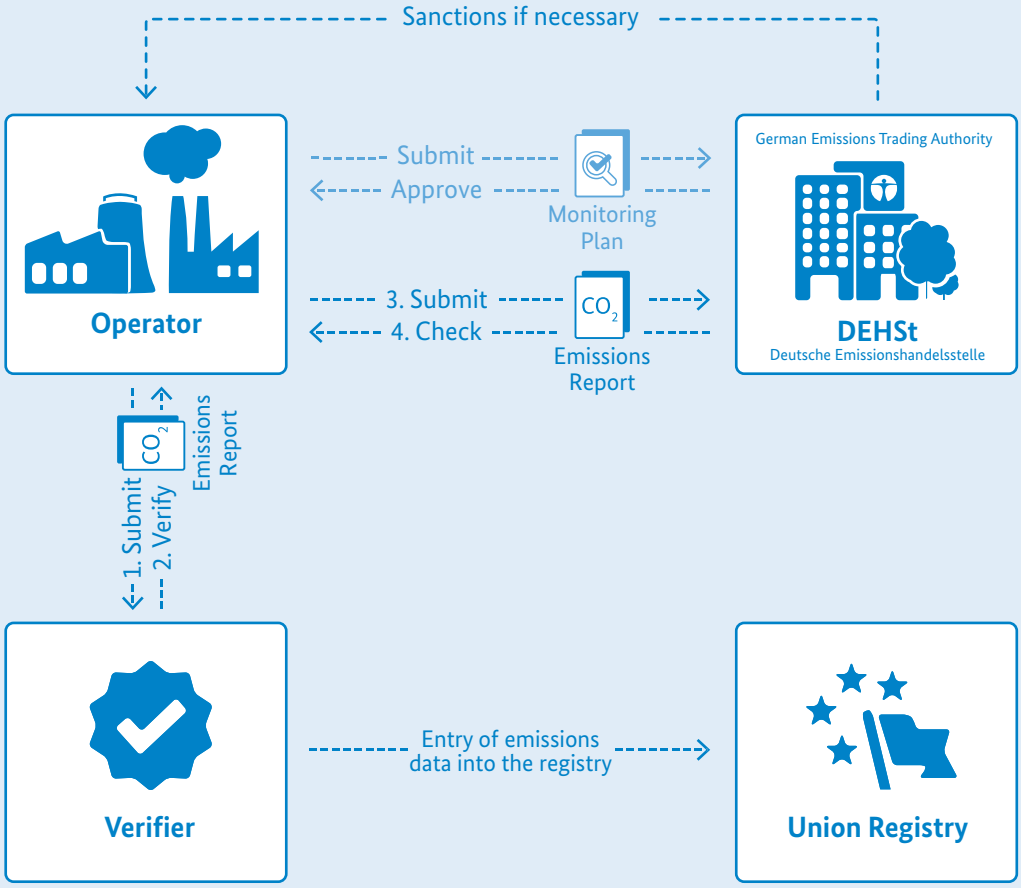
Information on the emissions being produced is a fundamental building block for forming a basis on which to make management and policy decisions for a country, sectors, and entities. In order to ensure environmental integrity as well as trust and confidence in the market, market participants must be satisfied that entities are uniformly complying with the regulations. Therefore, detailed and comprehensive data on actual emissions must be gathered, constantly monitored, reported, and verified. This is also true

for carbon tax and has come to be known as Monitoring, Reporting and Verification, or MRV. An additional question is determining who is responsible for this data gathering: the state or the entity itself. Companies have better access to information about themselves, but they have an incentive to underreport. The government authorities or another system administrator therefore need auditing and enforcement/penalty mechanisms.

There are two basic possibilities for **measurement:** (1) direct and continual; and (2) calculations based on activity variables such as fuel use and their associated emissions factors. Direct measurements are costly because they involve sophisticated technical equipment (Continuous Emission Monitor Systems (CEMS)) that must be installed and constantly serviced, while calculations may lead to some uncertainty about the data. Overall, both methods are considered reliable for measurement purposes under an ETS.

