


EMISSIONS TRADING SCHEMES AND THEIR LINKING: CHALLENGES AND OPPORTUNITIES IN ASIA AND THE PACIFIC

ASIAN DEVELOPMENT BANK

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Notes:
(i) In this publication, "$" refers to US dollars.
(ii) ADB recognizes "China" as the People's Republic of China, "Korea" as the Republic of Korea, "Russia" as the Russian Federation, and "Vietnam" as Viet Nam.

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Foreword

A successful policy response to the challenges posed by climate change will be critical to the future development of Asia and the Pacific. With high rates of economic growth, the region must pursue low carbon development path and make its contribution in cutting greenhouse gas (GHG) emissions to keep global warming well below 2°C compared to pre-industrial levels. The recently concluded Paris Agreement on climate change includes a commitment by the global community to drive efforts to limit the temperature increase even lower to 1.5°C above pre-industrial levels.

Without such action, Asia and the Pacific will account for more than 40% of global GHG emissions in the next decade. The region, home to 60% of the world population, is especially vulnerable to the effects of climate change. Rising sea levels and extreme weather events of higher frequency and increased intensity pose vital threats to the health and safety of over 4 billion people in the region and particularly put the poor at risk. However, low carbon growth in the region offers opportunities not only for meting out challenges posed by the climate change but also for enhanced economic activities facilitating more efficient industries to compete more successfully on global markets.

Action on climate change is central to the Asian Development Bank's (ADB's) vision of an Asia and the Pacific free of poverty and its mission to help developing member countries (DMCs) improve the living conditions and quality of life of their people. Robust policies creating the requirement and flexibility to reduce GHGs in a cost-effective manner, as well as supporting the mobilization of finance for the development and deployment of innovative technologies, will be essential to underpin climate change efforts in the region. Emissions trading systems (ETSs) can be important tools for achieving these aims effectively and efficiently. Since the European Union (EU) ETS was founded in 2005, the number and coverage of ETSs have been accelerating. As of 2015 there were 17 ETSs in place across four continents, ranging in scale from city, province, national, and super national levels, which together cover 40% of global gross domestic product (GDP). In Asia and the Pacific there are 11 ETSs operating, with more being planned.

As we look to more concerted and ambitious actions to cut GHG emissions, the linking of ETSs will be an important approach. It encourages emissions savings where they are cost effective, and minimizes the impact of carbon costs on competing industries through a

common carbon pricing mechanism. The Paris Agreement established a mechanism for voluntary cooperative approaches for GHG mitigation between countries, which may in time become the basis for international collaboration on emissions trading.

The growing wealth of experience with ETSs can be valuable to support DMCs that are planning and designing new systems of their own. In view of this, it is an endeavour to summarize some of the most significant learning experiences to date and describes the solutions to the challenges that have been faced. It also provides experiences to help policymakers, drawing on linkages planned or implemented in the United States and EU. While linking may be a longer-term issue for DMCs that are early in their carbon market development journey, the experiences elsewhere with linked systems show the importance of early design choices that can later underpin links between trading systems.

This knowledge product has been developed under the regional capacity development technical assistance project Supporting the Use of Carbon Financing to Promote Green Growth in Asia and the Pacific.

Ma. Carmela D. Locsin
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Preface

This knowledge product on the current and emerging emissions trading systems (ETSs), interlinking of ETSs, and outlook for future carbon markets in Asia and the Pacific has been prepared to support policymakers and practitioners in the development of their ETSs.

Section 1 presents different policy instruments available to reduce greenhouse gas (GHG) emissions and incentivize investment in low-carbon abatement within jurisdictions. The section also lays a particular emphasis on the policy design considerations from the perspective of developing member countries (DMCs).

Section 2 provides an overview of the design of existing ETSs which entails the theoretical building blocks for designing an ETS—with particular emphasis on the modalities and harmonizing requirements to enable linking of ETSs. The section also covers institutional infrastructures, legal foundations, supporting policies, and the basic design of a trading framework. The design issues examined include coverage definition; cap setting; allowance allocation mechanisms; monitoring, reporting, and verification frameworks; and flexible mechanisms. Subsequently, the ways in which these building blocks have been applied in practice in existing ETSs is explored, by presenting an overview of the key design elements of eight existing ETSs.

The descriptions on the building blocks are followed by analyses of the experience of these jurisdictions in implementing and operating these ETSs, reviewing the challenges faced and the lessons learned (Section 3). Particular attention is given to the causes of over allocation in some existing systems, especially in Canada, the US, and the EU, and the measures that have been employed to address these. Detailed examination is given to rules concerning use of offsets for compliance and the effect they have had on abatement within trading systems and on allowance surpluses. Approaches to allocation that mitigate industrial competitiveness while avoiding windfall gains are also highlighted.

Under section 4 an overview of the ETS and related initiatives being developed in DMCs has been provided. This section summarizes the key challenges being faced in these jurisdictions, focusing especially on capacity building, institutional readiness, and coordination issues associated with implementing new trading systems. Section 5 presents a blueprint for developing an ETS based on the lessons learned in existing ETSs. Finally, an overview of the theory and international experience in linking ETSs together with lessons learned from this experience are presented under Section 6.

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This knowledge product has been produced by the Technical Support Facility, a component of ADB's Carbon Market Program under its Sustainable Development and Climate Change Department (SDCC) in implementation of the regional capacity development technical assistance project R-CDTA 8223: Supporting the Use of Carbon Financing to Promote Green Growth in Asia and the Pacific.

Ma. Carmela D. Locsin, director general, SDCC encouraged the development of this publication. Xuedu Lu, advisor, and Preety Bhandari, director, Climate Change and Disaster Risk Management Division (SDCD), spearheaded the development of this knowledge product. Jiwan Acharya, senior energy specialist, Energy Division, South Asia Department and Virender K. Duggal, senior climate change specialist (SDCD, SDCC) supported the development and finalization of this knowledge product.

The research work in preparation of this knowledge product has benefited from inputs and suggestions from the Climate Change Department, National Development and Reform Commission of the People's Republic of China (PRC) and Teng Fei of Tsinghua University, PRC.

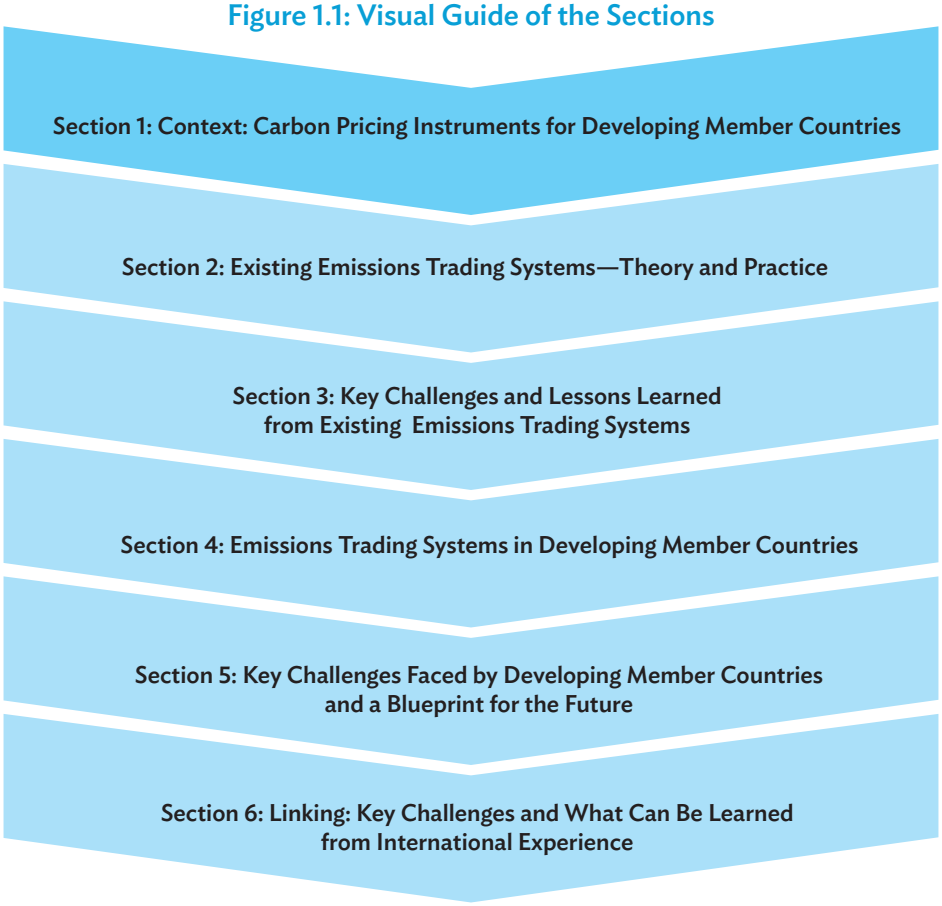
This knowledge product has been prepared with immensely valuable inputs and contributions from: Lingshui Mo, carbon market specialist (consultant); Christian Ellermann, climate finance specialist (consultant), Takeshi Miyata, transaction manager – Future Carbon Fund (consultant), Hanh Le, carbon market expert (consultant) and Madeline Rawlins, principal consultant, Mott MacDonald, UK. It would not have been possible to present this work in its current form without insightful review and excellent contribution from Mark Johnson of Ricardo Energy & Environment - all of which are sincerely commended.

Abbreviations

ADB	Asian Development Bank
BAU	business as usual
CDM	clean development mechanism
CH_4	methane
CO_2	carbon dioxide
PRC	People's Republic of China
CP	compliance period
DMC	developing member country
EETS	energy efficiency certificate trading systems
ETS	emissions trading system
EU	European Union
GDP	gross domestic product
GHG	greenhouse gas
HFC	hydrofluorocarbon
MRV	monitoring, reporting, and verification
N_2O	nitrous oxide
NAP	National Allocation Plan
NH_3	nitrogen trifluoride
PFC	perfluorocarbon
RGGI	Regional Greenhouse Gas Initiative
SF6	sulfur hexafluoride
SMEs	small and medium-sized enterprises
tCO_2e	ton of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
WCI	Western Climate Initiative

1 Context: Carbon Pricing Instruments for Developing Member Countries

Figure 1.1: Visual Guide of the Sections



The 21st Conference of Parties (COP) under the United Nations Framework Convention on Climate Change (UNFCCC) in Paris December 2015 required for the first time that all parties prepare an intended nationally determined contribution to the global climate agreement. The majority of Asian Development Bank's (ADB's) member countries (developing and developed) prepared an intended nationally determined contribution, with varying greenhouse gas (GHG) emissions reductions targets, mitigation and adaptation priorities; and the policies and support required for achieving these.

At a national level, member countries are increasingly developing carbon pricing instruments, such as emissions trading, crediting, and carbon taxes, as part of a suite of policies designed to support their achievement of such goals. In addition, according

to analysis by the World Resources Institute, many member countries have expressed openness to the possibility of using market mechanisms to achieve their climate goals.[1]

In line with ADB's aims to support its developing member countries (DMCs) in their development of carbon pricing instruments, this section introduces the basic concepts and tradeoffs of three key approaches—emissions trading system (ETS), carbon taxes, and crediting mechanisms— and explores how these can be used complementarily, before the remainder of the knowledge product provides an in-depth guide to developing and linking ETSs, with particular emphasis on issues faced by the DMCs.

Carbon Pricing Options

The two main routes for carbon pricing are emissions trading and carbon taxes. The choice of approach will be important for policymakers looking to create a carbon price signal to drive emissions abatement within a sector or multiple sectors of the economy (e.g., industrial, commercial, residential, agriculture, transport). Emissions trading options and carbon taxes can each be cost-effective and efficient ways to realize emissions reductions.

Emissions trading involves tradeable units that are used to represent emissions or emissions savings. It can take the form of a cap-and-trade ETS (referred to here as an ETS) or a crediting mechanism. In an ETS, emissions are capped at a predetermined level and the market establishes an emission price necessary to meet that cap. In crediting mechanisms, emission reductions relative to a baseline or target are credited, which can be for specific projects, sector performance, or the result of policies. The price of credits is determined by demand/supply balance. Actors may purchase credits either for compliance (targets within the system) or voluntary purposes.

For carbon taxes the key difference is that the price of emissions is set by policy makers rather than by a market mechanism. The price level determines the level of economically viable abatement and the emissions result that is achieved.

The choice and design of instruments for any specific jurisdiction will depend on its economic, social, and environmental objectives, circumstances, and the capacities of the parties that would be involved in developing and implementing the system.

These main options are described briefly below. Emissions trading design choices are described in more detail in Section 3, and the complementarity and compatibility with energy efficiency and renewable energy trading systems are considered in Appendix 2.

Emissions trading systems

In an ETS, the main policy lever available to regulators is to control the volume of emission allowances. This is formulated as a cap and translated into emission allowances that are released to the market either for free or at a charge. Mandated participants are required to

[1] Bangladesh, Bhutan, Brunei Darussalam, Fiji, Indonesia, Japan, Kazakhstan, Kiribati, the Republic of Korea, Myanmar, New Zealand, Solomon Islands, Thailand.

acquire emission allowances equal to their determined emissions over a compliance period and surrender these back to the system administrator.

The optimum compliance strategy for participants is to carry out abatement where it is cheaper than the carbon price but buy allowances where abatement would be more expensive. Thus, the price of allowances is dynamic, being determined in the market as the level of incentive necessary to meet the cap. The cost of meeting the target can be further reduced if credits from outside the system are permitted as a means of compliance, in cases where these credits are cheaper than the cost of abatement within the system. In a similar way, linking between ETSs can minimize their collective costs of abatement.

