Low Carbon Green Growth Roadmap for Asia and the Pacific

CASE STUDY

Multinational pioneers learn by doing

European Union’s Emissions Trading System

Key points

- As the world’s largest carbon trading market, the European Union’s Emissions Trading System provides valuable lessons for adopting and developing carbon pricing mechanisms.
- The phased approach enabled time to integrate lessons from the pilot phase into subsequent phases.

There was a need...

As agreed in the Copenhagen Accord in 2009, limiting the global temperature rise to 2 °C or less, relative to the pre-industrial level, by 2050, is necessary to limit the dangerous anthropogenic interference with the climate system. According to the International Energy Agency modelling, a reduction of more than 50 per cent of global greenhouse gas emissions from the baseline is required to achieve this goal. Thus drastic policy changes, especially in the power sector, were – and remain – imperative.

What was done?

The concept of a European cap-and-trade scheme emerged as an ambitious policy experiment to lead a global effort through the use of market forces to reduce harmful emissions by achieving its 2020 greenhouse gas reduction goal (by 20 per cent from the level of 1990). The European Emissions Trading System (EU ETS) became a mandatory cap-and-trade scheme for large emitters in countries under the Agreement on the European Economic Area, in which each participating member State was expected to develop a national allocation plan (NAP) that then had to be approved by the European Commission. NAPs contain information about the total quantity and distribution of allowances that a member State intends to issue, based on objective and transparent criteria provided in the guidelines.

Carbon pricing mechanisms, such as emissions trading schemes and carbon taxes, are gaining momentum as an essential and necessary means to drive carbon reductions with the required rapidity.

The ETS framework, based on a 2003 European Commission directive, fixed an upper limit (“cap”) on the maximum emission of carbon dioxide from factories, power plants and other installations covered under the scheme. Under this ceiling, every tonne of “permitted” CO₂ receives an emission allowance (European Union allowance, or EUA), also known as the “authorization to emit”.

The total emissions of a country are thus converted to an equivalent amount of allowances, which are then distributed to the facilities affected by the scheme, based on their historical emission baseline. These allocated allowances (permits) cover their actual emissions and “allow” entities to release a specific amount of greenhouse gases. To emit more than the allocated allowance threshold, additional permission can be purchased from other entities (businesses, organizations, etc.) that have emitted less than their allocated allowance. Carbon emission allowances can be sold and purchased to meet the entities’ respective assigned carbon emissions reduction quota.

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How allowances are traded

The trading process is handled through a national emissions trading registry that needs to send each transaction proposal to the central hub of the Secretariat of the United Nations Framework Convention on Climate Change (International Transaction Log, or ITL). Approval is given by the ITL, based on the compliance with the rules agreed under the Kyoto Protocol.3

The first national registries were set up in early 2005 to launch the operation of the EU ETS; there are now 30 registries, including the three non-European Union countries that joined the scheme in 2008 – Iceland, Liechtenstein and Norway.4 Any individual or organization operating an installation under the ETS obligation is required to open an Operator Holding Account within the national trading registry, which officially records all EU emission allowances. This online database enables participants to trade their allowances and record allowance allocations, their movement between accounts and annual verified emissions.

The trade of allowances can be conducted through direct trading between businesses, through such intermediaries as banks, brokers and specialist traders and by joining an exchange that lists carbon allowance products or EU member State auctions.

The revision of the ETS Directive in 2009 resulted in the creation of a centralized European Union registry, managed by the European Commission. This single registry, including all national registries, is used now by more than 25,000 end users (operators and traders)5 and is subject to the European Union Transaction Log (EUTL), which took over the role of the ITL for keeping track of ownership of allowances in the EU ETS.6

The step-by-step approach: From voluntary trial and pilot phase to Kyoto and post-Kyoto phase

A voluntary phase was introduced in Denmark and the United Kingdom in 2002. A pilot phase (Phase I) followed, from 2005 to 2007, before the full-scale second phase (Phase II, also called the Kyoto Phase) was launched, from 2008 to 2012.

