



Cap-and-trade scheme

Key points

- ***A cap-and-trade scheme obligates polluters to pay for their emissions and creates certainty over the total quantity of the emission reductions that will be achieved.***
- ***Developing countries can implement a cap-and-trade scheme in a phased approach, which gives businesses time to adjust to the necessary changes in their production and management practices.***

Cap-and-trade scheme explained

A cap-and-trade or emissions-trading scheme is one form of pricing greenhouse gas emissions. It is a market instrument in which a government puts a “cap” or limit on the total amount of greenhouse gases that can be emitted. Under such a scheme, greenhouse gas emitters are obligated to pay for each tonne of carbon dioxide or carbon dioxide equivalent¹ they emit.² Hence, it rewards those who reduce their emissions.

The entities covered by the scheme are allocated allowances (permits) that permit them to emit a specific amount of greenhouse gases. Each emission allowance represents one tonne of greenhouse gas that is allowed to be emitted within a determined period or phase. The entities that emit more than the regulated amount can buy emission allowances from those entities that reduce their emissions to below the assigned threshold. Allowances are thus traded – bought or sold – among the participants in the trading scheme. The price of emission allowances or carbon is determined by the supply and demand of these allowances in the carbon market, similar to the trading of stocks. Because only a fixed amount of allowance is allocated, the cap-and-trade scheme assures certainty over the total quantity of emission reductions. Additionally, because the price of emission allowances is determined by the market, the scheme promotes the least-cost action for meeting the assigned emissions cap.

How it works

Caps

To ensure compliance of the “caps”, the participating entities are obligated to measure, report and verify their emissions to the designated authority. The total amount of greenhouse gases that can be reduced depends on how stringent the cap is set. As well, there are different types of caps. An “absolute” cap ensures that a specific level of emissions will not be exceeded.^{3,4} A “relative” cap restricts emissions relative to national or sector-specific levels of output. It thereby allows for emissions to increase in correspondence with the rise in production levels or GDP.⁵ Another way to allocate caps is by assigning a target emission pathway to the participating entities (“baseline and credit” scheme). The entities then receive tradable credits if their emissions are below the baseline level or they have to purchase credits if their emissions are above the baseline level.⁶ Additionally, caps

¹ One tonne of carbon dioxide equivalent is a measure for the quantity of another greenhouse gas that gives the same amount of global warming based on the conversion factors adopted by the United Nations Framework Convention on Climate Change (UNFCCC).

² Christina Hood, *Reviewing Existing and Proposed Emissions Trading Systems* (Paris, International Energy Agency, 2010). Available from www.iea.org/papers/2010/ets_paper2010.pdf (accessed 12 April 2011)

³ *ibid.*

⁴ For instance the EU Emissions Trading System (EU ETS) imposes an absolute cap.

⁵ *ibid.*

⁶ *ibid.*

can be set through negotiated benchmarks, such as greenhouse gas emissions per unit of output or input.⁷ These benchmarks can also be changed to become more stringent as new technologies develop.⁸

Offsets

Offsets can be used to minimize the costs for meeting the emissions reduction targets. Offsets are basically credits generated through greenhouse gas emission reductions from projects outside the sectors or regions covered by the cap. They can be generated, for example, via Joint Implementation (between industrialized countries) or the Clean Development Mechanism (between industrialized and developing countries) of the Kyoto Protocol. These credits must be additional,⁹ measurable and verifiable. Some cap-and-trade schemes limit the amount of offsets that can be used to meet the reduction targets. This is due to the fact that although offsets reduce the costs for meeting emission targets, they also reduce the rate of domestic transition to low-carbon energy systems because they shift emission reductions to other regions.¹⁰

Participants and coverage

Designing the cap-and-trade scheme as a generator-based “upstream” system, which applies to fuel suppliers, such as oil refiners and gas processors, assures a simple and less costly implementation because it involves relatively few participants and readily available data coverage.¹¹ A “downstream” approach is a load-based system that covers the direct emitters of greenhouse gases and offers a more immediate price signal to stimulate behavioural change of consumers, which provides more emissions reduction options and has been more widely used to date.¹² An example of a downstream approach is requiring automobile users to pay for the carbon emissions from the fuel they use.