Since the carbon price can vary, the costs to participants are uncertain. To mitigate the impacts, flexibility can be introduced, for example banking and borrowing rules at the participant level and flexibility mechanisms at the system level. Flexibility mechanisms may include the withholding or release of allowances based on the prevailing level of scarcity or price.

Carbon taxes

A carbon tax allows regulators control over the price of carbon emissions, however they have less direct control over the environmental outcome—i.e., the emissions reductions that are actually achieved. It creates a fiscal liability for the emission of GHG, and taxed entities may either incur the liability or reduce it by investing in abatement measures. In the same way as for emissions trading, regulated entities are incentivized to abate emissions where it is cheaper than the carbon price, but not where it is more expensive to do so.

A carbon tax creates a stable price signal for investment in emissions abatement, in so far as the tax rate is known and can be relied upon not to change.

Crediting mechanisms

Crediting mechanisms, whereby credits represent reductions in emission relative to targets or baselines, can be an important mechanism for enabling financial and technology transfer and can be an effective tool for stimulating the growth of the low-carbon economy. Crediting may occur at the project or the programme level or involve the development of sectoral or policy-based approaches.

Crediting mechanisms can be used to complement both ETSs and carbon taxes. Use of credits can provide participants with the flexibility to meet their compliance obligations—whether the surrender of emissions allowances or the meeting of a tax liability. Importantly, credited emission reductions should be additional to those within the policy that is using the credits. Therefore crediting systems should only be created in sectors or regions not covered by the ETS or carbon tax in question. Offsets counted towards the compliance of the buyer within an ETS or carbon tax regime cannot be claimed as reductions in the area where they were generated (double-counting).

Although crediting mechanisms can be developed to complement either an ETS or carbon tax, policymakers may wish to develop a crediting mechanism on a standalone basis to

attract climate finance, whether at a local, national, or international level. Examples of such climate financing include results-based financing instruments, which provide an alternative source of demand for such credits.[2] An increasing number of dedicated funds are emerging with the objective of purchasing robust emission reduction credits (usually with qualitative or quantitative restrictions). Examples include ADB's Future Carbon Fund (FCF), the World Bank's Transformative Carbon Asset Facility, the Pilot Auction Facility, the Forest Carbon Partnership Facility's Carbon Fund, as well as providers of voluntary carbon offsets.

Choosing the Right Carbon Pricing Approach

Further to the inherent design features of carbon pricing options described above, there are additional factors to be taken into account when choosing an approach. Each design option has its relative advantages and suitability to local policy circumstances, and these should be carefully considered when deciding the best way forward.

Readiness

The instruments differ significantly in terms of their readiness requirements, for both the public and private sector.

Stakeholder readiness. While the public and private sector are generally familiar with the implementation and compliance requirements of taxes, the same cannot be said for the role they may be expected to play as regulators, participants, and traders within an ETS. They may require significant capacity building support, and approaches such as pilots or voluntary systems may be necessary.

Institutional infrastructure. A carbon tax may utilize existing tax infrastructure and institutions, for instance through the extension to or revision of energy taxation arrangements. However, ETSs are more complex, requiring the creation and allocation of a new commodity, the establishment of market infrastructure including auctioning mechanisms, and the creation of new regulatory and enforcement arrangements. Both options require strong modeling capacity and good data availability, to set appropriate tax levels or emissions caps.

Monitoring and reporting. ETSs and carbon taxes require the establishment of robust systems for the monitoring and reporting of emissions, and use of emission reductions credits, in order to ensure compliance.

Verification. Both instruments create the requirement for high-quality confirmation of determined emissions, such as third-party verification. This may require access to a pool of suitably qualified and experienced independent and accredited verifiers.

[2] A program where payments are made upon achievement of certain results (i.e., GHG reduction). Clean Development Mechanism is an example of results-based financing.

Structure and Characteristics of Priority Mitigation Sectors

The characteristics of the sector or sectors being targeted will be important in informing policy choices.

Participant number. Large numbers of participants help establish a liquid market for allowances.

Participant size. Larger participant sizes can avoid the costs of monitoring, reporting, and verification (MRV) being disproportionate relative to the emissions of the installation or enterprise covered. Most ETSs have a minimum threshold for size of installations covered. For sectors with multiple small participants such as small and medium-sized enterprises (SMEs), carbon taxes may be preferable.

Alignment with Development Priorities

The choice and design of a mechanism will depend on a country's economic development priorities. Crediting mechanisms can provide a source of financing for emission reductions, where there is a strong demand for the credits that are produced. It can help foster a new low-carbon growth industry focused on certain sectors or technologies and support economic growth in those areas. This may be a particular priority for less-developed countries.

By contrast, carbon taxes and ETSs can impose a net cost on participants and can introduce competitiveness concerns for trade-exposed industries, while the economic impact of the measures may be neutral overall, given the potential income streams for the government. The pass-through of carbon costs can impact society more widely. These are factors in the choice of mechanisms and its coverage but also in the design of mitigation measures such as free allocation for ETSs, carbon tax rebates, or compensation measures. ETSs and carbon taxes can drive greater emissions reductions than crediting, with ETSs (that have an absolute cap) providing a determined emissions trajectory. Therefore for more industrialized countries they can be important for driving decarbonization and realizing co-benefits such as improvements in air quality and public health.

Complementarity of Tax, Trade, and Crediting Systems

A mix of carbon pricing measures can be employed within the same jurisdiction. Some examples include

(i) carbon tax and crediting (South Africa),
(ii) ETS and crediting systems (the Republic of Korea), and
(iii) carbon taxes, ETS, and crediting systems (Japan; the People's Republic of China is considering implementing taxes).

Crucially however, these instruments should not cover the same participants or sectors at any one time. Carbon pricing instruments can also be used sequentially to progressively improve institutional readiness, for example:

(i) Crediting mechanisms can create stakeholder learning (MRV methodologies) and institutional infrastructure (registries) particularly in the public sector, as well as stimulate the pipeline of project developers of GHG mitigation projects, which

can prepare a country for the implementation of an ETS, as is the case in Viet Nam.

(ii) Carbon taxes can similarly create stakeholder learning and institutional infrastructure for the implementation of an ETS, as is the case in Chile.

Emissions Trading Systems in Asia and the Pacific

While the discussion above is concerned with the options and choices for different carbon pricing mechanisms, the remainder of the guide focuses on experiences and lessons learned with ETSs, to support those DMCs who chose to pursue that route. The role of ETSs in the region can be set against the international context.

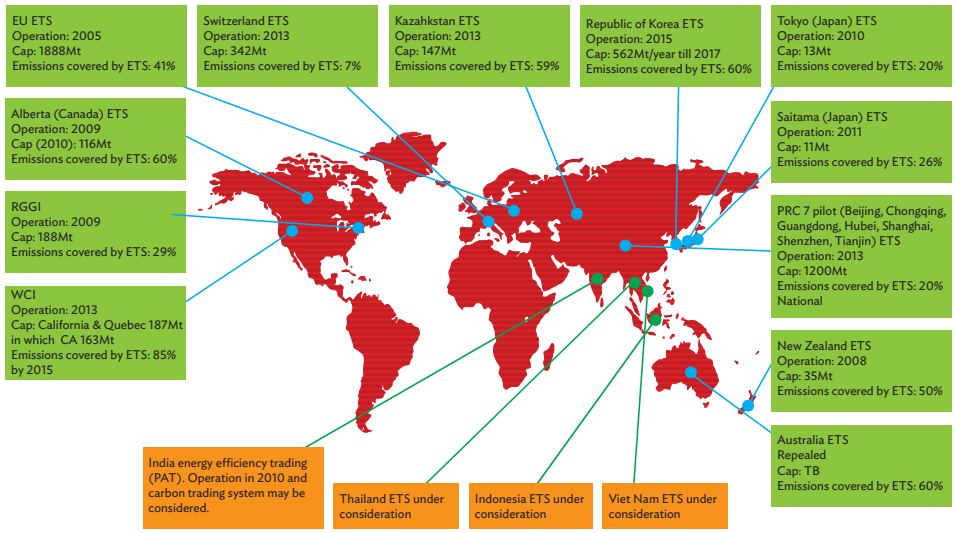
Ten ADB member countries within the Asia and the Pacific region have experience with developing or establishing ETSs, whether at the national or subnational level, as shown below.

Table 1.1: Existing and Emerging Emissions Trading Systems

Existing ETS			
National level	**Province**	**Prefecture/ Municipality/City**	**ETS under development**
Kazakhstan Republic of Korea New Zealand (Australia: now repealed)	Guangdong (PRC) Hubei (PRC)	Beijing (PRC) Chongqing (PRC) Shanghai (PRC) Shenzhen (PRC) Tianjin (PRC) Saitama (Japan) Tokyo (Japan)	PRC (national system) India Indonesia Thailand Viet Nam

PRC = People's Republic of China, ETS = emissions trading system.

Figure 1.2: Existing and Emerging Emissions Trading Systems in Asia and the Pacific



PRC = People's Republic of China; ETS = emissions trading systems; EU = European Union; MT = million ton; PAT = Perform, Achieve, Trade; RGGI = Regional Greenhouse Gas Initiative; WCI = Western Climate Initiative.

Source: ADB 2015.

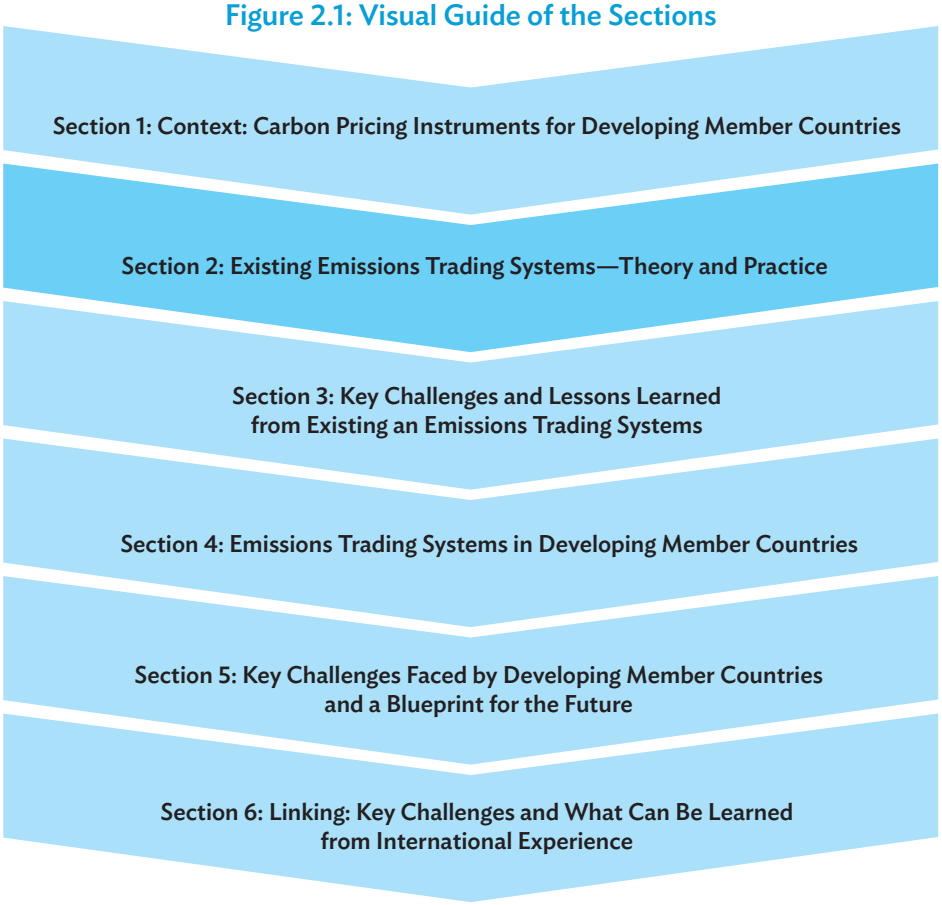
Figure 1.2 provides an overview of these existing and emerging systems in the region.

According to an ADB analysis in 2013, jurisdictions with ETS in operation or under consideration account for about 38% of global carbon emissions.[3] Since then, the interest in developing carbon markets activities in the Asia and the Pacific region has been growing, and with it the potential for linking emerging ETS within the region. The remainder of the guide examines in depth the issues related to developing and linking ETSs, with particular emphasis on issues faced by DMCs.

[3] Asian Development Bank. 2013. Economics of Climate Change. http://www.adb.org/publications/economics-climate-change

2 Existing Emissions Trading Systems—Theory and Practice

Figure 2.1: Visual Guide of the Sections



Theory—Building Blocks of Emissions Trading Systems

This section provides an outline of the basics of emissions trading, the main elements and the principal policy choices when establishing a new system. It elaborates on the brief introduction in Section 2, but focuses solely on the greenhouse gas (GHG) cap and emissions trading system (ETS) option.