**Verification** can be carried out through either a government agency or an independent third party. The party responsible for verification, depending on the measurement method used, checks the instruments or calculations based on activity data and combustion-efficiency factors (or one against the other), to ensure that the proper methodology has been implemented.

**Box 4: The Monitoring, Reporting, and Verification Process in the EU ETS - The Example of MRV in Germany in Phase III of the EU ETS (2013-2020)**




Operators are required to submit a Monitoring Plan with a description of their emission-measuring methodology to the German Emissions Trading Authority (DEHSt), which then evaluates the plan. Thereafter, operators prepare an Annual Emissions Report that is then reviewed by an accredited independent verifier. Subsequently, the DEHSt examines and audits the verified reports (including automatic checks for all reports, and more detailed reviews for some reports). Sanctions may be imposed in cases of non-compliance.

The benefits of emissions trading, both economic and environmental, can only be fully realised when market participants are in compliance with the cap and the market functions, which requires all parties to comply with and have confidence in the rules and regulations of the system. It is for this reason that an **enforcement** mechanism, with associated penalty measures, should be a central component of the system. Such measures are most effective when it is not necessary to enforce them on a regular basis, but rather when they serve as a deterrent to cheat the system. They therefore should be strict, painful, and easy to

implement. Penalty measures can take the form of financial penalties, stricter mitigation requirements in future periods, requirements to reduce emissions for which allowances have not been surrendered, or a combination of these. It is extremely important that there is a high probability that penalty measures will be imposed, and this should therefore be built in as an automatic mechanism. This avoids a decision procedure where loopholes, exemptions, and exceptions may creep in, damaging the operation of the system.

### FLEXIBILITY PROVISIONS

In addition to the flexibility an ETS provides for a company to either invest in emission mitigation or buy allowances, some systems have allowed for other flexibility provisions including offset credits, banking and borrowing.

The rationale for allowing **offset credits** in an ETS is that there may be economically efficient mitigation options in sectors not covered by the ETS, either because they are below the minimum threshold for compliance, not in a covered sector, or are located in a country that is not covered by the ETS. Offset crediting has been developed both to finance these mitigation measures and to allow compliance entities additional flexibility, without diminishing the overall environmental integrity of the system. Such credits may contribute to liquidity in the market and help minimise distortions and volatility. Early on, the European Union and New Zealand opted to use the existing Kyoto mechanisms of the Clean Development Mechanism (CDM) and Joint Implementation (JI) as offset mechanisms in their systems. From 2013 the use of these credits in the EU ETS is restricted to CDM and JI projects registered until 2012 and new CDM projects hosted by Least Developed Countries (LDCs). From 2020, no further international offset credits will be used to achieve the 40% target. They might be used to increase ambition beyond this target, but no political debate on this subject has yet taken place. Projects developed under the CDM produce units known as Certified Emission Reductions (CERs) and are carried out in developing countries that have no mitigation obligations under the Kyoto Protocol. Projects developed under JI produce units known as Emission Reduction Units (ERUs) and are carried out in industrialised countries that do have reduction obligations, but do not need the achieved emission reductions for their own targets. In addition to these international offset credits, ETSs may also allow for offset credits in sectors of their economy that are not covered by the system. California and Quebec have domestic offset programmes; projects are carried out in the United States and Canada respectively. For both international and domestic offset credits, it is important for the environmental integrity of the system that offset projects be “additional”, in that they would not have occurred without the financing provided by the sale of offset credits; permanent, in that the emissions are not released after the project’s end; and verifiable, so that the number of credits issued

accurately reflects the number of emissions actually reduced. For both international and domestic offsets, the type of project, how they are carried out, and how emission reductions are measured, reported and verified, is established in specific protocols and regulations.