The coverage varies from system to system and can range from sector-wide to economy-wide approaches. In many cap-and-trade schemes, the coverage usually includes the electricity, energy and industry sectors. It is determined by the availability of information on emissions and the respective measurement methods and systems in place. Pilot schemes and modelling exercises are used to determine the best measuring methodologies. Through them, the greenhouse gases, sectors and entities (including the scale) that will be covered in the cap-and-trade scheme can be determined, based on eco-efficiency criteria. The coverage must also be evaluated by the government, the participating entities and the public. To ease their introduction, cap-and-trade schemes can start with a narrow coverage and then gradually expand to include additional sectors or entities that will be subjected under the scheme at a later stage or it can be linked to other cap-and-trade schemes or regions, for example via the offset mechanisms.

Allowance allocation and auctioning

Governments determine how the allowances are distributed, based on national allocation plans. The distribution of allowances is primarily carried out in the form of a free allocation or through auctioning. Free allocation is based on participating entities' historical emissions (also referred to as “grandfathering”) or on estimates of future conditions or production levels. In the initial start-up period of the cap-and-trade scheme, allowances or permits may be allocated for free to participating entities to discourage them from moving outside the designated boundaries of the scheme (country, state, etc.), which would cause “carbon leakage” (see details further on). Free allocation is also a way to reduce the financial burden that is incurred on the scheme's participants and protects their competitiveness during the adjustment period. Other transitional measures include different

⁷ Julia Reinaud, *Trade, Competitiveness and Carbon Leakage: Challenges and Opportunities*, Energy, Environment and Development Programme Paper 09/01 (London, Chatham House, 2009). Available from www.chathamhouse.org/sites/default/files/public/Meetings/Meeting%20Transcripts/0109reinaud.pdf (accessed 12 April 2011).

⁸ *ibid.*

⁹ Additional means that the emission reductions would not have occurred without the offset scheme under business as usual conditions.

¹⁰ Hood, *op. cit.*

¹¹ Pew Center on Global Climate Change and The Pew Center on the States, *Climate Change 101: Understanding and Responding to Global Climate Change* (Arlington, VA, 2009). Available from www.pewclimate.org/docUploads/Climate101-Complete-Jan09.pdf (accessed 26 February 2012).

¹² *ibid.*

entry dates into the scheme for businesses relative to their readiness, selling allowances at a fixed price, a transitional price cap, partial obligations or prohibiting the banking of allowances to subsequent periods.¹³

Governments have to keep in mind that over-allocation and “gaming”¹⁴ can delay action by the participants. As well, grandfathering permits can fall short of the emissions reduction potential and also reduce government revenue.

Box 1: The European Union’s Emissions Trading System

The European Union’s Emissions Trading System (EU ETS) features a combination of auctioned and free allocations (table 1). In the third phase of the EU ETS, starting from 2013, 100 per cent of the allowances for the power sector will be auctioned.¹⁵ Other sectors will have to purchase only 20 per cent of their allowances through auctions in 2013, while 80 per cent will be allocated for free. The share of auctioning for these sectors will be increased every year, to 70 per cent by 2020 and ultimately to 100 per cent in 2027. For sectors at risk of leakage, meaning that they may suffer competitive disadvantage against competitors outside the European Union that do not have to comply to emissions reduction commitments, up to 100 per cent may be allocated free of charge. For all sectors, benchmarking and not grandfathering will be the adopted method to arrange the free allocation.¹⁶

Table 1: EU ETS auctioning rates per sector, 2013 and beyond

Sector	2013	2020	2027
Power generation	100%	100%	100%
Power generation in new EU member states	30%	100%	100%
Other	20%	70%	100%
Sectors at risk of carbon leakage	Up to 100% may be allocated free of charge		

Source: CMS Cameron McKenna LLP, *Phase III of the EU Emissions Trading Scheme: Your Q&A Guide* (London, 2009). Available from www.law-now.com/cmck/pdfs/nonsecured/phase3.pdf (accessed 21 March 2012).

Market price of allowances

The price of the allowances varies as a result of their demand and supply in the market. Forecasting the business-as-usual level of emissions is difficult because it is not static; weather, economic conditions, energy resource prices and other factors affect the emission trends.¹⁷ Thus it is also difficult to predict the price of the allowances. Placing price floors and ceilings has been one way to control the price volatility and price uncertainty and build investor confidence. In such cases, a public institution can be a seller of allowances when the price is high and a buyer when the price is low.¹⁸ The downside of having these political interventions in the market mechanism is that they may undermine the effectiveness of the cap-and-trade scheme.