The voluntary trial phase (starting in 2002)

The voluntary trading scheme was the world’s first multi-industry carbon trading system and allowed governments and the private sector to gain experience with auctioning and trading allowances. The 34 recruited UK participants received a share of an incentive fund in exchange for their willingness to reduce their emissions.7 Each participant agreed to hold sufficient allowances to cover their actual emissions and to take part in a scheme that followed an annually resetting cap. It was up to the participants to decide in which way they would meet the requirements: reducing emissions and thereby releasing allowances or covering an excess of emissions by buying allowances from other participants.8

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5 ibid.
Consequently, the participants took advantage of the incentive for reducing their emissions to invest specifically in greenhouse gas reduction measures and efficient facilities. The experience gained in the voluntary trial phase helped policymakers to determine pricing strategies, establish emission trading brokerage businesses and learn about negotiating issues as well as the auctioning process. In Denmark, eight companies (with historical emissions greater than 100,000 tonnes of CO₂ per year from combined heat and power generation) participated in the initial trading scheme, with a 2003 target of reducing CO₂ emissions by up to 60 per cent of the historic level (between 1994 and 1998). Revenues from penalties for non-compliance were to be spent on additional energy-saving measures.9


Integrating a pilot phase into a new emissions trading scheme is an important element for the scheme’s development. When the EU ETS opened up its pilot phase operations in January 2005, market participants were already in place thanks to the prior launch of the UK Emissions Trading Scheme. Despite the potential of emissions trading to cover many sectors of the economy and all six greenhouse gases regulated by the Kyoto Protocol (CO₂, methane, nitrous oxide, hydrofluorocarbon, perfluorocarbon and sulphur hexafluoride), the pilot phase began with a limited scope of coverage: CO₂ emissions from large emitters in the power and heat generation industry and in defined energy-intensive industrial sectors (combustion plants, oil refineries, coke ovens, iron and steel plants and factories making cement, glass, lime, ceramics, pulp and paper).10 About 2.2 billion tonnes of CO₂ allowances were issued annually in the pilot phase.11

The cap was set very moderately to enable a smoother entry into the scheme, considering that there was not enough time for the participants to make significant preparations. The allowances for this phase were distributed according to the national allocation plans, mostly for free and based on previously estimated emission levels ("grandfathered").12 This historic emission data was rather inaccurate and problematic because it was largely dependent upon the reports and the industry projections made by the businesses themselves. The businesses tended to “overstate” their past and expected future emissions.13 In result, this induced an over-allocation of allowances and a biased evaluation of the factual emission reductions achieved through the ETS.

The inventories during that first phase revealed that real emissions were below the projected business-as-usual scenario. Due to oversupply, the allowance price fell close to zero and the scheme consequently offered no incentive for abatement anymore, hindering the efficient commencement of the financial regulation and carbon reduction measure. During that time, the oil and natural gas prices fluctuated, which affected also the allowance price.14 As a consequence of these previously supposed difficulties, the amount and composition of EUAs applied in Phase I was not transferred to Phase II.

Fifteen EU member States participated in the pilot phase. Its launch helped to identify difficulties in the operation and the impacts on the economy, which were taken into account before recommending new regulations for the design of the scheme in Phases II and III. Key components of the required infrastructure for ETS, including emission data monitoring, national registries and inventories were established during this phase.

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13 In order to receive more Phase I allowances (and consequently, to receive more Phase II allowances, because the Phase II allowance was based on the emissions performance during Phase I).
Table 1: Summary results for Phase I of the EU ETS