**Banking and borrowing** are flexibility provisions based on the principle that in the short to medium term, a ton of a GHG, as far as its effect on climate change, is the same regardless of when the ton is emitted. Such provisions may help smooth out the business cycle and help entities comply at the lowest possible cost. In an ETSs with several compliance periods, unused allowances from previous periods may not simply expire at the end of the compliance period, but may also be valid for future periods. Administrators, entities, and other market participants may therefore accumulate unused allowances from previous periods and "bank" them for future compliance or trading. This may give entities an incentive to bring forward mitigation investments because they know they can benefit from reductions now and in the future. In some cases, ETSs may also allow entities to "borrow" credits from the future, or in other words, promise to "pay" back its carbon debt through future mitigation. This can be an important flexibility mechanism in that it

allows companies that may have capital stock that is still productive to realise their full investment in that stock and then invest in better technology once their original investment is fully depreciated. If borrowing is allowed, it is extremely important that future emissions reductions actually do occur and are not continually postponed into the future. This can be achieved by limiting the borrowing provisions to a short period within the reduction pathway.

### MARKET STABILITY MEASURES

One principle of emissions trading is that it is preferable to allow the market to find an appropriate price for an emissions allowance under a given cap rather than have a regulator set the "right" price. Nonetheless, in order to adjust to exogenous shocks or dampen price volatility, many ETSs have incorporated additional mechanisms to help balance supply and demand, ensure a robust price signal, and provide market participants with some certainty regarding price developments.

The mechanism or stability measures work by adjusting the number of allowances available in a market either triggered by specific price or quantity levels. For example, an auction price floor (as can be found in California, Quebec and the Regional Greenhouse Gas Initiative) does not control the price of allowances on the secondary market, but only automatically adjusts auction volumes and therefore influences the price in the primary market. In California allowances are auctioned at a minimum price and a so-called cost containment reserve is in place to help dampen price spikes by bringing additional allowances onto the market in times of high scarcity.

In contrast, the EU agreed to establish a quantity and rule based mechanism in answer to a lack of flexibility that prevented adjustments to flagging demand in the system. The so called Market Stability Reserve (MSR) works in the following way: if the surplus is above a certain threshold a defined number of allowances is not auctioned but shifted to the MSR. If the surplus is below a certain threshold a defined number of allowances is taken out of the MSR and returned to the market. The overall intention is to improve the system's resilience to future shocks and thus ensure a robust price signal that is determined by the market.

However, it is important for the environmental integrity of a programme that these market stability measures are always taken under the overall cap set for the system. Furthermore, they have to be carefully designed so that they provide transparency and predictability to market participants and leave the market the flexibility to determine an efficient price to reduce emissions.