According to the World Bank, the value of the global carbon market grew in 2009 to US\$144 billion, up 6 per cent from 2008, despite the financial crisis. In the European Union’s Emissions Trading System (EU ETS), more than 6 billion European Union allowances (EUAs) were transacted in 2009, for a total value of US\$118 billion.¹⁹

¹³ Hood, op. cit.

¹⁴ Gaming is when businesses embellish historical emissions or exaggerate difficulties in adjustment and thereby gain substantial profits from large allowances, according to Nicholas Stern, *Blueprint for a Safer Planet* (London, Vintage U.K. Random House, 2009).

¹⁵ For new EU member states, that feature little interconnection with the EU electricity network or very low GDP per capita, this restriction is eased to 30 per cent auctioned allowances in 2013, but will be aligned to 100 per cent by 2020.

¹⁶ Hood, op. cit.

¹⁷ Hood, op. cit.

¹⁸ Nicholas Stern, *Blueprint for a Safer Planet* (London, Vintage U.K. Random House, 2009), p.109.

¹⁹ World Bank, “Global Carbon Market Grows to \$144 billion Despite Financial and Economic Turmoil” Press release, 26 May 2010. Available from <http://climatechange.worldbank.org/news/global-carbon-market-grows-144-billion-despite-financial-and-economic-turmoil> (accessed 25 April 2011).

Trading

Carbon credits are exchanged on trading platforms,²⁰ such as the European Climate Exchange in London, the European Energy Exchange in Leipzig, the Nord Pool in Oslo, the Bluenext in Paris and the Chicago Exchange in Chicago. The credits can be traded over the counter through brokers (banks or members of the exchange), among operators of businesses and through futures and spot markets. Voluntary credits, which can be used as offsets, are sold in dedicated trading platforms.

Basic infrastructure needs to be in place before the trading begins: registries to collect data on emissions; accredited verifiers; exchanges and over-the-counter systems to enable trading; financial institutions (banks); human resources, including information providers and analysts; and project developers.

Monitoring and compliance

Strict monitoring and enforcement is critical for ensuring the credibility of the scheme. Data collection and analysis is a vital element to kick off a cap-and-trade scheme, especially for setting the appropriate emissions cap. A registry must be set up to track and verify emission reductions from the participating entities. Verification of data is carried out by a third-party audit or through self-reporting with auditing. Many developing countries, however, may lack the capacity to collect and analyse the data necessary to operate this kind of emissions registry. In this case, technical assistance from experienced industrialized countries can be effective in designing and employing cap-and-trade schemes. Some countries can build on existing systems and capacities at the national level; for example, existing data collection and monitoring infrastructure for conducting greenhouse gas inventories (which respond to the reporting requirement of the climate change National Communications under the United Nations Framework Convention on Climate Change) can be used to measure emissions and emission reductions and assure compliance with the cap-and-trade scheme.

In the case of non-compliance, penalties, such as fines, are imposed on the emitters and should be set high enough to act as a deterrent.

Carbon leakage

For many countries and industries, competitiveness is a major issue that must be considered before such a scheme is introduced. One of the more critical concerns is "carbon leakage", whereby emissions-intensive and energy-intensive businesses relocate to regions and countries that are less stringent on carbon regulation. This process undermines the environmental effectiveness of the cap-and-trade scheme. It also impacts on the industrial competitiveness of the CO₂ trade-exposed sectors, resulting in the loss of profits, outputs and jobs and is thus a significant worry for investment plans and other business decisions.

Despite the concerns about carbon leakage, studies of the EU ETS found that since 2005 the scheme had not triggered any changes in the trade flows or production patterns for cement products, iron and steel, refineries or aluminium.²¹ This was attributed to policy measures designed to lessen the impact on industries, including through the free allocation of allowances. Another way to minimize carbon leakage is through the introduction of a global cap-and-trade scheme, which would make all countries subject to putting a cap on their emissions and result in a more level competing field. Other proposed alternatives include border tax adjustment systems or sector-based approaches.

Need for complementary policies

To ensure effectiveness, a cap-and-trade scheme needs to be supported by complementary policy measures, including regulations, standards and incentives. Some complementary policies are energy-efficiency standards,

²⁰ The Garnaut Climate Change Review (Australia) recommends certain considerations for the design of a trading platform: accessibility for those wanting to participate in the market, ability to secure the exchange quickly and at minimal cost and transparency of offers and bid prices. For more details, refer to Garnaut Climate Change Review, *Emissions Trading Scheme*, Discussion Paper (Canberra, 2008).