Basics of an Emissions Trading System

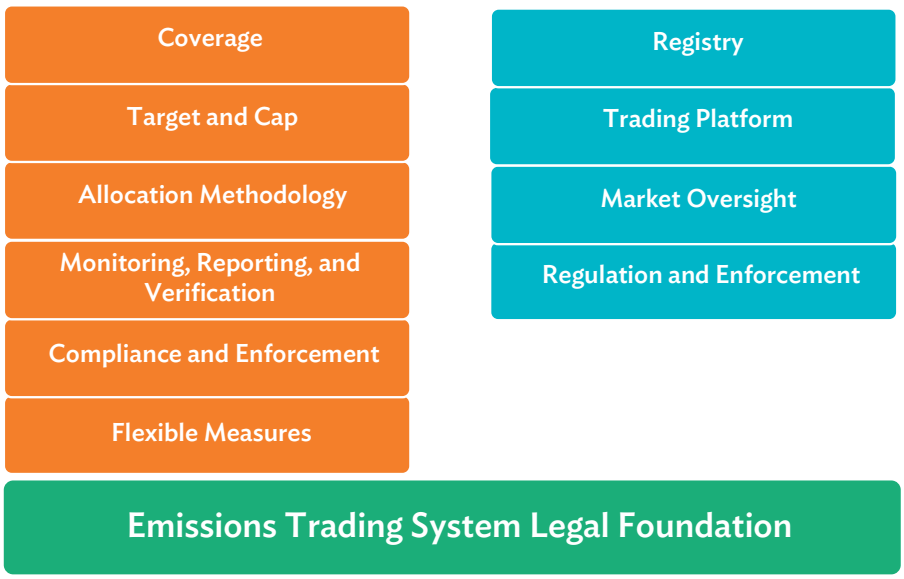
The cap is a limit on the total GHG emissions for obligated participants covered by the system over a given period. Emissions allowances are created that represent, normally, one ton of

carbon dioxide (tCO_2) or ton of carbon dioxide equivalent (tCO_2e). These are released to the market either for free or at a charge and can be traded among participants and, potentially, other market actors. Participants are required to acquire a number of allowances equal to their monitored emissions over a compliance period and surrender these to the system administrator. This approach allows participants the flexibility to choose to abate emissions, for example investing in more efficient technology or using less carbon intensive energy sources, or acquire allowances. If a participant reduces emissions to a level below the number of allowances given for free, then the surplus can be sold at a profit. This flexibility encourages emissions abatement where it can be undertaken most cheaply and provides participants with an incentive to innovate and find new ways to reduce emissions in a cost-effective manner. The cap ensures that a predetermined emissions outcome is realized.

Emissions Trading Elements

The enabling architecture for an ETS comprises three main elements. First is the system design, or framework, which encapsulates the rules that govern what it will cover and how it will function. Next is the institutional infrastructure that covers the implementation systems and regulatory oversight arrangements. Third is the underpinning legal basis for the system. The components of each of these elements are illustrated in Figure 2.2.

Figure 2.2: Key Elements of an Emissions Trading System



Trading Framework

An ETS is structured with certain key elements, such as sector and GHG coverage; the cap; allocation of allowances; the monitoring, reporting, and verification (MRV) regime; compliance and enforcement regulations, and flexible measures that support participants or non-participants in managing costs and improving the robustness of the system in the case of unforeseen events such as economic downturns. These are described below.

Coverage

A key decision in ETS design is which sectors, activities, and GHGs are to be included. In theory, broad coverage that includes more sectors of the economy and a large proportion of emissions within those sectors can provide greater mitigation potential and maximize the GHG reductions and economic efficiency of a system.

Important considerations are the size of the potential sectors to be included, their abatement potential, and the feasibility of regulating them cost effectively via an ETS, taking account the number and size of individual installations or enterprises. Consequently, it is common that energy-intensive industrial sectors and the power sector are included, although other sectors may be important in a national context. Once established, the scope may be expanded over time to include additional sectors. Activity coverage rules may also include thresholds for inclusion, such that only the larger installations or enterprises are covered, which may be expressed in terms of installed capacity, throughput, or annual emissions.

Phase I of the Kyoto Protocol covered six GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). These gases are considered to have the largest contribution to global warming.[4] Phase II of the Kyoto Protocol also includes nitrogen trifluoride (NH_3). Decisions on which gas to include will take account of the level of emissions and cost effectiveness of monitoring the sources of these emissions. The feasibility of monitoring emissions will be vital, since it is important that robust methods are applied to all activities, to ensure the environmental integrity of the cap.

A further design choice is the point within the supply chain at which emissions are accounted for, and hence the regulated entities. The options include upstream regulation, for example the inclusion of fuel suppliers in respect to the emissions associated with the fuel they sell to customers; midstream, meaning regulation at the point of direct emissions; or downstream, in which consumers are responsible for the emissions associated with the products they use.

The upstream approach can be an effective way to cover large numbers of smaller direct emitters (such as in the transport sector) when the carbon cost would be passed down to consumers and encourage more efficient use of the energy supplied. The downstream approach can be effective where market structures would not allow the pass-through of carbon costs from the direct emitters to consumers. For example, in price-regulated electricity systems, without carbon cost pass-through, a downstream approach could create an additional incentive for consumers to use electricity more efficiently.

In reality, there are practical issues to be addressed when defining the scope of the system, such as, technical capacity, data availability, available methodologies for accounting and monitoring emissions, and so on, as well as broader issues of political advocacy and industrial acceptance.

[4] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (1997).

Target and cap

The cap of an ETS represents the quantity of GHGs that covered entities are allowed to emit in a compliance period or phase of compliance periods. An ETS is an enabler for governments to achieve national, regional, or local aims or targets within a sector or selected group of sectors. This means that it should be set by reference to those targets. It also means that consideration needs to be given to how much of the national aim or target is achieved from within the trading system and how much from the nontraded sectors. This decision would take account the relative emissions and economic growth, abatement potential, and effectiveness of other policies in the traded and non-traded sectors.

Decisions on the length of the cap period are important, as is the quality of the analysis that underpins cap setting, since the cap is set with an expectation for future emissions that may not unfold in practice. The cap would lock in the level of emission reduction over a defined period. If that ambition were to be smaller than anticipated, or nonexistent, the system would deliver limited additional abatement. However if it were greater, it risks a high carbon price, as expensive abatement would be needed to meet the cap.

Market mechanisms can also work under a regime of intensity targets, although these would not cap emissions at predetermined levels. Such targets would allow emissions to rise or fall according to economic activity and would set a clear trajectory for improvements in specific emissions efficiency of the regulated sector. Targets could be set as emissions per unit of industrial output or gross domestic product (GDP).

Setting a cap is critical for the effective functioning of an ETS. It is the decisive factor in achieving environmental objectives and determining allowance prices. Cap setting takes into account technical, political, economic and environmental considerations.

Allocation of allowances

Carbon costs to sectors that are subject to competition from outside the system can affect their relative competitiveness and may potentially cause movement of operations and investment in favor of unconstrained (or less constrained) regions, resulting in carbon leakage. Free allocation is often used to protect industrial competitiveness and avoid carbon leakage in the early stages of a system. Where free allocation is employed to address carbon leakage it is necessary to have a transparent mechanism for evaluating the degree to which sectors are exposed to the risk of carbon leakage and the level of free allocation that would be desired to help mitigate that risk. It is more commonly applied to energy-intensive, trade-exposed industrial sectors.

In cases where sectors are able to pass on carbon costs to consumers free allocation can lead to windfall gains, as participants would be compensated for the cost of allowances by the free allocation, yet also recover the cost from the consumers through the price of their products. These pass-through conditions can occur when there is no competition from outside the carbon pricing region, for example in transport or buildings sectors.

Allowances have value and the method of allocation is important and needs to be fair. Allowances may be allocated for free or through the use of auctions, or a combination thereof.

Free allocation of allowances

A free allocation may be based on either historic emissions ("grandfathering") or on benchmarks. Grandfathering requires detailed and verified baseline emissions data for every installation. Benchmarking requires the determination of a specific emissions intensity (the benchmark), which is then multiplied by an activity level determined for each installation. The benchmark may be defined as emissions per unit of production or economic output or per unit of heat or fuel use. The benchmarks may be defined according to actual sector performance or reference technology levels, such as best available technology. The activity levels can be actual historic values, requiring verified installation-level monitoring, or may be derived from installation capacity values and assumptions regarding utilization. Compared to grandfathering, benchmarking rewards those installations that have undertaken mitigation efforts prior to the ETS being rolled out.

The level of free allocation must be consistent with the overall cap including, if applicable, its trajectory over time. It may therefore be necessary to adjust the historic emissions or benchmark-derived amounts in order to achieve this consistency.

If free allocations are made to incumbent installations or enterprises, then consideration needs to be given to how to treat new entrants and closures, that is, installations that either join or leave the system during a compliance year or phase. Free allocation to new entrants can provide parity with incumbents that receive allowances for free, and address the barrier to market entry that would otherwise exist. Similarly, while removal of free allocation to closing installations is common, it can create a barrier to exit and prolong the continued operation of less carbon-efficient installations. New entrant rules can cover extensions in capacity or throughput for existing installations as well as greenfield sites, and likewise closure rules can cover partial as well as full closure.

Auctioning allowances

Auctioning allowances can be a more straightforward method than free allocation, as it does not require collection of baseline data or negotiation of individual allocations or targets. It does, however, require the design of the auction framework and architecture and may need supporting to enable participants to engage effectively. Auctions generate a source of revenue that can for example be used to scale up mitigation by supporting mitigation activities in sectors outside the ETS or to compensate sectors outside the ETS that are exposed indirectly to ETS cost impacts. The revenues could also be used to support mitigation within the ETS sectors, but this itself then requires a means of allocating funds, and influences the level of incentive for abatement provided by the ETS.

Monitoring, Reporting, and Verification

Monitoring is the process of gathering data that is used to determine emissions produced or saved. It can be based on direct emissions monitoring or calculation methods that derive emission from other parameters, such as fuel use. It may involve calculations based on general reference values, such as emission factors for fuels, or specific values, for example the characteristics of fuels used at an installation derived through sampling and measurement. Monitoring rules may contain arrangements for risk-based or tiered

approaches to minimize costs to smaller emitters and to take a proportional approach to monitoring sources.

Reporting is the mechanism and infrastructure by which the regulated entity provides emissions information to the regulator. This can employ a range of possible tools from use of templates to electronic reporting systems and web interfaces. More sophisticated reporting systems can include workflow management for more-holistic facilitation of engagements between regulators, verifiers, and operators during the compliance cycle.

Verification is the process for third-party checking of the correct application of the monitoring method and the accuracy of the reported emissions. Verifiers will be independent from operators and should be accredited to carry out their work in accordance with established standards and protocols.

The MRV system is the core of an ETS, as it is essential to assure the environmental integrity of the system. It is the means by which participants determine their emissions and the number of allowances that they must surrender, so MRV underpins the demand for allowances in the market. Robust MRV systems build confidence in the market that the emission reductions are real and accurate.

Compliance and Penalties

The ETS places obligations on participants to manage their involvement. This can include the maintenance of a permit, monitoring plans, applications for free allowances, trading account management, reporting, and surrender of allowances. A regulatory body is required to establish the systems for these activities, manage approval processes, and take action to enforce penalties for noncompliance in cases where participants fail to comply with their obligations.

Enforcement measures generally include financial penalties and may include public disclosure of noncompliance or criminal sanctions. Financial penalties should be disproportionate compared with the expected carbon cost, to encourage compliance with the system.

The enforcement regime needs to specify treatment of cases where participants fail to surrender the correct number of allowances to match their emissions, including where the emissions were subsequently found to be misreported. To protect the environmental integrity of the system, a "make-good provision" would require participants to acquire allowances equal to the shortfall in those previously surrendered. If the penalty were just a cost per tCO_2 shortfall, then this penalty price would function as a price ceiling on the market. The surrender of multiple allowances to cover past shortfalls is a further option, although this would constitute a gradual (if likely small) tightening of the cap.

Flexible Measures

Flexible measures support the achievement of caps at lower cost to participants and provide them with options for meeting their compliance obligations. They include banking, borrowing, offsets, and linking.

Banking and borrowing

Banking allows surplus allowances in one compliance period to be carried forward for use in subsequent compliance periods. Banking encourages participants to take early actions and gain credit for doing so. In the event of a surplus, banking may smooth out price volatility in the short-term, as excess allowances in 1 year may have value if they can be used in later years during which scarcity is anticipated. On the other hand, unexpected surpluses carried to later years would result in less abatement being undertaken than if banking were not permitted.

Borrowing allows participants to use for compliance allowances that are issued for subsequent years. For example, if the allowance surrender deadline for a calendar year compliance period were April in the year following, but allowances for the subsequent year were issued in February, then borrowing rules would permit the use of the newly issued allowances for compliance with the previous year's obligation. Borrowing could delay abatement actions.

Restrictions on banking and borrowing can be applied differently between years within a phase and between phases.

Crediting mechanisms (offsets)

Crediting mechanisms allow participants to meet their compliance obligations by acquiring and surrendering emission reduction credits that are generated by projects in a crediting system outside the scope of an ETS. They may be from domestic or international projects. Offsets can not only provide more cost-effective mitigation options to participants, but also give an incentive to invest in mitigation in sectors not covered by an ETS.

However, reliance on use of offsets reduces the level of abatement from within the ETS and in the case of international offsets reduces the contribution of a domestic ETS towards national mitigation aims. Therefore, limits on the number of offsets can maintain an incentive for domestic action.

Standards for MRV of offset projects must be as strict as for the ETS to protect the environmental integrity of the system. Criteria for the eligibility of offsets can place restrictions on project types such as those likely to be additional or those that have better sustainability characteristics.[5]

Linking

Linking between ETSs would enable the aggregate caps to be achieved at lower cost, since the cheapest abatement actions would be carried out irrespective of the system in

[5] Emission reductions are 'additional' if the emission reduction project would not have occurred (holding all else constant) in the absence of the incentive provided by the value of the offset credits that are generated. Regarding project based offsetting, four types of additionality tests may be applied: law or regulation test (project is not required by law or regulation), financial test (project is only financially viable with carbon offset revenue), barriers test (project is only viable because it overcomes [non-financial] barriers), common practice test (project does not employ technologies or practices in common use).
Source: Carbon Offset Research & Education. 2011. "Additionality". http://www.co2offsetresearch.org/consumer/Additionality.html

which they fall. This reduces compliance costs for participants. It also enhances regional or international cooperation on climate change and by leveling carbon prices helps to address competition and carbon leakage impacts between the systems (but not with regions outside the systems).