## Box 5: The EU ETS at a Glance

| | |
|---|---|
| Participating countries | 28 EU member states, Iceland, Liechtenstein and Norway |
| Cap | Phase I: Cap set at level of each member state in national allocation plans, together with allocation<br>Phase II: Similar to Phase I<br>Phase III: Centralised EU-wide cap: 2.08 billion $tCO_2$ in 2013, reduced by, 1.74% (38.26 million $tCO_2$) annually from the average annual total quantity of allowances issued by the Member States in 2008-2012. The 2020 target is 1.78 billion $tCO_2$. |
| Covered greenhouse gases | $CO_2$, $N_2O$, PFC (since 2013) |
| Covered sectors | Phase I: Power stations and other combustion plants, and industrial installations (oil refineries, coke ovens, iron and steel plants and installations producing cement, glass, lime, bricks, ceramics, pulp, paper and board).<br>Phase II: Sectors covered by Phase I, plus aviation for intra-EU flights (since 2012)<br>Phase III: Sectors covered by Phase II, plus installations undertaking the capture, transport and geological storage of greenhouse gases; $CO_2$ emissions from additional industrial installations (petrochemicals, ammonia, non-ferrous metals, gypsum and aluminium sectors); $N_2O$ emissions from the production of nitric, adipic and glyoxylic acid; and PFC emissions from aluminium production. |
| Thresholds | Energy: 20 MW annual thermal capacity per installation<br>Industry: Varying output-based thresholds for different industry sectors<br>Aviation: Aircraft operators with more than10 k $tCO_2$/a |
| Trading period | 3 years (Phase I, 2005-2007)<br>5 years (Phase II, 2008-2012)<br>8 years (Phase III, 2013-2020) |
| Compliance period | 1 year |
| Point of regulation | Downstream |
| Allocation method | Phase I: Largely free allocation through grandfathering<br>Phase II: Similar to Phase I with some benchmarking for free allocation and some auctioning and selling (e.g. in Germany)<br>Phase III: Auctioning as principal allocation method (especially for the power sector); free allocation for industry based on ambitious product benchmarks and gradual increase in the use of auctioning<br>Special rules for sectors at risk of carbon leakage (temporary exemption from the general policy of increased auctioning of allowances) |
| MRV | Every installation needs a monitoring plan approved by the competent authority<br>Annual reporting<br>Verification by independent, accredited verifier |
| Enforcement | EUR 100 per $tCO_2e$ for non-compliance, rising with inflation from 2013, plus surrender of missing allowances in the following year |
| Banking | Unlimited (since 2008) |
| Borrowing | Not allowed, but yearly allocation before surrendering (leads to de facto borrowing for one year for sectors with cost free allocation) |
| Offset credits | Phase I: Unlimited use of CDM credits (in practice no demand and supply).<br>Phase II: Most categories of CDM/JI credits allowed, varying from country to country to a certain extent. Credits from LULUCF and nuclear power not eligible; additional requirements for large hydro projects.<br>Phase III: Similar to Phase II, but with further quantitative and qualitative restrictions - new CDM credits only from projects in LDCs, no credits from new JI projects, no credits from certain industrial gas destruction projects (e.g. HFC23). The overall quantity of international credits is limited by the principle of supplementarity (no more than 50% of emissions reductions). |

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# Emissions Trading in Practice

## INSTITUTIONAL AND LEGAL FRAMEWORK

Emissions trading is a policy mechanism developed to respond to the externalities of GHG pollution at the lowest possible cost. Its institutional framework therefore requires a compulsory legal basis that establishes the following: allocation; provisions that ensure compliance; further provisions that may be needed for the operation of the system; and the aforementioned cap, scope and coverage. The form of this legal and institutional framework will vary from system to system based on existing political, environmental, energy, industrial, and financial market regulations and institutions. However, it is the efficient interplay between institutions that is essential for a successful carbon market.

## Box 6: The German Emissions Trading Authority (DEHSt)

Founded in 2004 as part of the German Federal Environment Agency, the DEHSt is the competent national authority for emissions trading, which operates under the guidance of the German Federal Ministry for the Environment (BMUB). Currently, a staff of about 150 experts is in charge of emissions trading in the industrial and energy sectors, and aviation and climate projects (CDM/JI). They are the central service and communication hub linking participating companies, verifying bodies and authorities.

**The responsibilities of the DEHSt include:**

- Allocation of emissions allowances
- Supervision of the auctioning of emissions allowances in Germany
- Review of yearly emissions reports (sanctions where applicable)
- Approval and review of climate protection projects within the framework of the Kyoto Protocol
- Account management of the accounts administered by Germany in the EU ETS section of the Union Registry and Kyoto processes in the national Kyoto Registry
- Supporting the independent verification bodies in verifying emissions data
- Supporting the German Federal Ministry for the Environment and the European Commission in analysing and enhancing European Emissions Trading
- Fulfilment of national and international reporting
- International cooperation with different institutions so as to build up national and regional emissions trading systems

Most activities at the DEHSt happen digitally – whether it is the submission of an application for emission allowances, reporting actual emissions, managing files or communicating with participants in emissions trading. All applications needed for emissions trading are available on the DEHSt website at www.dehst.de. There is software for allowance applications, monitoring plans, emission reports and a variety of other useful digital devices, as well as manuals and factsheets.

Source: http://www.dehst.de/EN/Servicesites/About-Us/Duties/duties_node.html, retrieved 1.8.2014.