Available from

[www.garnautreview.org.au/ca25734e0016a131/webobj/d0836448etspaper-final-fullcolour/\\$file/d08%2036448%20%20ets%20paper%20-%20final%20-%20full%20colour.pdf](http://www.garnautreview.org.au/ca25734e0016a131/webobj/d0836448etspaper-final-fullcolour/$file/d08%2036448%20%20ets%20paper%20-%20final%20-%20full%20colour.pdf) (accessed 25 February 2012).

²¹ Reinaud, op. cit.

support for R&D and the deployment of low-carbon technologies, promoting energy-efficient vehicles and facilitating renewable energies. Not all greenhouse gases can be covered by one single cap-and-trade scheme, and thus the introduction of additional schemes working in parallel will be required.²²

Another concern is that the accrued costs for allowances, trading and production adjustments incurred by the cap-and-trade scheme will be passed down from the energy-intensive sectors to consumers through a rise in prices for goods and services whose production entails a large amount of emissions. Studies show that even under grandfathered allocations, prices of energy-intensive products will increase because businesses will use the opportunity to maximize their profits. As such, governments will also need to consider policies that lessen the impact of such price increases on the consumers as well as those to recover windfall profits of businesses, especially from the power sector, such as limiting the amount of free allowances by adopting auctioning methods.

Employing a cap-and-trade scheme will require a steep learning curve for everyone involved. Policymakers should allow for a transitional phase in which experience and knowledge can be accumulated. During this phase, policymakers must also provide sufficient economic support, such as tax breaks and loan guarantees, to give businesses enough time and financial leverage to prepare their participation in the scheme and thus better protect their industrial competitiveness.

Government use of revenue from cap and trade schemes

To gain public acceptance, governments need to provide information on the constructive use of revenues from the auctioning of allowances – uses that contribute back to society. Governments may use the revenues to fund various mitigation policies, such as R&D, to invest in renewable energy technology or to compensate low-income households for higher energy bills through direct rebates or energy-efficiency programmes. In the forthcoming third phase of the EU ETS, for example, 50 per cent of auction revenue is to be used to fund greenhouse gas reductions and climate change adaptation through R&D, renewable energy and improved energy efficiency and reduced deforestation. As well, some allowances are to be auctioned to fund demonstration carbon capture and storage projects.²³

Strengths of a cap-and-trade scheme

- **Reduces greenhouse gas emissions efficiently.** A market mechanism, like the cap-and-trade scheme, is a powerful tool for a climate change mitigation policy that leads to a cost-efficient reduction of greenhouse gas emissions.
- **Ensures carbon emissions reduction quantities.** Cap-and-trade schemes provide more certainty over the emissions reduction potential compared with the carbon tax, although they may incur higher administrative costs.
- **Influences consumption and production patterns.** The scheme is also highly effective in influencing production and consumption patterns within the economy by adding the carbon price to energy-intensive products and thereby facilitating the shift to low-carbon production methods and goods and services.
- **Provides innovation incentives for the private sector.** Carbon markets provide price signals and incentivize the private sector to look for options that will bring the lowest abatement costs, which in turn drives technological innovations and investments.
- **Creates revenue that can be directed to compensate consumers or to fund related programmes, such as energy efficiency-improvement programmes,** low-carbon technology R&D and technology demonstration projects.²⁴

²² Hood, op. cit.

²³ Hood, op. cit.

²⁴ Hood, op. cit.