Linking between ETSs requires a strong level of harmonization of system design, including related to the type of cap or targets, stringency of the cap, the enforcement mechanisms, MRV standards, offset eligibility, price containment measures, and so on. Linking is discussed further in Sections 3.2 and 7.

Supporting Measures

The supporting measures described here concern responses to market shocks and measures to address cost concerns for participants and non-participants.

Measures to manage market supply and price

Managing supply of allowances. Unexpected events (e.g., economic downturns or growth) may reduce or increase emissions in the system and therefore impact the balance of supply and demand of allowances. If this is excessive it may create significant and persistent imbalances in the market, for example, surpluses in which carbon prices fall to low levels or shortfalls in which they become very high. Measures such as strategic reserves that are withheld and released under certain market conditions can be useful tools for managing these effects. Importantly, these measures would not affect the overall level of the cap. Changes to the cap are possible, but this may damage the market confidence in the robustness of caps that are subsequently set.

Price caps and price floors are tools that can be used to avoid excessively high or low prices. While these measures provide some reassurance to participants and investors on pricing, they may also create barriers for linking. Excessive intervention in the market may have the effect of reducing investor confidence, so the rules surrounding the use of price mechanisms should be transparent.

Measures to contain costs for participants

Cost containment measures. The introduction of a carbon price increases the production cost of energy-intensive and emissions-intensive industries, which may lead to carbon leakage.[6] Mitigating measures may be needed to address the impacts of carbon pricing in vulnerable sectors such as energy-intensive and trade-exposed sectors. There are various measures to deal with this, such as providing free allowances, discussed in Sections 4.5 and 4.6, recycling auctioning revenues, and providing financial assistance or tax relief to compensate affected industries and households. Any supporting measures that are adopted should complement the system and provide long-term incentives to drive the transformation of industries onto a lower carbon trajectory and to enable sustainable industrial competitiveness.

[6] Carbon leakage means the increase in emissions arising from production relocating to jurisdictions with lower emissions controls (Aldy and Pizer, 2009; Stern, 2006).

Institutional Infrastructure

Regulation and enforcement. The regulatory body will monitor the involvement of obligated entities including carrying out checks on compliance actions such as the management of permits, approval of monitoring plans, reporting of emissions, and surrender of allowances. The regulator should be independent from the participants and have powers to enforce penalties, including, if applicable, bringing criminal prosecutions. The regulator needs to have capabilities on all aspects of ETS compliance and knowledge of the sectors covered by the ETS. The regulator may be responsible for ETS participant capacity building in the early stage, as well as the production of system guidance.

Allowance registry. Participants are obliged to acquire and surrender allowances equal to their verified emissions, and the allowances themselves are tradeable between obligated participants and (possibly) other parties. A registry system for recording ownership, transfer, and surrender of allowances is a pre-requisite for a compliance mechanism and the functioning of the market.

Trading platform. The trading architecture comprises the mechanisms by which market participants can buy or sell allowances, covering a spot market and potentially a futures market. It may include one or more exchanges, brokerage services, and auctions for the government sale of allowances. Services may be provided by the private sector or government agencies.

Market oversight. Oversight of the trading market will be independent of the operation of the market. The regulator will have powers of inspection and enforcement, able to pursue any evidence of fraud or market manipulation. The role will include auction monitoring, carried out either by the regulator or an appointed monitor.

Legal Foundation

An ETS requires a robust legal framework to not only support its establishment but also to safeguard its operation. The legal framework may consist of three levels of regulation:

(i) an overall law or regulation on ETSs including clearly defining key components of the ETS, e.g., the legal nature of allowance; the trading of allowances; related taxation, liability, and accounting issues; legislation on cap setting; allocation; MRV; penalties for noncompliance; registry; trading platform and trading rules; and market oversight;
(ii) detailed technical guidance and standards on each component; and
(iii) administrative regulations for management and governance of the system's operation.

Practice—Existing Emissions Trading Systems

A variety of domestic and regional emissions trading initiatives is emerging, each with specific designs and at different stages of implementation. The jurisdictions covered by these systems range from broad regional (European Union ETS, Regional Greenhouse Gas Initiative, Western Climate Initiative), (Australia, the Republic of Korea, New Zealand), provincial (Alberta), or city level (Tokyo). Their designs are diverse. This section provides

an overview to key design features of the main mandatory systems including both existing and proposed ETSs, assessing their performance and the issues they have faced. It focuses on systems in jurisdictions that are not Asian Development Bank DMCs, since DMCs are described in Section 6 and examined in more detail in Section 5. The jurisdictions covered here are:

Table 2.1: Emissions Trading Systems Examined in Section 6

International	Regional	National	Province	Prefecture
EU ETS Western Climate Initiative (California, US and Quebec, Canada)	Regional Greenhouse Gas Initiative	Republic of Korea New Zealand	Alberta (Canada)	Tokyo and Saitama (Japan)

This section provides an overview to key design features of the main mandatory systems identified above.

European Union Emissions Trading System

The EU ETS is a cornerstone of the EU's climate policy to address climate change. It began operation in 2005 in 25 EU member states. It is the first multinational ETS and it is by far the largest ETS in the world. The system has evolved in phases and is currently operating in its third phase (2013–2020) and will aim to achieve the emission reduction targets set out in the EU 2030 framework for climate and energy policy.

Table 2.2: Overview of the European Union Emissions Trading System

Building block	Description
Coverage	Currently covers 28 EU member states and Iceland, Liechtenstein, and Norway—over 11,000 installations. It is the largest ETS in the world. **GHG:** carbon dioxide (CO_2), methane, nitrous oxide (N_2O), sulfur hexafluoride, hydrofluorocarbon (HFCs), perfluorocarbons, and nitrogen trifluoride. **Sectors:** power stations and other combustion plants with ≥20 MW thermal rated input, oil refineries, coke ovens, iron and steel, cement clinker, glass, lime, ceramics, pulp, paper and board, aluminum, bulk organic chemicals, ammonia, nitric/adipic/glyoxylic acid production, hydrogen, soda ash, carbon black, CO_2 capture and storage. In aviation, limited to flights within the European Economic Area until 2016.
Legal foundation	Established according to Directive 2003/87/European Commission (EC) of the European Parliament and of the Council, of 13 October 2003, establishing a system for greenhouse gas emission allowance trading within the Community and amending Council Directive (96/61/EC).
Targets and cap	Target relative to 1990 and absolute cap: (i) Phase I (PI) - 2005–2007: Not applicable, 2,298.5 $MtCo_2eq$ (ii) Phase II (PII) - 2008–2012: 8%, 2,086.5 $MtCo_2eq$ (1st Kyoto Protocol commitment period) (iii) Phase III (PIII) - 2013–2020: 20%, 1,777 $MtCo_2eq$ (iv) Phase IV (PIV) - 2021–2028: 40%, Not applicable

continued on next page

Table 2.1 *continued*

Building block	Description
Allocation of allowances and carbon leakage	PI and PII: decentralized mainly free allocation, minimum auctioning requirements 5% and 10%. PIII: 43% allowances auctioned. Fully auctioned in power sector. (At least half of auctioning revenues are required to be used for climate and energy-related purposes.) Full auctioning is required by 2027. **Carbon leakage** is mitigated by free allocation to certain sectors considered vulnerable, such as manufacturing and aviation, based on harmonized benchmarks. Proportion of allowances auctioned decreases going forward.
Monitoring, reporting, and verification	Installations are required to have an approved monitoring plan and monitor and report their emissions according to the monitoring and reporting regulations. Third-party verification of an annual emissions report is required. Verified annual emissions reports are due 31 March of the subsequent year, and it is required to surrender the equivalent number of allowances by 30 April.
Compliance and enforcement	Failure to comply incurs a penalty of €100/metric ton in PIII, rising with Eurozone inflation (Consumer Price Index).
Flexible measures	**Banking**: Between phases, was not permitted PI to PII, was permitted PII to PIII, and going forward. **Borrowing**: Not permitted. **Linking**: Norway, Iceland, and Liechtenstein linked in 2008. Negotiations with Australia launched in 2012 but repealed in 2014, with Switzerland under discussion. **Offsets:** Quantity restrictions: in PI determined by member states. Subsequently, offsets limited to 50% of compliance 2008–2020. Quality restrictions: credits from Kyoto Protocol mechanisms (CDM and JI) permitted from PII. From 2004, no nuclear, forestry, land use, land-use change, and forestry, large hydro; from 2010 no HFC-23 and N_2O adipic industrial gas project permitted.
Institutional infrastructure	**Registry and tracking**: The EU registry ensures the accurate accounting of EU allowances issued under the EU ETS and international credits. It records accounts, transactions, national allocation plans, verified emissions, reconciliation of allowances and emissions. The EU transaction log guards the integrity of the EU registry, recording all transfers into and out of the accounts. **Trading platform**: European Energy Exchange and ICE Futures Europe are the primary auctioning platforms. **Market oversight**: EU allowance derivatives and spot trading are subject to the rules of EU financial markets, namely Markets in Financial Instruments Directive 2 (MiFID 2).
Measures to manage market supply and price	**Back-loading of allowances**: To deal with structural surplus, auctioning of 900 m allowances was postponed from 2014–2016 until 2019–2020. **Market stability reserve**: To manage a structural surplus, from 2019, if surplus allowances are above a maximum threshold, they will be placed in a reserve and only released when surplus drops below minimum threshold. Back-loaded allowances will be placed in the reserve. **Offset restrictions**: Due to flooding of the market, JI offsets delivered after 2012 were restricted.

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Table 2.1 *continued*

Building block	Description
Cost containment	(i) Phase I was a transitional pilot phase, with predominantly free allocation, restricted coverage of GHGs and sectors, and lower noncompliance penalties. (ii) Small emitters are given the opportunity to "opt-out" where administration costs might be disproportionately high, so long as they are subject to equivalent measures. (iii) Certain countries that joined the EU since 2004 have been allowed to allocate free allowances to the power sector in Phase III.

ETS = emissions trading system, EU = European Union, GHG = greenhouse gas, $MtCO_2e$ = Million metric tons of carbon dioxide equivalent, MW = megawatt.

Regional Greenhouse Gas Initiative

Regional Greenhouse Gas Initiative (RGGI) is the first mandatory regional ETS among US states in the Northeast and Mid-Atlantic regions. RGGI is comprised of individual state-level cap-and-trade programs and implemented through the state CO_2 Budget Trading Programs, designed according to the Model Rule that was agreed in a memorandum of understanding. Each state's independent regulations, based on the Model Rule, limits emissions of CO_2 from electric power plants, includes provisions for the issuance of CO_2 allowances, and establishes participation in regional CO_2 allowance auctions.

Table 2.3: Overview of the Regional Greenhouse Gas Initiative

Building block	Description
Legal foundation	RGGI was established through a regional agreement by the states, initially signed in December 2005. It established a Model Rule, with each participating state passing regulations and/or statutes based on the Model Rule framework. Program compliance began on 1 January 2009.
Coverage	Currently includes nine states of Connecticut: Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. **Sectors:** 168 power plants over 25 MW. **GHG:** CO_2
Targets and cap	Target and absolute cap (3-year compliance period): 1st CP – 2009–2011: Stabilize emissions, 188 $MtCo_2eqO$ annually. 2nd CP – 2012–2014: Stabilize emissions, 165 MtCo2eq in 2012–2013, 91 $MtCo_2eqO$ in 2014. 3rd CP – 2015–2017: Annual reduction of 2.5% from 2014 base year (91 $MtCO_2e$).
Allocation of allowances and carbon leakage	Model Rule requires the auctioning of at least 25% of the allowances. Quarterly regional auctions are held. From 1st CP to 2013, 72% of total allowances were auctioned. Proceeds used for consumer benefits or strategic energy purposes. **Early action incentive:** Allowances rewarded for reductions 2006–2008. **Carbon leakage:** To deal with the issue of emissions leakage, there may be an expansion of the program at a later date to include emissions associated with electricity imports.

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Table 2.2 *continued*

Building block	Description
Monitoring, reporting, and verification	Mandated entities must report quarterly to RGGI member state environmental agencies, who perform emissions verifications, as well as the US EPA Clean Air Markets Division (latter is a national legal requirement). Third-party verification is required for all offset credits.
Compliance and enforcement	Participants demonstrate compliance by submitting a compliance certification report to the regulating agency at the end of each CP. During the first two years of a CP, participants must hold at least 50% of their total compliance obligation for the CP. Penalty for noncompliance is to surrender allowances equal to three times the number (tons) of excess emissions. In addition, state-specific penalties may apply.
Flexible measures	**Banking:** Unlimited banking permitted between CPs. **Borrowing:** Not permitted. **Linking:** Interest expressed in linking with Western Climate Initiative system. **Offsets:** Quantity restriction: allowed for 3.3% of compliance obligation. Qualitative restrictions: Offsets from five project categories, which must come from projects within the RGGI states and be certified under the state's program: (1) landfill CH_4 capture and destruction; (2) SF_6 emissions reduction from power transmission; (3) CO_2 sequestration from afforestation projects per US Forest Projects Offset Protocol; (4) CO_2 reductions from end-use energy efficiency; and (5) CH_4 abatement from agricultural manure management operations.
Institutional infrastructure	**Registry and tracking:** Emissions data is reported through the US EPA system which is then transferred to RGGI CO_2 Allowance Tracking System (COATS) for review by RGGI participating states. COATS records and tracks emission, allowance, and compliance data, enabling market participants to receive and transfer CO_2 allowances, register and submit reports for offset projects. **Trading platform and market oversight:** An independent market monitor oversees the market to detect attempts of price manipulation or collusion during auctions and exchanges on secondary markets.
Measures to manage market supply and price	**Adjustment due to oversupply:** To manage oversupply, the cap is adjusted downward by a volume equivalent to banked allowances in 1st and 2nd CP. Adjustments spread over 7 years from 2014–2015. **Cost containment reserve (CCR):** RGGI allocates a fixed quantity of CO_2 CCR allowances as set forth in updated Model Rule, that is separate from and additional to the RGGI states caps. This is held in reserve, only to be made available if allowance prices were to exceed predefined price levels, which rise annually. The CCR is replenished at the start of each calendar year.
Cost containment	**Emission leakage:** To deal with the issue of emissions leakage there may be an expansion of the program at a later date to include emissions associated with electricity imports. Auction proceeds are used for consumer benefits.