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>Total phase I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price (time average)</td>
<td>€18.40</td>
<td>€18.05</td>
<td>€0.72</td>
<td>€12.39</td>
</tr>
<tr>
<td>Trading volume</td>
<td>262 Mt</td>
<td>817 Mt</td>
<td>1 364 Mt</td>
<td>2 443 Mt</td>
</tr>
<tr>
<td>Trading value</td>
<td>€5.4 billion</td>
<td>€14.6 billion</td>
<td>€28 billion</td>
<td>€48 billion</td>
</tr>
<tr>
<td>Allocation</td>
<td>2 099 Mt</td>
<td>2 072 Mt</td>
<td>2 079 Mt</td>
<td>6 250 Mt</td>
</tr>
<tr>
<td>Emissions</td>
<td>2 010 Mt</td>
<td>2 031 Mt</td>
<td>2 041 Mt</td>
<td>6 081 Mt</td>
</tr>
<tr>
<td>Surplus (volume)</td>
<td>89 Mt</td>
<td>41 Mt</td>
<td>39 Mt</td>
<td>168 Mt</td>
</tr>
<tr>
<td>Surplus (%)</td>
<td>4.22%</td>
<td>1.98%</td>
<td>1.85%</td>
<td>2.69%</td>
</tr>
</tbody>
</table>

a OTC (Over-the-Counter) and exchange trading for phase I and II, but excluding bilateral trades

Kyoto phase (2008–2012)

Phase II of EU ETS integrated project-based flexible mechanisms of the Kyoto Protocol. The so-called “linking directive” enabled participants to purchase a certain amount of Kyoto certificates (including for certified emission reductions and emissions reduction units) from flexible mechanism projects in developing countries to meet the EU emissions targets.

The Kyoto flexible mechanisms are:

- **International Emissions Trading (IET):** (under Article 17 of the Kyoto Protocol) specifies that Annex I (industrialized) countries are allowed to trade assigned amount units (AAUs) with each other.
- **Joint Implementation projects (JI):** (under Article 6 of the Kyoto Protocol) an Annex I country A or an authorized institution participates in an emission-reducing project in another Annex I country B. Country A receives a certain amount of the emissions reduction units (ERUs).
- **Clean Development Mechanism (CDM):** (under Article 12 of the Kyoto Protocol) allows Annex I countries to purchase emissions reduction certificates (certified emissions reduction, or CERs) through projects in non-Annex I countries (developing country). This promotes the technology transfer and enables implementing emissions reduction projects in developing countries.

In the second and the third phase, the introduction of banking for further carbon offsetting (“offset credit”) has been arranged to facilitate compliance with the targets. The offset possibility may provide (dis)incentives for more attractive investment options (cost-wise) in developing countries outside the European Union and thus discourage the trading of allowances within Europe.

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15 ibid.
Post-Kyoto phase (2013—2020)\textsuperscript{9}

The upcoming Phase III aims to substantially revamp the EU ETS to improve its efficiency while clearing some of the problems that surfaced in the previous phases. To prevent oversupply and support more effective carbon reduction across the continent, the third phase is introducing a series of more rigorous measures, with a centralized and harmonized management of the whole system:

- A more ambitious EU-wide cap on emissions (aiming to deliver two thirds of the unilateral 20 per cent emissions reduction target on 1990 levels by 2020), with a strictly defined amount of allowances allocated to each EU member State.\textsuperscript{20}
- Auctioning as a preferred mode of allocation, such as rising to 20–100 per cent (depending on the sector)\textsuperscript{21} in the starting year, with ongoing annual increase (from 3 per cent in Phases I and II). Although a common auction platform will be appointed according to the auctioning regulation, individual member States will be allowed to opt out to establish their own national auction platform.
- Introducing aviation into ETS (which obliges member States to auction 15 per cent of aviation allowances by the end of 2012).

The allocation of allowances will be more centralized by the European Commission with the harmonization of auctioning processes, allocation and treatment rules across the EU member States. Allowances will be distributed to member States based on historical emission data, with extra allowances granted to lower-income member States for more balanced competition conditions; and the power sector will be fully auctioned to address the issue of windfall profits.\textsuperscript{22}