Challenges for implementing a cap-and-trade scheme

- **Competitiveness.** How to maintain the domestic industrial competitiveness is a central issue that needs to be considered when introducing a cap-and-trade scheme. In terms of the trade-exposed sectors, the international competitiveness is more vital. However, competitiveness concerns can be turned into business opportunities. For instance, early movers in energy-intensive sectors can improve their competitiveness by investing in R&D for low-carbon technology innovation and their commercialization and deployment (breakthrough technology).
- **Investor confidence.** Governments must build investor confidence by designing a stable and well-functioning cap-and-trade market through policies that ensure the credibility, predictability, simplicity and transparency of the scheme. Introducing the scheme will mean that businesses need to change their modus operandi by investing time and financial resources. Some businesses will need to retrofit existing infrastructure or install new infrastructure and equipment, which will require huge upfront investment. Economic instruments, such as tax incentives, loan guarantees and R&D funds, are needed to buttress the situation and minimize investment risks for the private sector.
- **Institutional capacity.** These schemes need to be well designed with good institutional foundations, including a designated authority that is responsible for the registry, monitoring, reporting and compliance systems and backed by appropriate legislation.
- **Cost of innovation.** Although technological innovation alone does not enable countries to make the transition to a low-carbon development path, it is an important driver. Inducing technological innovation, however, requires huge financial resources. A well-designed cap-and-trade scheme can generate sufficient revenues that support R&D investments.

NOTE: For a comparison between carbon taxes and cap-and-trade schemes, see the fact sheet on carbon pricing.

Implementing strategies

Strongly commit to an emissions trading scheme: The government's role in setting up an emissions trading scheme is critical, especially for fixing the cap and designating the coverage and allocation of permits. Governments must show strong leadership by providing a clear and consistent long-term vision and a strategy to motivate and obtain acceptance from all actors, especially the business sector. Governments must ensure that the necessary infrastructure is in place, such as trading exchanges and registries.

Provide predictability through long-term policy and price signals: Medium- and long-term emissions reduction goals and related policies foster a sense of predictability that incentivizes businesses to plan ahead and to look for the least expensive abatement methods, which fosters investments in R&D for technological innovations, low-carbon technologies and infrastructure. Also crucial for building investor confidence is a coherent policy framework for the energy, technology and industry sectors. Additionally, a phased cap-and-trade scheme promotes business sector reassurance, especially with periodic reviews of the cap levels.

According to an International Energy Agency study, "providing certainty over the trading scheme's environmental goals – and related prices of CO₂ – for ten years increases low-carbon investment: with less than this, it is in investors' interest to take a 'wait and see' approach and this leads to higher system prices overall."²⁵

Set stringent cap levels: Mandatory target setting and emissions caps are essential. The stringency determines the effectiveness and efficiency of the schemes. Governments must ensure that the cap is set below the business-as-usual emission levels. Policymakers must take bold steps in setting and announcing the long-term goals, targets and caps at a very early stage to enable businesses and government institutions to prepare.

²⁵ Hood, op. cit., p. 55.

During the initial phases, caps can be set at a modest rate to help businesses adjust, make investment plans and ease the pressure on industrial competitiveness and thus lessen negative impacts.²⁶ At the same time, it is important that governments also provide assistance to businesses in making the transition, especially towards the carbon-intensive and trade-exposed sectors. This then is followed with a raise in the caps in the ensuing phases. Additionally, measures are needed that prevent an oversupply of allowances, which would reduce their value and lead to a price collapse.

Define the coverage scope: The coverage determines the emission sources and entities that will be responsible for emission reductions (either upstream or downstream). The coverage must be discussed and agreed by all actors in the design stage of a cap-and-trade scheme.

Embrace free allocation in the early phase of the scheme and include auctioning at the later stages: Free allocation is important in the initial phases of the scheme to ease the economic burden on participating entities. However, to prevent an oversupply of allowances in the market, governments are highly encouraged to gradually transition to fully auctioning the allowances as the cap-and-trade scheme gains maturity. This applies especially to the energy (electricity) sector. Although this shift may be very challenging politically, it can speed up the settling period of the scheme.

Consider providing support towards consumers, especially low-income households: In many cases there is resistance towards the introduction of a cap-and-trade scheme due to concerns that it may raise consumer electricity prices. A number of measures can be introduced as compensation for consumers from the revenues generated through the auctioning of allowances. Special attention needs to be given to support low-income households. Measures can include direct cash transfer, tax breaks or subsidies to limit consumer price rises (shielding). Other options can be the introduction of consumer energy-efficiency programmes, which prevent a raise in the total energy cost for the consumer despite an increase in energy prices.²⁷

Use auction revenues wisely to benefit society: Revenues can also be directed towards supporting the research, development and demonstration of low-carbon technologies and low-carbon development programmes.

Ensure that the public is adequately informed about the cap-and-trade scheme before and during its implementation (particularly with regards to the benefits, challenges and government support measures): Transparency on the amount, the distribution and use of the revenues generated from the cap-and-trade schemes are important factors to garner public support.