CH_4 = methane, CP = control period, CO_2 = carbon dioxide, MW = megawatt, RGGI = Regional Greenhouse Gas Initiative, SF6 = sulfur hexafluoride, US EPA = United States Environmental Protection Agency.

Western Climate Initiative Regional Cap-and-Trade Program

The Western Climate Initiative (WCI) is a regional cap-and-trade program among US states and Canadian provinces.[7] The WCI partners collaborated to develop the common rules for WCI partner jurisdictions to design the cap-and-trade program in their jurisdictions. So far, only two jurisdictions have implemented their programs: California and Quebec. Specifics of their ETS are highlighted below.

Table 2.4: Overview of the Western Climate Initiative

Building block	Description
Legal foundation	Individual cap-and-trade programs are designed according to the common rules specified in design for the WCI regional program, then implemented for each jurisdiction's regulation. Intergovernmental recognition agreements form a regional allowance market where the partner jurisdictions recognize each other's allowances and offset credits for compliance and trading.
Coverage	British Columbia, California, Ontario, Québec, and Manitoba continue to work together, but the system only partially began in 2013 with California and Quebec. **GHG**: CO_2, CH_4, N_2O, NH_3, SF_6, HFCs, and PFCs. **Sectors and threshold**: In the first CP the program covers stationary sources of emissions above 25,000 tCO_2e per year from large industrial sources, electricity generation, and imports. In the second CP, it expands to cover suppliers of natural gas, distillate fuel oil, and liquefied petroleum gas.
Targets and cap	Absolute cap is set using gradual linear decline from 2005–2020. **California** (two- and three-year compliance period): CP I (2013–2014): 162.8 $MtCo_2e$ in 2013 (electricity and industry) CP II (2015–2017): 394.5 $MtCo_2e$ in 2015 (includes all covered sectors) CPIII (2018–2020): 334.2 $MtCo_2e$ in 2020, target to return to 1990 levels **Quebec** (two- and three-year compliance period): CP I – 23.2 $MtCo_2e$ in 2013 CP II – 65.30 $MtCo_2e$ in 2015 CP III – 54.74 $MtCo_2e$ in 2020, 20% reduction relative to 1990 levels
Allocation of allowances and carbon leakage	Majority freely allocated, minimum auctioning level at 10% rising to 25% by 2020. Common benchmark approaches used. Early emission reduction allowances were allocated to reward early action. **California**: 50% total allowances will be auctioned throughout CPs. Proceeds are invested in clean transportation and sustainable communities. **Quebec**: 100% auctioning for electricity production and energy distribution as of CPI. Proceeds invested in GHG mitigation, adaptation, and public awareness.
Monitoring, reporting, and verification	In the US, reporting requirements are harmonized with the Environmental Protection Agency mandatory reporting rules for GHG emissions, and equivalent standards are expected in Canada. Reported emissions need to be verified by a third party.

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[7] Air Resources Board, State of California. 2012. *Proposed Amendments to the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms to Allow for the Use of Compliance Instruments Issued by Linked Jurisdictions*. http://www.arb.ca.gov/regact/2012/capandtrade12/isormainfinal.pdf

Table 2.4 *continued*

Building block	Description
Compliance and enforcement	30% of compliance allowance must be submitted by November of 1st year of CP, and remainder in November of 2nd year of compliance period. A penalty of three allowances imposed for each ton that they are short.
Flexible measures	**Banking**: Unlimited banking permitted between CPs. **Borrowing**: From future CPs not permitted unless allowance is already in circulation, to reduce risk of price spikes. **Offsets**: Qualitative restrictions – domestic offset credits are allowed, in agriculture, forestry, waste management, from projects located in Canada, the US, or Mexico. CDM credits from developing countries also allowed. Jurisdictions establish accepted protocols. Quantitative restrictions: offset credits limited to 8% of compliance obligation, with further limits for international offsets. **Linking**: Quebec and California are linked from January 2014. The priority for the WCI is to facilitate linking with other partner jurisdictions. Linking with other local initiatives (RGGI and Midwestern GHG reduction accord) may be anticipated. **California**: **Voluntary Renewable Energy reserve:** Allows participants who purchase eligible voluntary renewable electricity to request retirement of allowances on their behalf under the cap-and-trade program.
Institutional infrastructure	**Registry/tracking**: Jurisdictions maintain their own registries according to uniform operating parameters. In addition, a centralized body, WCI, Inc., is responsible for maintaining a system for tracking compliance instruments. **Trading platform**: WCI Inc. maintains a common auction platform, running regionally coordinated auctions of allowances and reserves, in accordance with the unified auction design. **Market oversight**: WCI Inc. is responsible for market monitoring.
Measures to manage market supply and price	**Allowance reserve**: From which emissions allowances could be released under high-price conditions, with amounts varying by CP. **Price floors/caps**: The program allows individual systems to set price floors and caps.
Cost containment	Jurisdictions allowed to implement optional reserve allowance pool for covering emissions from imported electricity. **California**: Allowances are allocated for free to electricity distributors on behalf of consumers to compensate for additional costs passed-through. Distributors auction these allowances to generators. **Quebec**: Auction proceeds invested in mitigating the economic and social impact of GHG reduction efforts.

CH_4 = methane, CO_2 = carbon dioxide, CP = control period, GHG = greenhouse gas, HFCs = hydrofluorocarbons, N_2O = nitrous oxide, NH_3 = nitrogen trifluoride, PFCs = perfluorocarbons, RGGI = Regional Greenhouse Gas Initiative, SF_6 = sulfur hexafluoride, tCO_2e = ton of carbon dioxide equivalent, WCI = Western Climate Initiative.

Alberta Greenhouse Gas Reduction Program

Alberta is the first province in Canada to develop legislation regulating GHG emissions. In 2011 Alberta emitted 267 $MtCO_2e$, which accounted for 37% of Canada's overall emissions[8]. An ETS is in place in Alberta since 2007, with large industry mandated to report their GHG emissions and to reduce their emissions intensity by 12%.

Table 2.5: Overview of the Alberta Greenhouse Gas Reduction Program

Building block	Description
Legal foundation	In 2003 Alberta passed the Climate Change and Emissions Management Act. Under this Act the Specified Gas Emitters Regulation (SGER) was developed and came into force in July 2007.
Coverage	**GHG:** CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6. **Sectors:** Large regulated facilities that emit more than 100,000 tCO_2e/year, approx. 70% of Alberta's industrial emissions. Includes chemical plants, coal mining, oil and gas, power generation, fertilizers, mineral products, oil sands, refineries, metals, waste treatment, and wood products
Targets and cap	The Alberta program limits emissions intensity rather than absolute emissions and therefore absolute emissions may still rise, and there is no overall cap. Existing covered facilities must reduce their emissions intensity by 12% below a baseline based on 2003–2005 emissions and production by 2014, 15% in 2016, and 20% as of 2017. New facilities are given graduated reduction obligations.
Allocation of allowances and carbon leakage	Unlike other systems, covered facilities are not given an allocation of allowances. Instead, tradeable emission performance credits (EPCs) are only awarded when targets are over-achieved. Carbon leakage is not an issue, as there is no overall cap on emissions.
Monitoring, reporting, and verification	Participants are required to establish baseline emissions intensity through an application to Alberta Environment & Parks and submit annual compliance reports to Alberta Environment & Parks and Environment Canada. Third-party verification conforming to SGER requirements is necessary.
Compliance and enforcement	Noncompliance penalty of Can$200/ton, capped at Can$500,000 for covered facilities.
Flexible measures	**Banking:** The unlimited banking of EPCs is permitted. **Offset:** Purchasing offsets approved and verified by the Alberta Offset Registry is permitted. Qualitative restrictions: Domestic offsets from non-covered facilities in Alberta, not mandated by law and resulting from actions taken after 1 January 2002. **Fee payment** to Climate Change and Emissions Management Fund: Acting like a price cap on the system. To meet compliance obligations entities may pay Can $15/ton, rising to Can $20/ton in 2016 and Can $30/ton in 2017. Proceeds used in strategic projects—mitigation, transformative technology, and adaptation. **Linking:** No provisions.

[8] Alberta Environment and Parks. 2016. Industrial Emissions Management. http://esrd.alberta.ca/climate-change/programs-and-services/industrial-emissions-management.aspx

Table 2.5 *continued*

Building block	Description
Institutional infrastructure	**Registry/tracking:** Alberta Carbon Registry is composed of the Emission Performance Credit Registry and the Alberta Emission Offset Registry. **Trading platform:** Both registries are run by an independent party and allow the purchase of offsets and EPCs. **Market oversight:** Is the role of the Government of Alberta.
Support measures	Not applicable

CH_4 = methane, CO_2 = carbon dioxide, GHG = greenhouse gas, HFCs = hydrofluorocarbons, N_2O = nitrous oxide, PFCs = perfluorocarbons, SF6 = sulfur hexafluoride, tCO_2e = ton of carbon dioxide equivalent.

New Zealand Emissions Trading System

New Zealand's ETS was launched in 2008 as a mandatory system, initially covering just the country's forestry sector. Other sectors have gradually been added from 2010–2013, with NZ's agricultural sector included only as a reporting obligation. The system covered 76 $MtC0_2e$ in 2012 and covers around 54% of New Zealand's total emissions annually. The system now covers 2,424 entities.

Table 2.6: Overview of the New Zealand Emissions Trading System

Building block	Description
Legal foundation	Developed in accordance with the Climate Change Response Act (2002), which sets out the legislative framework for the ETS, and was amended in 2009 and 2012. The New Zealand ETS came into force in September 2008.
Coverage	**GHG:** CO2, CH4, N2O, SF6, HFCs, PFCs. **Sectors:** All sectors—covers forestry, transport fuels, electricity production, synthetic gases, agriculture, waste, and industrial processes. Sector-specific thresholds apply: e.g., liquid fuel supply is above 50,000 liters per year and deforestation is more than 2 hectares per year.
Targets and cap	To support the target of 5% at 1990 level by 2020: CP I (2008–2012): 309.6 MtCO2e for the 5-year period. CP II (2012–2016).
Allocation of allowances and carbon leakage	Free allocation: Intensity-based allocation for the industrial sector using output-based benchmarks. Two sectors received one-off free allocation of **NZUs:** owners of pre–1990 forestry to compensate for a decrease in land value, and fishing quota owners to make up for rising fuel costs. Emission-intensive and vulnerable industries at risk of leakage have high level of free allocation, but this will decrease annually to zero by 2025. **Auctions:** The government is still studying the development of an auctioning mechanism. **Carbon leakage:** Emission-intensive and vulnerable industries at risk of leakage have free allocation. In addition, non-forestry ETS participants in the liquid fossil fuels, energy, industrial, waste, and synthetic gases sectors are only required to surrender one unit for every two tons of emissions produced.

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Table 2.6 *continued*

Building block	Description
Monitoring, reporting and verification	Annual self-reporting, supplemented by audits. Verification by a third party is required only when participants apply for use of a unique emission factor. Administering agency may verify the compliance of participants.
Compliance and enforcement	A penalty of NZ$30 for each emissions unit shortfall (in addition to the obligation to surrender the units).
Flexible Measures	**Banking:** Unlimited. **Borrowing:** Not permitted. **Fee payment:** An option for compliance is to pay NZ$25 per ton of emissions. **Offsets:** Quantitative restrictions: none. Qualitative restrictions: Domestic (outside ETS scope) and international allowed until 2015, however with the same restrictions as the European Union ETS on CDM credits. In addition, since January 2013, pre–1990 forest landowners have the option to offset deforestation on their land by planting an equivalent new forest elsewhere in New Zealand. **Linking:** Intended link with Australia halted given repealing of Australian ETS.
Institutional infrastructure	**Registry and tracking:** NZ Emission Unit Register is the official register of Kyoto Protocol units **Oversight:** Ministry for the Environment and the Environmental Protection Authority.
Measures to manage market supply and price	**Price cap:** Fee payment effectively caps price at NZ$25/ton.
Cost containment	**Transitional measures:** Sectors are gradually phased into the system according to the readiness of each sector.

ETS = emissions trading system, CH_4 = methane, CO_2 = carbon dioxide, GHG = greenhouse gas, HFCs = hydrofluorocarbons, N_2O = nitrous oxide, PFCs = perfluorocarbons, SF6 = sulfur hexafluoride, $MtCO_2e$ = Million metric tons of carbon dioxide equivalent, NZU = New Zealand Units.

Australian Carbon Pricing Mechanism

In November 2011 the Australian Parliament adopted the Clean Energy Future (CEF) package, which established the carbon pricing mechanism (CPM) as a key policy to reduce Australia's carbon emissions. CPM came into effect on 1 July 2012 and had two distinct phases: a fixed price period (P1) from 2012–2015 (similar to a carbon tax) and a flexible price period thereafter (P2). However, on 17 July 2014 the CPM was repealed by the Australian senate, effective 1 July 2014.