In addition to the public/private institutional arrangements for MRV, one essential institution that must be considered is a **registry** to keep track of the actual allowances and allowance transactions. This includes account holder information, account balances, and transfers between accounts. Registries, however, are not exchanges where market participants meet and trade emissions allowances. Instead, they are a record and account institutions that maintain the integrity of the system in that they ensure that the cap is fixed, and that only the predetermined number of allowances are traded on the market and are used for compliance. Registries should have comprehensive, accurate, transparent, and up-to-date information about traded allowances. In order to deal with the complexity of the modern market, customised computer systems have been developed for this role.

### MARKET PARTICIPANTS, TRADING INSTRUMENTS, AND MARKET OVERSIGHT

**Carbon markets** are large and sophisticated systems. On one hand, emissions are closely related to energy use and the carbon market is therefore tied to the commodities market for energy, including gas, coal, oil, and electricity. On the other hand, the carbon market differs from energy markets in that: (1) while in the energy market demand affects supply (the higher the price of a commodity, the more producers will produce), in a carbon market there is a fixed cap and therefore a limit on the supply; and (2) companies that produce emissions regulated in an ETS must surrender their allowances at the end of a compliance period. For increased liquidity, price discovery, and to help installations hedge against future risk, allowance derivatives have been developed which are bought and sold like other financial instruments. The carbon market therefore also takes on many characteristics of both financial and energy markets, with some of features of its own. Market oversight will therefore be conducted differently depending on a jurisdiction's pre-existing regulatory infrastructure for these various markets.

In terms of market oversight, the **primary market** refers to the initial allocation of allowances by the state to the market participants, as previously discussed. If allowances are distributed by auction, oversight must see to it that auctions are conducted fairly along predetermined transparent rules.

The **secondary market** consists of the trading of allowances between market participants (spot market), and another trading instrument: allowance derivatives. These financial instruments "derive" their value from the allowances themselves, which give them their name. Allowance derivatives fall primarily into three categories:

- Forward contracts and futures contracts are agreements to deliver allowances to a certain party at a future date for an agreed price. Entities may not need an allowance now, but know they will need some at a future date. In order to fix that price now without necessarily buying it outright, it can use a forward or future;
- Options give a party the "option" but not the obligation to buy or sell allowances for a specific price regardless of the current market price during a specific time frame; and
- Swaps are an agreement between two parties to a series of exchanges during a given time frame in order to hedge price volatility risk. Swaps are essentially a series of futures or forwards.

**Participants** in the carbon market include not only regulated entities but also other intermediaries, such as banks, brokers, and other investors. Since, for example, a specific utility may not be able to find another utility that will guarantee delivery of specific amounts at specific prices and specific times, these intermediaries may also enter the market and buy and sell commodities and contracts. These intermediaries increase the "liquidity" of the market, greatly increasing the probability that at any given time, an entity can find someone who will be able to guarantee the availability of some product at a certain time. This service comes at a price, which is built into the price of the trading instrument. Having this liquidity contributes to "price discovery" or the likelihood that one will be able to find a competitive market price because one can find multiple offers from which to choose.