A concise implementation checklist for developing countries is offered in box 2.

Box 2: Implementation checklist for developing countries

- ✓ Set national mitigation targets and goals.
- ✓ Consider including carbon pricing in national climate change action plans, development plans or low-carbon development plans.
- ✓ Organize dialogues with parties to facilitate understanding and promote public acceptance.
- ✓ Commit to a cap-and-trade scheme.
- ✓ Consider integrating the cap-and-trade scheme as part of the nationally appropriate mitigation actions (NAMAs) framework.
- ✓ Designate an authority for implementing and overseeing the scheme.
- ✓ Consider seeking technical assistance for designing and implementing a cap-and-trade scheme, specifically to:
 - Collect baseline emission data and set up methodologies for measuring, reporting and verifying emissions
 - Undertake modelling exercises to determine the potential carbon emissions, cost, impact on industrial competitiveness and impact on society
 - Set an appropriate and manageable cap
 - Identify the coverage – the sectors, businesses and gases that will be covered

²⁶ Consideration is required toward ensuring that "target pathways in the early years are sufficiently ambitious for long-term cuts to remain achievable and that the ETS design options selected are compatible with ambitious caps in the long term." Cited from Hood, op. cit., p.18.

²⁷ Hood, op. cit.

- Determine implementing phases and respective allocation methods (free distribution or auctioning)
- Determine price floors and ceilings for allowances
- Determine appropriate systems and institutions that need to be in place (for example, registry, inventory, data collection and assessment, monitoring, verification and compliance)
- Identify and undertake institutional capacity improvement through human resource development (training and workshops).
- ✓ Establish and put in place appropriate systems and institutions.
- ✓ Provide economic incentives to businesses to support the transition.
- ✓ Provide support to ease consumer impact, especially for low-income households.
- ✓ Use revenues from the cap-and-trade scheme to benefit society.
- ✓ Ensure transparency of the amount and redistribution of revenues generated from the cap-and-trade scheme.
- ✓ Inform the public on every aspect of the scheme: why, how it works and how it benefits.

Examples from around the world

India: The National Action Plan for Climate Change²⁸ promotes, with the intent of expanding, the share of domestic renewable energy in India. The plan proposed an enhancement to the regulatory energy tariff regime through the introduction of a renewable purchase obligation (RPO) scheme, dubbed by the Dynamic Minimum Renewables Purchase Standard. The RPO is maintained by the State Electricity Regulatory Commission and mandates the purchase of a minimum share of renewable energy in the total consumption in the area of a distribution licensee.²⁹ In fiscal year 2009–2010, the minimum purchase quantity from renewable sources was set to 5 per cent of the total grid power purchase. It was also decided that this quantity shall increase by 1 per cent each year for the following four years, reaching 9 per cent by 2013.³⁰

In November 2010, renewable energy certificates (RECs) were launched as a mechanism to assist states that cannot meet the RPO. The REC value is equivalent to 1 MWh of electricity injected into the grid from renewable energy sources and is issued to a renewable energy generator by a central agency. To meet their obligations, utilities may either purchase renewable power or buy the RECs from a renewable energy generator or a combination thereof.³¹

In addition, the Perform, Achieve and Trade (PAT) mechanism covers facilities that account for more than 50 per cent of the fossil fuel used in India. The mechanism will help reduce CO₂ emissions by 25 million tonnes per year by 2014–2015. Approximately 700 of the most energy-intensive industrial units and power stations in India are mandated to reduce their energy consumption. An energy saving certificate will be issued to entities that achieve savings above the mandated target. These certificates may be sold to other entities that are unable to make sufficient energy consumption cuts in their own facility to meet the mandated targets.³²

Republic of Korea: A carbon market is envisioned as the major policy tool for the Government's National Strategy on Green Growth. Article 46 of the Framework Act on Low Carbon, Green Growth mandates the introduction of a cap-and-trade scheme to meet the national emissions reduction target. However, specifications for the registration, management, allocation and the operational structure of the scheme will be covered by a Bill for Greenhouse Gas Emissions Trading System, which is still under review. The emissions trading system is expected to start in 2015.

²⁸ India, *National Action Plan on Climate Change* (New Delhi, Prime Minister's Council on Climate Change). Available from http://pmindia.nic.in/climate_change_english.pdf (accessed 27 February 2012).