Table 2.7: Overview of the Australian Carbon Pricing Mechanism

Building block	Description
Legal foundation	November 2011 the Australian Parliament adopted the Clean Energy Future (CEF) package which was adopted but repealed in July 2014.
Coverage	**GHG:** Covered CO_2, CH_4, N_2O, and PFCs. **Sectors:** Stationary energy sector, transport, industrial processes, domestic aviation, domestic shipping, rail transport, and non-transport use of fuels. Landfill facilities with direct emissions of 25,000 tCO_2e a year or more are included.

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Table 2.6 *continued*

Building block	Description
Targets and cap	**Target:** 5% reduction from 2000 levels by 2020. **Cap:** None set during fixed price period.
Allocation of allowances and carbon leakage	Phase 1: Allowances purchased during fixed price period at $23/ton. Phase 2: Free allocations only to trade-exposed and energy-intensive industries, and those that cannot pass-through costs. Remaining permits sold at auction. **Carbon leakage:** Free allocations to trade-exposed and energy-intensive industries, and those that cannot pass-through costs in P2.
Monitoring, reporting and verification	All liable entities were required to register under the Clean Energy Regulator. The liable entities were required to measure through calculating or direct monitoring their emissions according to the methodologies set out in the National Greenhouse and Energy Reporting Scheme (NGER).
Compliance and enforcement	**Penalty:** Phase 1: Unit shortfall charge was calculated as 130% of the fixed price. Phase 2: An amount specified in the regulations or 200% of the 'benchmark average auction charge' for the previous financial year.
Flexible measures	**Banking and borrowing:** Unlimited banking of permits is allowed in the flexible price period. There is limited borrowing of permits such that in any particular compliance year a liable entity can surrender permits from the following year to up to 5% of their liability. **Offsets:** Quantitative restrictions: P1 – domestic credits up to 5% of their obligation, and international emissions units were prohibited. P2 – international credits up to 50% of the obligation and unlimited domestic credits. Of international credits, 37.5% would come from EU allowances (EUAs) or credits from other international systems and 12.5% from Kyoto Protocol credits such as CERs and emissions reduction units. **Linking:** Australia had expressed interest in bilateral linking with credible international systems, including the EU and New Zealand emissions trading systems (ETS). In order to do the former, limits to the use of KP credits and amendments to the price floor and price cap were required.
Institutional infrastructure	**Registry/tracking:** Clean Energy Regulator maintained the Australian Carbon Credit Units register, Australian National Registry of Emissions Units (registry). **Market oversight:** Role of the clean energy regulator. Trading of allowances was regulated as a financial product trade.
Measures to manage market supply and price	Price cap/floor: P1 – Fixed price. P2 – Price ceiling (set at $20 over international price) and floor. Once link was in place with EU ETS from 2018, floor to be removed, and cap at EUA price.
Cost containment	**Cost for consumers:** A comprehensive policy package was designed. Revenue from the auctioning would be used by the government to assist households, support jobs and competitiveness, and invest in clean energy and climate change programs.

Japanese Prefecture-level Emissions Trading Systems

Although the Japanese government has been considering a national ETS since 2010, options are still being evaluated in light of existing mitigation measures. Notably, Japan implemented a carbon tax in April 2014; ¥192/tCO_2e is set to increase to ¥289/tCO_2e by 2016. The tax covers approximately 70% of its national GHG emissions.

Japan has two city-based ETSs currently in place. The Tokyo cap-and-trade program was launched on 1 April 2010 and is the first mandatory ETS to be implemented in Asia and the Pacific. The Saitama Target Setting ETS was established in April 2011 and is bilaterally linked with the Tokyo system. Further, there is a voluntary cross-sectoral ETS in place since 2005 (covering less than 1% of national emissions); and offsets from clean development mechanism (CDM) and a joint crediting mechanism with several countries including Bangladesh, Indonesia, the Lao People's Democratic Republic, and Viet Nam can be used.

Table 2.8: Overview of Japanese Prefecture Level-Based Emissions Trading Systems

Building block	Description
Legal foundation	The implementation of the Tokyo Climate Change Strategy, announced in June 2007. The Saitama system was established in April 2011 as part of the Saitama Prefecture Global Warming Strategy Promotion Ordinance.
Coverage	**GHG:** CO_2, CH_4, N_2O, PFC, HFC, and SF_6 (only energy-related CO_2 emissions tradeable). **Sectors**: Urban emissions from fuel consumption and electricity usage of commercial buildings and factories. Large-scale facilities with annual consumption of fuels heat and electricity at or above 1,500 kiloliters are covered.
Targets and cap	Target is 25% reduction relative to 2000 by 2020. CP I (2010–2014) 6%–8% reduction on baseline (Saitama CPI starts in 2011). CP II (2015–2019) 15%–17% reduction on baseline (Saitama 13%–15%).
Allocation of allowances and carbon leakage	Free allocation given in full to participants, based on historic emissions. Allocation to new entrants is based on past emissions or on emissions intensity standards.
Monitoring, reporting, and verification	Participants are required to report their emission reduction plans and verified emissions annually based on system-specific monitoring/reporting guidelines. These must be third-party verified. Verification guidelines also exist. Verification is required only when used for compliance.
Compliance and enforcement	Compliance assessment is conducted at end of compliance period in the sixth year. Participants only allowed to sell emissions allowances that are left over once a facility's annual emissions are accounted for. Tokyo has the following noncompliance measures: First stage: Facility must reduce emissions by the amount of the reduction shortage multiplied by 1.3. Second stage: Any facility that fails to carry out the order will be publicly named and subject to penalties (up to ¥500,000) and surcharges (1.3 times the shortfall).

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Table 2.8 *continued*

Building block	Description
Flexible measures	**Banking and borrowing:** Unlimited banking is permitted between consecutive compliance periods, and borrowing future emissions allowances is not permitted. **Offsets:** Quantitative and qualitative restrictions: Participants can use unlimited amounts of domestic offset credits from energy efficiency projects in small and medium businesses inside the respective cities but outside program scope. Credits from large facilities outside the cities can be used for only one-third of obligations in both cities, with the exception of Saitama factories—only half of obligations. In addition, the Saitama system allows Forest Absorption Credits and excess reduction as credits. **Tradeable allowances:** Qualitative restriction: Only energy-related C_{O2} verified reduction amounts can be traded to other facilities. **Renewable energy** certificates from certain kinds of projects can also be used as offsets, are prioritized as one of the most effective offset credits that can be used under this program. **Linking:** Tokyo linking with the Saitama Prefecture had started in April 2011. Credits from excess emission reductions and small and mid-size facility credits (offsets) are officially eligible for trade between the two jurisdictions. However, since excess emission reductions need to be confirmed at the end of the first compliance period and credits will thus only become tradeable from 2015 on, no trade has occurred yet.
Institutional infrastructure	**Trading platform**: Allowances can be traded through the Japan Climate Exchange and the Tokyo Stock Exchange. **Market oversight**: TMG Bureau of Environment and Saitama Prefectural Government.
Measures to manage market supply and price	**Supply management:** In the event of high allowance prices, international credits from the clean development mechanism and other units recognized under the KP may be allowed as offsets, and an increase in the supply of domestic offsets outside Tokyo and to other sectors will also be implemented.
Cost containment	Not applicable

CH_4 = methane, CO_2 = carbon dioxide, GHG = greenhouse gas, HFCs = hydrofluorocarbons, N_2O = nitrous oxide, PFCs = perfluorocarbons, SF6 = sulfur hexafluoride.

The Republic of Korea's Emissions Trading System

The Republic of Korea's ETS started 1 January 2015, and is the first nationwide cap-and-trade program in operation in Asia. This is a major step; as a non–Annex I country under the KP, the Republic of Korea has no legally binding obligation to reduce its emissions.

Table 2.9: Overview of the Republic of Korea Emissions Trading System

Building block	Description
Legal foundation	Emissions trading was identified as a key strategic policy to achieve the Republic of Korea's GHG mitigation target and was legislated in the Low Carbon Green Growth Act Article 46. The Allocation and Trade of the GHG Emission Allowances Act Enforcement Decree was approved in November 2012, which outlines the institutional framework for governing the system.

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Table 2.9 *continued*

Building block	Description
Coverage	Covers about 60% of the nation's GHGs. **GHG:** CO_2, CH_4, N_2O, SF_6, HFCs, PFCs.. **Sectors:** Power and energy, waterworks, waste, buildings, telecommunication, aviation, mining, food and drink, textile, lumber, paper, oil-refining, petrochemicals, glass and ceramic, cement, steel, nonferrous, machinery, semiconductor, display, electric and electronic, automobile, shipbuilding. **Threshold:** Facilities with annual emissions of more than 25,000 tCO_2e/year per year and business entities with combined average annual emissions from multiple installations at or above 125,000 tCO_2e over past 3 years prior to ETS start.
Targets and cap	37% reduction relative to business-as-usual (BAU) by 2020, which will allow emissions to grow in the short term. Absolute caps: CPI (2015–2017) 573.5 $MtCO_2$ in 2015 with a decline to 550.9 $MtCO_2$ in 2017 CPII (2018–2020) 543 Mt CO2e by 2020 CPIII (2021–2025)
Allocation of allowances and carbon leakage	CPI – 100% free allocation, based on historical benchmarks. CPII – 97% of allowances will be allocated for free to energy-intensive and trade-exposed sectors. Remainder auctioned. CPIII – Free allocations will decrease to not less than 90% in phase III. 10% reserve for new entrants. 3% reserve for early action. **Carbon leakage:** During CPII: 97% of allowances will be allocated for free to energy-intensive and trade-exposed sectors.
Monitoring, reporting, and verification	MRV system under the pre-existing Energy Target Management System. Participants are required to establish annual emissions inventories, which need to be verified by third parties before being reported to the government. Reports are then reviewed and certified by the Certification Committee of the Ministry of Environment.
Compliance and enforcement	Shortfalls incur penalty of three times allowances for each allowance not surrendered (at most) with a maximum penalty of W100,000 per tCO_2e.
Flexible measures	**Banking.** Surplus allowances can be banked between years in the same compliance period and within 1 year following compliance period. **Borrowing** is only allowed between years over a compliance period for up to 10% of annual emissions. **Offsets:** Domestic offsets are allowed from the start of the ETS limited to a maximum of 10% of total obligations. International offsets are not allowed in phase I and phase II, and a limit of 50% of total offsets and 5% of annual emissions will be imposed after 2020. Eligible credits must have methodologies approved by the Republic of Korea Verification Committee. **Linking:** The Act on Allocation and Trading of the GHG Emission Allowances allows linking provided that the other ETSs are comparable and credible. Discussions about linking are ongoing with New Zealand (formerly Australia). They have also expressed interest in building an integrated East Asian carbon market through linking its ETS with the People's Republic of China ETS and the Japan ETS.
Institutional infrastructure	**Trading platform:** Korea Exchange Derivatives Market **Market oversight:** Korea Exchange, Ministry of Environment

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Table 2.9 *continued*

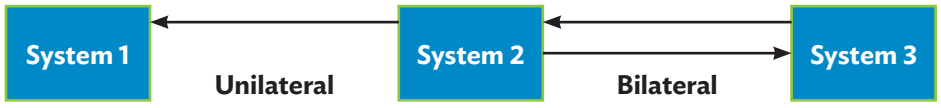
Building block	Description
Measures to manage market supply and price	**Allowance reserve, limits on number of allowances held by any one participant, amendment to borrowing rules, offset limits, and price controls may be introduced**, in the event that (i) the price of allowances increases more than threefold for six straight months compared to the previous year or the year before that, (ii) the average price of allowances increases more than twofold for six straight months compared to the average price for the previous 2 years because traded volumes have increased more than twofold, and (iii) there is a 60% reduction in price in one month compared to the average prices of the last 2 years.
Cost containment	Not applicable

ETS = emissions trading system, GHG = greenhouse gas.

Theory—Possible Linking Arrangements

ETSs are considered to be linked if one system's emissions allowances or emission reduction credits can be used directly or indirectly for compliance purposes in another system and allowances/credits can flow between them.[9] Linking between carbon trading systems can take a variety of forms and may be direct or indirect, unilateral, bilateral, or multilateral. This section looks at the possible forms of linking.

Figure 2.3: Direct Linking between Three Systems



Direct Linking

Direct linking allows market participants to directly trade units (either allowances or credits) between systems and obligated entities to use tradeable units for compliance in either one or both of the systems. Direct linking can be distinguished as either unilateral or bilateral as shown in Figure 2.3.

Unilateral Linking

Unilateral linking occurs when participants of System 1 purchase trading units (allowances or credits) from System 2 and then use them for compliance in System 1, but not vice versa.[10] For example, the Norwegian ETS allowed its participants to purchase EU allowances

[9] E. Haites. 2003. Harmonisation between National and International Tradable Permit Schemes: CATEP Synthesis Paper. OECD.

[10] W. Sterk et al. 2006. Ready to Link Up? Implications of Design Differences for Linking Domestic Emissions Trading Schemes. Wuppertal: Wuppertal Institute for Climate, Environment and Energy.

for compliance in phase I, but the EU ETS did not accept allowances from the Norwegian system. Trade of allowances in this way may not be restricted to obligated entities.

Unilateral linking could also occur between an ETS and a credit system—e.g., certified emission reductions created under the CDM, and in this case the credit system would be System 2 in the diagram. For example, the EU ETS accepts credits for compliance from CDM and Joint Implementation (JI) projects.

The effect on System 1 is the reduction in its carbon price and an increase in its emissions, since abatement contributing towards System 1's target will take place in System 2. Conversely, the net effect in System 2 is the increase in carbon price and reduction in emissions.

A unilateral link between trading systems is established simply by including a provision for the recognition of foreign allowances or carbon credits in the receiving system's emissions trading legislation. For example, the EU implemented a directive enabling the linking of CDM and JI credits to the EU ETS. In practice, for linking nationally run systems, the link would likely be supported by a political agreement between the jurisdictions operating the two systems.