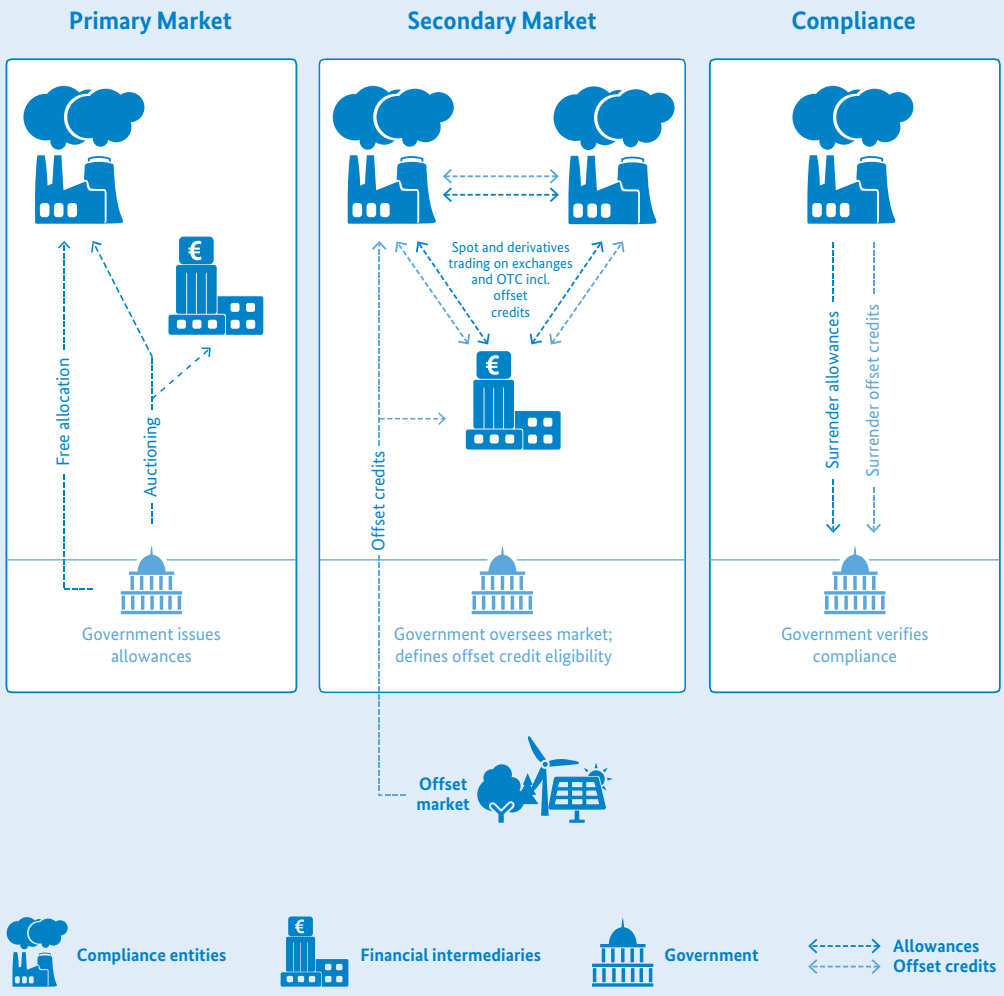
This trading can take place bilaterally, also known as **"Over the Counter" (OTC)**, where an entity may or may not know with whom it is transacting. It is more likely that one can design a customised contract to meet one's risk-hedging needs in the OTC market, because the instruments need not be totally standardised as on an exchange. However, OTC trading can entail a certain amount of "counter party risk". For example, the other party might not have what it claims or might not intend to honour its side of the agreement. This risk can be reduced through "clearing" the transaction through a third party, which can be done for OTC trades, and is common for the more standardised instrument trading that is often conducted on exchanges. Clearing means that a third party becomes the counter party to both entities involved in the trade and, as a third party, guarantees that they have what they claim.

Since uncleared OTC trades often occur bilaterally, it is hard to know if and when they are happening, which makes **market oversight** more complicated. For trading based on exchanges, market oversight is easier for the following reasons: prices and volumes are published, there are often position limits and margin requirements, and there are specific membership requirements for exchange participants. In addition to limiting what can be

traded where (OTC or on exchanges), market oversight provisions may require that there are reporting and disclosure levels, that all trades go through a clearing house, and that market participants have certain qualifications to be able to trade and/or observe certain position limits. In Europe, current policy proposals foresee increased regulation of OTC trading.

## Box 7: The Emissions Trading Market Structure

The following chart illustrates the flow of allowances through the primary and secondary market until they are used for compliance purposes. Ownership, transfers and surrendering of allowances and offset credits are recorded in the registry.