²⁹ Renewable Energy Certificate Registry of India website "About REC". Available from www.recregistryindia.in/index.php/general/publics/AboutREC (accessed 27 February 2012).

³⁰ India, *Maharashtra Electricity Regulatory Commission: (Renewable Purchase Obligation, its Compliance and Implementation of REC Framework) Regulations, 2010* (Mumbai, Maharashtra Electricity Regulatory Commission, 2010). Available from [www.mercindia.org.in/pdf/Order%2058%2042/Final_MERC\(RPO-REC\)_Regulation_2010_English.pdf](http://www.mercindia.org.in/pdf/Order%2058%2042/Final_MERC(RPO-REC)_Regulation_2010_English.pdf) (accessed 21 March 2012).

³¹ Renewable Energy Certificate Registry of India website "About REC". Available from www.recregistryindia.in/index.php/general/publics/AboutREC (accessed 27 February 2012).

³² India, *India: Taking on Climate Change Post-Copenhagen Domestic Actions* (New Delhi, Ministry of Environment and Forests, 2010). Available from <http://moef.nic.in/downloads/public-information/India%20Taking%20on%20Climate%20Change.pdf> (accessed 27 February 2012).

As an interim measure to prepare businesses before the full-fledged emissions trading system is introduced, the Government introduced an Emissions Target Management Scheme in January 2012 that sets a cap on 1,564 facilities, including about 470 private entities,³³ that collectively emit more than 442 million tonnes of CO₂ per year.³⁴ Under this scheme, heavy emitters and the Government mutually agree on a viable emissions target, limiting either the amount of greenhouse gas emissions or energy consumption levels. Emission targets are to be reviewed annually. However, the penalty for non-compliance – a fine of up to 10 million won (approximately US\$9,000) – may not be enough of a deterrent.

In 2010, 13 provincial governments ran a pilot cap-and-trade scheme for public organizations. A platform was established at the Korea Exchange for more than 600 public and private organizations. In Seoul, 115 transactions were made by 47 public and private firms, amounting to 654 tonnes of emissions, equivalent to more than 16 million won. The city government set the price at 22,800 won (approximately US\$20) per tonne of CO₂ at the exchange, as of September 2010, based on the European Climate Exchange Market price of 15.44 euro (US\$20) per tonne. The cyber trading in September 2010 alone involved 32 public agencies trading 316 tonnes of emissions, equivalent to about 3.7 million won (US\$3,300). In addition, the Ulsan metropolitan government launched its first online carbon trading market in June 2010, with 228 tonnes of emissions traded so far.³⁵

Ukraine: In 2010, the Government proposed a joint carbon market with its neighbouring countries, Belarus, Kazakhstan and Russia.³⁶ Kazakhstan is also exploring options for setting up a domestic carbon trading system.

Mexico: In 2010, the Law for Mitigation and Adaptation was approved by the Mexico City Assembly. The law allows the Mexico City government to introduce green taxes, provide financial incentives for environmental improvements and to create a domestic carbon market.³⁷ The Mexican Government is working on a cap-and-trade scheme, currently in the design stage, which will cover the cement, petroleum and electricity sectors.³⁸

Brazil: Brazil is considering a domestic carbon market for its primary economic sectors.³⁹

³³ Hyon-hee Shin, "Korea Braces for Carbon Trading System", *Korea Herald*, 12 April 2011. Available from www.koreaherald.com/business/Detail.jsp?newsMLId=20101102000986 (accessed 8 January 2012).

³⁴ *Point Carbon*, "Korea Unveils Carbon Scheme Rules", 21 March 2011. Available from www.pointcarbon.com/news/1.1519474 (accessed 5 January 2012).

³⁵ *ibid.*

³⁶ Kateryna Choursina, "Ukraine Proposes Creating a Joint Carbon Market with Russia, Kazakhstan", *Bloomberg*, 13 September 2010. Available from www.bloomberg.com/news/2010-09-13/ukraine-proposes-creating-a-joint-carbon-market-with-russia-kazakhstan.html (accessed 23 April 2011).

³⁷ Jennifer Andreassen, "Mexico City Passes Historic Climate Bill While U.N. Climate Talks Remain Sluggish", *Environmental Defense Fund Talks Global Climate*, 4 December 2010. Available from <http://blogs.edf.org/climate/talks/2010/12/04/mexico-city-passes-historic-climate-bill-while-u-n-climate-talks-remain-sluggish/> (accessed 23 April 2011).