Table 1: Overview of the trading scheme stages

<table>
<thead>
<tr>
<th>Phase</th>
<th>Countries involved</th>
<th>Sectors included</th>
<th>Name</th>
<th>Gases covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voluntary trial phase\textsuperscript{a} 2002–2006</td>
<td>United Kingdom and Denmark</td>
<td>Any company or public body, electricity generators excluded</td>
<td>UK Emissions Trading System</td>
<td>All six greenhouse gases</td>
</tr>
<tr>
<td></td>
<td>2001–2003</td>
<td>Only electricity generators</td>
<td>Denmark Greenhouse Gas Trading Scheme\textsuperscript{b}</td>
<td></td>
</tr>
<tr>
<td>Phase I (pilot phase)\textsuperscript{c} 2005–2007</td>
<td>15 EU member States</td>
<td>Combustion installations with more than 20 MW, oil refineries, coke ovens, iron and steel works, mineral, pulp and paper industry, electricity generators included</td>
<td>European Union Trading System</td>
<td>Only carbon dioxide</td>
</tr>
<tr>
<td>Phase II (Kyoto phase)\textsuperscript{d} 2008–2012</td>
<td>30 countries (27 EU member States plus Norway, Iceland, Lichtenstein)</td>
<td>Combustion installations with more than 20 MW, oil refineries, coke ovens, iron and steel works, mineral, pulp and paper industry, electricity generators, aviation (2012)</td>
<td>European Union Trading System</td>
<td>Only carbon dioxide</td>
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<tr>
<td>Phase III (post-Kyoto phase) 2013–2020</td>
<td>30 countries (27 EU member States plus Norway, Iceland, Lichtenstein)</td>
<td>Combustion installations greater than 20 MW, oil refineries, coke ovens, iron and steel works, mineral, pulp and paper industry, electricity generators included, petrochemicals, ammonia and aluminium industries</td>
<td>European Union Trading System</td>
<td>To be extended to other greenhouse gases produced by processes already covered by the system.\textsuperscript{e}</td>
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\textsuperscript{e} A more ambitious EU-wide cap on emissions (aiming to deliver two thirds of the unilateral 20 per cent emissions reduction target on 1990 levels by 2020), with a strictly defined amount of allowances allocated to each EU member State.\textsuperscript{20}

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<th>Description</th>
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<td>I</td>
<td>Introducing aviation into ETS (which obliges member States to auction 15 per cent of aviation allowances by the end of 2012).</td>
</tr>
<tr>
<td>II</td>
<td>Auctioning as a preferred mode of allocation, such as rising to 20–100 per cent (depending on the emissions reduction target on 1990 levels by 2020), with a strictly defined amount of allowances</td>
</tr>
<tr>
<td>III</td>
<td>The upcoming Phase III aims to substantially revamp the EU ETS to improve its efficiency while clearing some of the problems that surfaced in the previous phases. To prevent oversupply and support more effective carbon reduction across the continent, the third phase is introducing a series of more rigorous measures, with a centralization drive towards a single auction platform.</td>
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Assessments of the impacts of EU ETS have been contentious and unclear, largely due to the data uncertainties as well as emission projection uncertainties. The forecasting of the economic growth and (thus the baseline of the business-as-usual situation) were reportedly inflated. With this background, reading the reported emission reductions requires caution:

- A 2–5 per cent emissions reduction was achieved during the pilot phase (Phase I, 2005–2007) and between 2007 and 2009, carbon emissions declined by 13.79 per cent.
- Average annual emissions per installation were reduced by more than 17,000 tonnes CO₂ equivalent (8.3 per cent reduction) compared to 2005 level, being as much as 7,500 tonnes of hard coal burned less per installation.
- With the EU ETS, about 45 per cent of total CO₂ emissions were being capped at a level consistent with the adopted climate change targets.

Whether the EU ETS can initiate a fuel switch from coal to natural gas in significant scale is yet to be seen. However, other unanticipated emission reduction strategies have already emerged, including infra-fuel substitution (broad to hard coal) in Germany and improved CO₂ efficiency in the United Kingdom.

Results so far (Phases I and II)

The EU ETS has grown to be the world’s largest greenhouse gas market with more than 11,000 participating facilities in 27 EU member States. It covers 45 per cent of Europe’s CO₂ emissions (as of 2010), holds a market value of more than US$118 billion as of 2009, and 6,326 Mt CO₂ equivalent of allowances are being traded. With 10 per cent of the global carbon emissions share, the ETS is expected to be a reference point for other countries when designing emissions trading schemes.