Bilateral and Multilateral Linking

Bilateral linking occurs when participants in two systems are able to purchase trading units (allowances or credits) from one another. When there are more than two systems linked, this is considered to be a multilateral link.[11] In the case of bilateral linking, the two systems recognize allowances or carbon credits from each other and allow free trading and use of those units for compliance purposes. Theoretically, the more linking in the system, the greater the potential economic efficiencies, as there is greater access to cheaper abatement opportunities overall. The carbon prices in the two systems would converge and the distribution of emissions within the system (compared with a non-linked scenario) would adjust accordingly.

A bilateral or multilateral link would require both a linking agreement between parties as well as provisions for a reciprocal link in domestic emissions trading legislation. The California ETS link with the Quebec ETS is an ongoing example of bilateral linking. In this case both governments agreed to harmonize and integrate the two systems through a linking agreement which set out the regulatory processes, offset provision, mutual recognition of compliance instruments, trading rules of the compliance instruments, auction, registries, and so on.

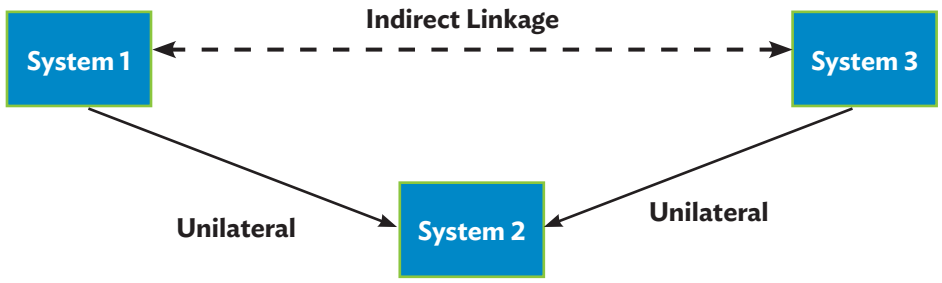
Indirect Linking

Two systems are indirectly linked when they share a common unilateral linkage. For example, if Systems 1 and 3 in Figure 2.4 are linked unilaterally to a credit system (System 2) such as the CDM, then they are automatically linked indirectly, since trading between two systems and the CDM system will impact supply and demand as well as pricing in both

[11] M. Mehling, K. Anttonen, and K. Upston-Hooper. 2007. Breathing Life into the Carbon Market: Legal Frameworks of Emissions Trading in Europe. 16 European Environmental Law Review. 2007(4):96-115.

systems. Therefore, changes in the allowance price and emissions cap in one system could affect the allowance price and emissions cap in the other. For example, several ETSs such as the EU ETS and the New Zealand ETS are unilaterally linked to the CDM and therefore they are indirectly linked.

Figure 2.4: Indirect Linking



Linking Experiences

The table below presents key examples of linking of ETSs to date.

Table 2.10: Experiences of Linking Emissions Trading Systems

Systems	Status	Linking type	Harmonization requirements
Norway ETS and EU ETS	Active	Unilateral linking since 2005: Norwegian participants allowed to surrender EUAs for domestic compliance. Bilateral linking since 2008.	In order to link, Norway adopted EU ETS directive to amend its ETS to increase compatibility, e.g., coverage. Norwegians had strong political willingness to ensure compatibility of ETS designs, to facilitate linking. Seen as a special case, since it occurred in the EEA European Free Trade Association (EFTA) context, therefore did not face significant political or harmonization barriers.
California and Quebec, under WCI	Active	Bilateral linking in 2014: mutual recognition of allowances and credits for compliance.	ETS designed and developed according to common rules under the design for the WCI regional program, reduced compatibility barriers despite separate implementation in respective jurisdictions.
Australia CPM and EU ETS	Cancelled (due to repealing of Australian CPM)	Unilateral link from 2015. Bilateral link from 2018.	To facilitate the full link, the EC and Australia agreed to harmonize key design features such as MRV arrangements, offset rules, and cost containment measures, etc. In particular, Australia needs to revise offset rules, e.g., limit the use of Kyoto Protocol eligible international units to 12.5% (EC, 2012) and amend the price floor and price cap.

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Table 2.10 *continued*

Systems	Status	Linking type	Harmonization requirements
Swiss ETS and EU ETS	Planned	Bilateral linking.	The negotiation of linking Swiss ETS with EU ETS has been ongoing since 2010, and an agreement is still pending. To do so, Switzerland is required to harmonize a number of components, including coverage of the aviation sector.

EC = European Commission,ETS = emissions trading system, EU = European Union, EUA = EU allowances, MRV = monitoring, reporting, and verification, WCI = Western Climate Initiative.

In addition to these experiences there is also increasing interest in cooperation on ETS development and improvement, which may facilitate a future linking of systems. California and RGGI have shared information and have adapted some design elements from each other[12] while the US state of Washington and the the United Kingdom have engaged in a partnership to collaborate on carbon market design, as well as other issues.[13]

In April 2013, Australia and the People's Republic of China (PRC) agreed to new arrangements to strengthen collaboration on carbon markets. Through this agreement, Australia and the PRC experts worked closely to share information on the design and implementation of ETSs, regarding design of domestic offsets, other complementary policies and measures, as well as collaboration on economic modelling through technical workshops and joint research projects, etc.[14] In September 2015, the China[15] Beijing Environment Exchange, the Center of North American Climate Registry, the Center of North American Climate Action Reserve, and the US Innovation Center of Energy and Transportation signed a strategic cooperation memorandum of understanding to facilitate development of the carbon market.[16]

In addition, initiatives such as the Partnership for Market Readiness hosted by the World Bank support knowledge exchange and funding of capacity building necessary for countries to implement market-based instruments such as ETSs. Implementing members include PRC, India, Indonesia, Thailand, and Viet Nam. Contributing countries include Australia and Japan.

[12] D. Burtraw et al. 2013. Linking by Degrees: Incremental Alignment of Cap-and-Trade Markets. Discussion Paper 13-04. Washington, DC. Resources for the Future. http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-13-04.pdf

[13] State of Washington and UK Department of Energy and Climate Change. 2014. Report on the Collaboration between Washington State and the UK Government on Climate Change. State of Washington, USA.

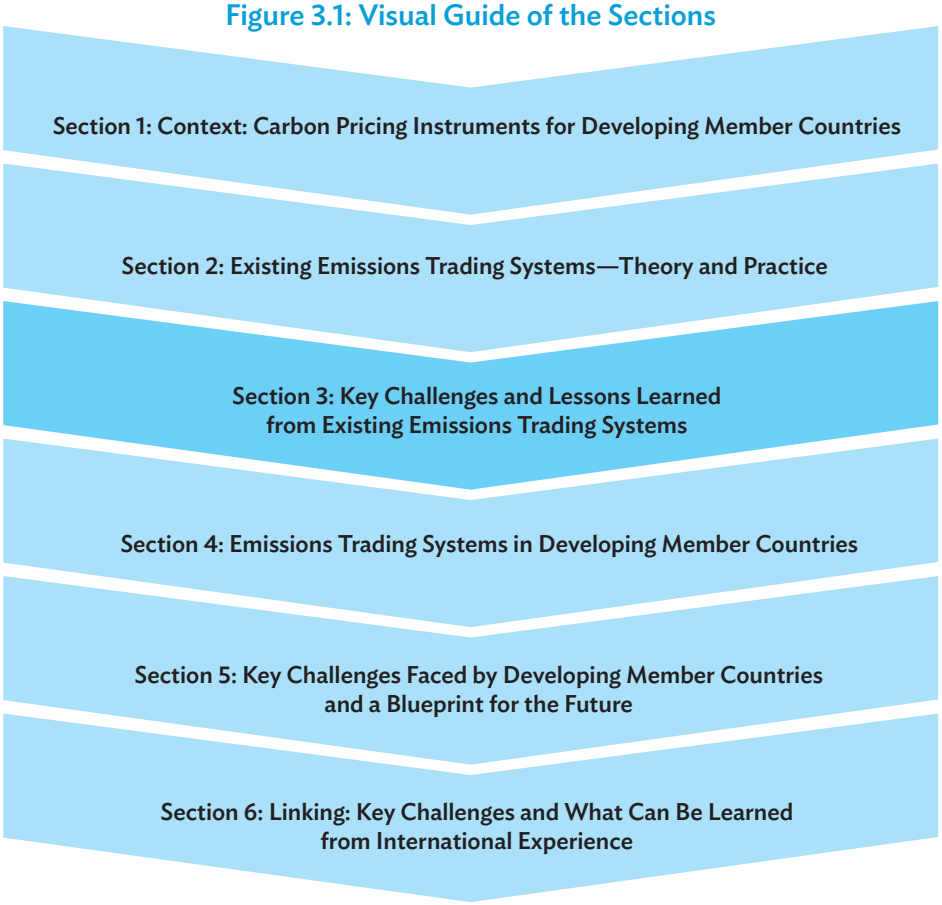
[14] Australia and China Strengthen Carbon Market Collaboration. Media release. The Hon. Greg Combet AM MP, Minister for Climate Change, Industry and Innovation, 9 April 2013. http://www.thepmr.org/content/australia-and-china-strengthen-carbon-market-collaboration

[15] ADB recognizes China as the People's Republic of China.

[16] China Beijing Environment Exchange. 2015. China Beijing Environment Exchange Signed Strategic Cooperation Memorandum with Key Carbon Market Agencies in North America. 15 September 2015. http://www.cbeex.com.cNot applicablerticle/zxdt/ bsdt/201510/20151000057355.shtml

3 Key Challenges and Lessons Learned from Existing Emissions Trading Systems

Figure 3.1: Visual Guide of the Sections



The main challenges faced by existing emissions trading systems (ETSs), the solutions that have been developed, and the learning points can be relevant to a government looking to establish an ETS for the first time. The principal issues are described below.

Overview

Existing systems display diversified design features that reflect the particular political and economic contexts. They face common issues and provide valuable experience and lessons, while each system presents its unique strengths and weaknesses. This section summarizes the experience and lessons learned from existing ETSs in terms of political and legal framework, technical design features, supporting policy, development strategy, the management of the emissions trading market, and implications for future development.

Table 3.1 summarizes the issues faced and lessons learned from existing systems, as discussed in Section 2.

The key issues and challenges in these ETSs relate to the design and implementation of the ETS. This is in terms of technical issues of allocations and surpluses, prices, liquidity, windfall profits, and offset arbitrage, as well as issues relating to environmental integrity and domestic low-carbon transformation, carbon leakage, and so on. The common experiences and resulting lessons also described in Table 3.1.

Table 3.1: Experience and Lessons From Existing Emissions Trading Systems

	Key issue							
System	Political desire	Oversupply	Offsets	Incentivizing long-term investment	Allocation	Banking	Institutional setup	City-level trading
EU ETS		●	●	●	●	●		
RGGI		●		●		●	●	
WCI					●		●	
Alberta ETS			●					
New Zealand ETS			●					
Australian CPM	●							
Tokyo ETS			●					●

CPM = Carbon Pricing Mechanism, ETS = emissions trading system, EU = European Union, RGGI = Regional Greenhouse Gas Initiative, WCI = Western Climate Initiative.

Political Desirability and Legal Frameworks Play Decisive Role in Emissions Trading Systems

Experience and Lessons—Australian Carbon Pricing Mechanism

The implementation of an ETS in Australia was at the top of the political agenda for many years, yet with strongly differing views across the party spectrum, the Carbon Pricing Mechanism was both enacted and since repealed. The political uncertainty around the Australian system was further exacerbated by the lack of political agreement at a global level which would have given credence to the system.

Likewise, although the New Jersey state government signed the agreement to implement the Regional Greenhouse Gas Initiative, it later withdrew at the end of 2011.

These experiences illustrate the importance of broad political support for ETS development and implementation.

Flexibility to Address Oversupply

Experiences—The European Union Emissions Trading System

The EU ETS has seen oversupply of allowances in each of its three phases to date, but the cause and impact has been different for each phase.

Over the 3 years of phase I, the cap was 114.7 metric ton of carbon dioxide ($MtCO_2$) (1.85%) above verified emissions. This surplus was prominent in early years; and only in the third year, 2007, was a shortfall observed (10.1 $MtCO_2$).[17] The oversupply of allowances was the result of a number of factors. Firstly, member states generally lacked verified baseline emissions data when establishing their caps in their national allocation plans (NAPs), and baseline emissions were generally overstated. Secondly, there was not an emission reduction target for member states in the EU; at that time, caps were largely established against a business-as-usual basis with limited ambition. Thirdly, the decentralized approach to cap setting meant that member states had an incentive and flexibility to seek to protect their own industries, and retrospectively, allocations appeared generous relative to emissions. The result of these factors was an oversupply of allowances, which first became clear from verified emission data following the first annual compliance year. Phase I verified emissions data, and the experience from Phase I cap setting informed subsequent cap setting for the Kyoto compliance period in Phase II.

In phase II the caps were still developed through the member state NAPs (as in phase I); although there was more robust application of the principles for cap setting by the European Commission, which had the responsibility to approve NAPs. However, the economic crisis caused a downturn in industrial activity and consequently reduced emissions, with large surpluses for each year after 2008, resulting in the accumulation of a large surplus by the end of Phase II. The surpluses will continue well into phase III, with the economic slowdown continuing to contribute to the oversupply of allowances relative to emissions.

These surpluses remove the need for abatement to meet the caps, and naturally the market has responded with a very low or zero-carbon price. Phase I carbon prices peaked at over €30 per metric ton in 2007 influenced by the rising gas prices[18] and fell to nearly zero by the end of the same year, because surpluses could not be carried over into phase II. In phase II a more ambitious cap taking into account verified baselines and more harmonized and stringent national cap setting processes lead to a strong initial carbon price, peaking at €30 per $MtCO_2$ in July 2008, but again prices fell to much lower levels as the oversupply position became clearer. These transient pricing characteristics reduce the effectiveness of EU ETS in driving low-carbon investment (Figure 3.2).