³⁸ Alex Morales, "Mexico Plans Carbon Market for Pemex, Power, Cement Businesses", *Bloomberg*, 9 April 2009. Available from www.bloomberg.com/apps/news?pid=newsarchive&sid=aKYM6lkFL70g&refer=latin_america (accessed 23 April 2011).

³⁹ *Point Carbon*, "Brazil Considers Domestic Carbon Market", 6 May 2010. Available from www.pointcarbon.com/news/1.1442709 (accessed 23 April 2011).

Figure 1 provides an overview of some of the mandatory emissions trading schemes currently operating around the world.

Figure 1: Mandatory emissions trading schemes

Geographical Scope	Name of ETS	Target Pollutant	Target Organisation
<i>International ETS</i>			
European Union* (2005~)	EU-ETS	6 GHGs ^b	Electricity generation and energy-intensive industries; aviation will be added from 2012.
<i>National ETS</i>			
New Zealand (2008~)	NZ-ETS	6 GHGs ^b	The scheme has no cap on emissions but strong links to international markets. Targets include all gases and sectors, including agriculture (from January 2015) ^c
Switzerland (2008~)	Swiss-ETS	Energy-based CO ₂	Around 350 companies are covered by the scheme, though targets are negotiated on a case-by-case basis ^d
United Kingdom (2010~)	Energy Efficiency Scheme	Energy-based CO ₂	Around 5 000 large businesses and public sector organisations using over 6 000 megawatt-hours of electricity (excluding those covered by the EU-ETS)
<i>Sub-national ETS</i>			
New South Wales, Australia (2003~)	Greenhouse Gas Reduction Scheme (GGAS)	GHGs from electricity production	Energy producers and highly energy-intensive users
Alberta, Canada (2007~)	Alberta trading scheme	Industrial GHGs	Around 100 very large emitters (over 100 000 tonnes of CO ₂ equivalent per year), such as oil sands mines and coal-fired power plants
North-eastern & Mid-Atlantic regions, United States (2009~)	Regional Greenhouse Gas Initiative (RGGI)	Energy-based CO ₂ from power plants	Electricity generators
<i>City-based ETS</i>			
Santiago, Chile	Emission Offset Program of Supreme Decree No. 4	Total suspended particulates	Stationary combustion sources with an exhaust gas flow rate greater than 1 000 m ³ per hour
Tokyo, Japan (2010~)	Tokyo-ETS	Energy-based CO ₂	Mandatory emissions reduction for large emitters, defined as single buildings or facilities that consume more than 1 500 KL crude oil-equivalent a year
Los Angeles, United States	Regional Clean Air Incentives Markets (RECLAIM)	NOx (nitrogen oxides), SOx (sulphur oxides)	Facilities emitting more than 4 tonnes a year of either gas
Chicago, United States	Emissions Reduction Market System (ERMS)	Volatile organic compounds, particularly tropospheric ozone	Stationary sources emitting more than 10 tonnes per season (2 seasons per year)

Notes:

a) EU 27 plus Norway, Iceland and Liechtenstein. The last three have been linked to EU-ETS since 2008; b) Six GHGs are carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF₆); c) Obligations are placed on emitters to surrender 1 eligible NZU (New Zealand Unit) for every tonne of CO₂ emitted. The price of 1 NZU is set at NZD 25 (though it is set at half the price, NZD 12.5 or €7, during the transition period, 2010-12). Participants in the scheme can import and surrender eligible Kyoto units (CERs for CDM and ERUs for JI), convert NZUs to Assigned Amount Units and export them. The government has the power to accept units from other ETSs; d) Under discussion with the EU to link the scheme to the EU-ETS from 2013.

Sources: Hood (2010); OECD (2011a); World Bank (2010a); <http://environment.alberta.ca>.

Source: Organisation for Economic Co-operation and Development, *Southeast Asian Economic Outlook 2011/12* (Paris, 2011).

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Further reading

Reviewing Existing and Proposed Emissions Trading Systems, by Christina Hood (Paris, International Energy Agency, 2010). Available from www.iea.org/papers/2010/ets_paper2010.pdf

Climate Change 101: Understanding and Responding to Global Climate Change (Arlington, VA, Pew Center on Global Climate Change and The Pew Center on the States, 2009). Available from www.pewclimate.org/docUploads/Climate101-Complete-Jan09.pdf