Source: adelphi

# 5 Vision of a Global Carbon Market

In addition to other emission reduction strategies and climate protection measures, emissions trading offers the opportunity to achieve ambitious GHG emission reductions in an economically efficient manner. Implementing an ETS results in cost-effective emission reductions and accelerates the development, diffusion and deployment of low-carbon technologies. An absolute cap guarantees that emissions reduction targets are met.

In the medium and long term, establishing an ETS provides the opportunity to link with other such systems, increasing efficiency gains. By linking different ETSs, a broader range of emission sources can be covered, including potentially more cost-effective abatement potentials. Additionally, a global system would achieve maximum liquidity and reduce market volatility. Such a system would lead to price convergence, avoid competitive distortions, and create mutual pressure to stick to the commitment among linked partners. A global carbon market can be created through linking different ETSs step by step.

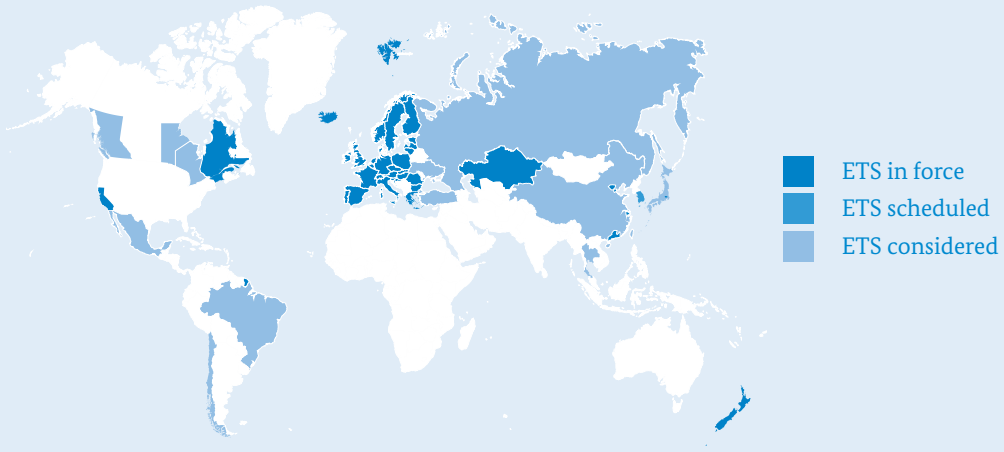
In addition to the European Union, many other jurisdictions have already implemented, or are currently designing emissions trading systems. These include: New Zealand, Kazakhstan, South Korea, Switzerland, Ukraine, Tokyo, Saitama, a number of Chinese pilot regions as well as a future national system, California, Quebec, Ontario and collectively, various states in the Northeastern United States. All of these systems are generally based on the same principles and considerations outlined in this paper, yet the differences in the respective domestic contexts and circumstances are reflected in their individual designs. At the same time, the vision of a global carbon market is shared by most, if not all, existing and emerging ETSs.

### Box 8: The International Carbon Action Partnership (ICAP)

ICAP is a partnership made up of public authorities and governments that have established or are actively pursuing carbon markets through mandatory cap-and-trade systems with an absolute cap. The partnership provides a forum to share knowledge and experiences and discuss important issues in the design and implementation of missions trading schemes (ETS) and the way forward to a global carbon market.

The website of ICAP contains an Interactive ETS Map that visualises the status of ETSs around the world and provides detailed information on design elements of each scheme.

**www.icapcarbonaction.com**




A steadily increasing number of countries and regions, including from the developing world, show an interest in emissions trading. Many countries with an existing ETS stand ready to offer the benefit of their expertise. Assistance to interested countries may be provided on a bilateral level or through multilateral forums and partnerships, such as the International Carbon Action Partnership (ICAP) or the World Bank's Partnership for Market Readiness (PMR). Germany and others with experience in designing and implementing ETSs actively support the efforts of countries interested in emissions trading in pursuit of the goal of establishing a global carbon market.

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Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

**Further information on emissions trading in Germany:**

German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB):
http://www.bmub.bund.de/en/topics/climate-energy/emissions-trading/

German Emissions Trading Authority (DEHSt): www.dehst.de/EN

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