![Image](http://example.com/image.png)

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20 The total allocation of allowances should not exceed the actual emissions because issuing too many allowances reduces the incentive for businesses to cut back their emissions.
21 For more details, see box 1 in the fact sheet on cap-and-trade schemes in the Roadmap.
There has been negative impact on industrial competitiveness: “windfall” profits in the power industry were largely due to lacking regulations in this sector, but also oversupply, free allowance allocation and arbitrary choice of baseline years referring to emission reduction targets as well as market restructuring and high fossil fuel prices. No empirical evidence so far indicates any market share loss in the non-power sector (including cement, refining, steel and aluminium). This implies that with more stringent controls in the future, the longer-term negative impact on competitiveness could be less.  

Lessons from the pilot phase

The EU ETS has pioneered a truly multinational emissions trading system. Several years’ piloting experience has yielded valuable lessons, which are reflected in the next phases, such as more stringent caps and harmonized regulations.

Lessons from the pilot phase:

- **Preparation needs time.** Governments and businesses require time to adopt a learning-by-doing approach until the system matures enough to demonstrate effectiveness and efficiency in reducing CO₂ emissions. The European market developed strongly in terms of traded volumes and market infrastructure in the pilot period, which indicates that not all the infrastructure has to be in place from the beginning as long as the rules of the system allow room for improvement.

- **Accurate data makes a difference.** Inaccurate data on emissions of participating entities leads to discrepancies in the calculation of allotted allowances, with the consequence of a possible over allocation of allowances that induces a lower price or even a price crash of emission allowances.

- **Free allocations require fair rules of distribution among recipients to achieve emissions reduction targets.** Giving emission permits for free may create a disincentive for businesses to reduce their greenhouse gas emissions, an effect that can be alleviated if permits are auctioned. Revenues from auctions can be used for research and development of low-carbon technology or to cut distortionary taxes, which would improve the efficiency of the overall cap policy.

- **Government decisions influence the market design and implementation.** Initially the allowances were grandfathered and the cap was set low due to the “learning-by-doing” nature of the pilot phase. The EU ETS is gradually shifting towards an auctioning system and is also adjusting the emission reduction targets for different sectors covered by the ETS.

- **Strong and stable price signals are necessary to create certainty.** Investment and operational choices are highly influenced by the efficiency of the scheme, which is determined by price stability.

- **Harmonizing allocation rules and implementing stricter caps.** Emission caps need to be stringent to drive significant reductions in emissions.

- **Market oversight and monitoring of compliance have to be managed through annual reporting and independent verification systems.** National authorities should oversee the trading in options and futures, national authorities should oversee the trading in options and futures, national authorities should oversee the trading in options and futures, national authorities should oversee the trading in options and futures, national authorities should oversee the trading in options and futures, national authorities should oversee the trading in options and futures, national authorities should oversee the trading in options and futures.

31 ibid.
32 ibid.
33 As shown in the year 2007, when the carbon price in EU EUS fell almost to zero.
37 For more details on the carbon leakage problem, see the fact sheet on cap-and-trade schemes in this Roadmap.
Challenges remain in several areas: First, addressing the problem of carbon leakage requires a broader (global) level of legally binding framework and institutions for emissions reduction. Measures should be established to prevent an increase in CO₂ emissions outside the countries through the possible re-allocation of carbon emissions to regions with less stringent mitigation rules. The regulations and the allowance rates need to be more stringent to induce behaviour change and industrial restructuring. Linking and harmonizing among (existing) emission trading schemes is expected to enhance enforcement and can also strengthen price recovery by adding liquidity, thus resulting in more efficient outcomes.

Ensuring the transparent and accountable management of the system is also required to prevent fraud cases (such as online theft and VAT fraud, and potential risks of insider trading or market manipulation, as shown in the case of the financial markets) through enhanced security of the registry and explicit market oversight.