[17] European Environment Agency. 2016. Data and Maps. http://www.eea.europa.eu/data-and-maps
[18] M. Grubb et al. 2012. Analyses of the Effectiveness of Trading in EU-ETS.

Figure 3.2: Evolution of European Union Allowance Prices from 2005–2015 (by August 2015)

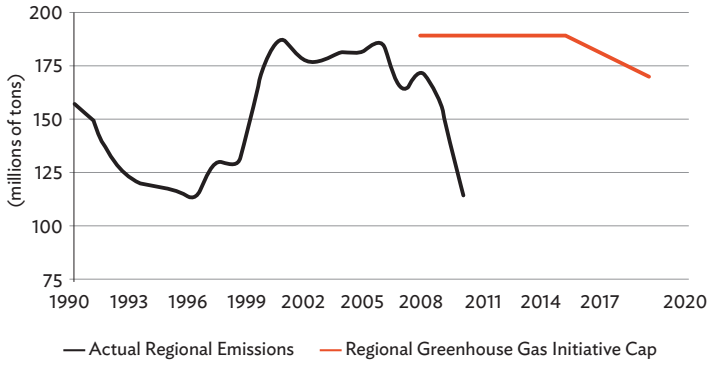
EUA = European Union allowance

Source: ICIS.

Regional Greenhouse Gas Initiative

The oversupply of allowances, relative to emissions, has also affected the Regional Greenhouse Gas Initiative (RGGI). The initial regional CO_2 emissions budget was set based on power plant emissions from 2000–2004, with an anticipated increase before the start of trading. However, soon after trading began, emissions were found to be well below the expected level. The New York State Energy Research and Development Authority[19] calculated that emissions in the RGGI region declined 33% from 2005–2009. The decline in emissions prior to trading, and the cap, are indicated in Figure 3.3.

Figure 3.3: Regional Greenhouse Gas Initiative Power Plant Emissions Compared with their Caps



Source: Woods Hole Research Center.

[19] NYS Energy Research and Development Authority, 2015. Regional Greenhouse Gas Initiative (RGGI): An Emissions Trading Case Study. http://www.ieta.org/resources/Resources/Case_Studies_Worlds_Carbon_Markets/rggi_ets_case_study-may2015.pdf

After 2008, further factors contributed to emissions being lower than the cap: substantial decreases in electricity consumption from industrial and commercial sectors during the economic recession; fuel switching from petroleum and coal to lower-carbon natural gas due to relatively low gas prices; and changes in the available generation mix to include more nuclear, wind, and hydro.[20]

The generous cap resulted in an accumulation of surplus allowances during the control period, manifested as unsold allowances. Ten percent of the allowances offered for sale went unsold from 2008 to 2010,[21] but this number rose to 50% in 2011 and 41% in 2012. The accumulated unsold allowances reached 200 million by 2012.[22]

As a consequence of oversupply, and the resulting lack of need for abatement, carbon prices remained low ($2–$3/ton) and close to the floor price up to the point at which the cap was reduced in 2014 (discussed below). The average daily volume of trading of futures contracts listed on the Chicago Climate Futures Exchange fell from 2.7 million in 2009 to 0.2 million in 2010 and 0.03 million in 2011.[23]

A further consequence of the low prices is that it reduced the funding available for public investment through auction revenues. This is important because variable or low proceeds from carbon market auctions can increase uncertainty and funding challenges in public expenditure programs.

Lessons

The experiences discussed earlier highlight that the risk of allowance surpluses in periods of unexpected economic downturn is a critical issue for the design of carbon market measures. Absolute caps set on the basis of ex-ante assumptions can prove overgenerous if actual emissions fall significantly below business-as-usual expectations. This has been the case particularly for EU ETS and RGGI, and in both instances measures have been applied to help address the oversupply problem. These measures were interventions in the market that were not expected at the points that the caps were set, but nevertheless provide models of options that could be built into an ETS at the design stage to address oversupply problems should they emerge:

(i) In phase III of EU ETS, a short-term measure of back-loading 900 million allowances was adopted in order to temporally alleviate oversupply problems. The allowances will be withheld from auctions early in the phase and be released towards the end of the phase. By this mechanism the overall phase cap is maintained.
(ii) For phase IV of the EU ETS a strategic reserve mechanism for withholding allowances is planned. The conditions under which allowances will enter or be

[20] NYS Energy Research and Development Authority, 2015. Regional Greenhouse Gas Initiative (RGGI): An Emissions Trading Case Study. http://www.ieta.org/resources/Resources/Case_Studies_Worlds_Carbon_Markets/rggi_ets_case_study-may2015.pdf
[21] NYS Energy Research and Development Authority, 2015. Regional Greenhouse Gas Initiative (RGGI): An Emissions Trading Case Study. http://www.ieta.org/resources/Resources/Case_Studies_Worlds_Carbon_Markets/rggi_ets_case_study-may2015.pdf
[22] Potomac Economics 2013. Annual Report on the Market for RGGI CO2 Allowances: 2012. RGGI Inc.
[23] Potomac Economics 2010. Annual Report on the Market for RGGI CO2 Allowances: 2011. RGGI Inc., Potomac Economics 2011. Annual Report on the Market for RGGI CO2 Allowances: 2012. RGGI Inc., and Potomac Economics 2013. Annual Report on the Market for RGGI CO2 Allowances: 2012. RGGI Inc.

released from the reserve are transparent, and the mechanism helps to reduce the extent of oversupply in the market.

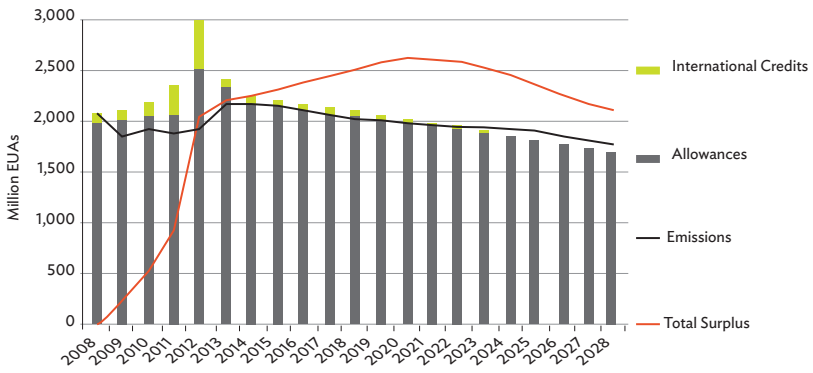
(iii) RGGI adjusted the cap by reducing the total number of emission allowances by 45% in the third compliance period (2014). Also, unsold allowances from 2012 and 2013 were retired. These impacts differ from those in the EU ETS in that they permanently tighten the emissions cap. A further measure introduced as a result of the review was the establishment of a cost containment reserve to be employed if prices increase above certain levels. Banked allowances as a strategic reserve will be gradually released to the market.

Consequences of Offsets for Allowance Surpluses and Emissions Trading System Abatement

Experiences—European Union Emissions Trading System

Under the EU ETS during phase II (2008–2012) there was a surplus of allowances of around 731 $MtCO_2$. While an unexpected driver of this situation was the economic crisis, high imports of international credits contributed part of the surplus. Over the phase, participants were permitted to purchase about 1 billion tons of international offset credits to be surrendered for compliance.[24] This exacerbated the oversupply of allowances by 1 billion tons. The challenge of oversupply remains for phase III. The cap for the phase was set before the extent of the economic crisis was appreciated, and the rules of the system allow surpluses to be banked between phases. As of 2013, the surplus stood at over 2.1 billion tons. The surplus buildup is expected to slow from 2014, but not to decline significantly during phase III (2013–2020), with the surplus remaining on the order of 2 billion allowances by 2020. The surplus is therefore estimated to continue into phase IV (Figure 3.4).

Figure 3.4: Oversupply of Allowances in the European Union Emissions Trading System



EUA = European Union allowance. Source: Commission Staff Working Document, Impact Assessment, Accompanying the document Proposal for a Decision of the European Parliament and of the Council concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emissions trading scheme and amending Directive 2003/87/EC, 2014.

[24] EEA-EU ETS data viewer. http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer

New Zealand Emissions Trading System

In New Zealand there has also been extensive use of international offset credits for compliance, as a result of there being no limits on their use and the prices for such credits having fallen on international markets. This has placed downward pressure on the price of domestic permits and offsets and limited the level of domestic emission reductions. In 2012, CERs and emission reduction units accounted for more than 80% of total surrendered units compared with less than 2% in 2010.[25] The price of New Zealand Units fell from above NZ$20 in 2011 to below NZ$2 in May 2013, although the prices have since partially recovered to around NZ$6 in 2015.[26] The lesson learned is that unlimited use of offsets exposes a system to risk of limited domestic abatement in the event that offset unit prices fall significantly.

Alberta Greenhouse Gas Reduction Program

The system provides regulated emitters a number of options to meet their emissions reduction targets without the need to take abatement actions themselves. The flexible options are:

(i) regulated emitters may purchase an unlimited number of credits from offset projects to use for compliance; and
(ii) they may choose to pay a contribution to the Climate Change and Emissions Management Fund (CCEMF) instead of surrendering allowances. The CCEMF option effectively constitutes a price ceiling, of Can$15/tCO2e in 2015 rising to Can$20/t in 2016 and Can$30/tCO_2e in 2017.

About 63% of the compliance obligation was achieved through the use of these mechanisms rather than taking abatement activities for improving their operations by 2014. The high degree of reliance on these mechanisms could delay the decarbonization of the sectors covered by the system.

Tokyo Cap-and-Trade Program

The program designed offset measures to be integrated with other systems including the recognition of renewable energy certificates and energy efficiency offsets from small and medium-size enterprises and energy saving projects outside the region otherwise excluded from the market. These measures maximize the opportunities for ETS facilities to reduce emissions cost effectively and at the same time leverage private sector investment.

Lessons

The use of offset mechanisms offers the opportunity for participants to purchase credits from cheaper mitigation measures, rather than reduce their own emissions, thereby improving the cost effectiveness with which the cap is met. The offsets also promote mitigation activities in more sectors of the economy. However, experience has shown that

[25] Government of New Zealand, Ministry for the Environment. 2011–2012.Report on the New Zealand Emission Trading Scheme. NZ ETS 2011 Facts and Figures; NZ ETS 2012 Facts and Figures. http://www.climatechange.govt.nz/emissions-trading-scheme

[26] Thomson Reuters. 2016. *NZ Carbon Prices and Volumes*. http://financial.thomsonreuters.com/en/resources/articles/point-carbon.html

extensive use of offsets can damage the environmental effectiveness of the ETS in the areas they cover.

Reliance on use of offset credits could delay domestic abatement action and low-carbon transformation of ETS sectors in the long term. In the short term the flexibility to meet commitments through offset credits is particularly useful for ETS participants to minimize the economic cost of GHG mitigation. However reliance on offsets may lead to ETS sectors being locked in to high-carbon technologies, making emissions cuts more expensive in the future. This issue has been debated in the EU ETS and the New Zealand ETS. Cutting emissions through domestic abatement taking place in ETS sectors should be the long-term strategy for low-carbon transformation. As seen in the Alberta GHG reduction program, too many flexible measures can deter improvements in emissions performance in the industry sectors covered by the ETS.

Extensive use of offsets may exacerbate allocation surpluses and suppress domestic abatement. This has been a particular issue for the EU ETS and the New Zealand ETS. In the New Zealand ETS, participants have a surplus of allowances derived from over-allocation. They choose not to submit these for compliance, using cheaper offsets credits from the market and carrying over allowances to the next period. Kyoto credits accounted for more than 80% surrendered units. Offsets under the EU ETS were supposed to be supplementary to domestic abatement, acting as a cost containment measure in the event that a scarcity of domestic allowances made EUAs too expensive. Given that phase II already had a considerable surplus of EUAs, the use of offset credits was essentially unnecessary from this perspective. Even so, a large amount of credits was still surrendered as a cheaper option for compliance, with EUA surpluses banked to later years.

Integration of offsets. For the Tokyo ETS, offset use was restricted to those of domestic origin, which were traded at very high prices. This has shown that the strategic design and integration of offset measures is necessary to assist facilities in achieving cost-effective emission abatement while circumventing issues associated with the reliance on, and extensive use of, offsets seen in other systems.

These experiences do not suggest that use of offsets is inherently undesirable. They simply highlight the consequences of offsetting instead of domestic abatement and the contribution to allowance surpluses that can arise.

Framework to Incentivize Long-Term Investment

Experiences—European Union Emissions Trading System

The EU ETS implements an absolute cap on emissions, with the cap set in line with the EU's obligations under the United Nations Framework Convention on Climate Change (UNFCCC). Phases I and II (2005–2012) of the EU ETS saw decentralized cap setting, where the EU cap was determined based on the aggregation of NAPs of each member state. For phase III (2013–2020), cap setting was centralized and EU-wide caps for stationary sources and aviation were implemented.

In July 2015 the EC set out its proposals to revise the EU ETS beyond 2020 (for phase IV). This marks the first step in delivering against the EU's binding target of reducing domestic GHG emissions by 40% by 2030—part of the EU's 2030 Climate & Energy Framework.[27] As part of the framework, ETS sectors will be required to cut emissions by 43% (compared to 2005).

To at least meet this target, the overall number of emission allowances will need to decline at an annual rate of 2.2% from 2021 onwards, compared to 1.74% currently under phase III (2013–2020). This amounts to an additional emissions reduction in ETS sectors of around 556 $MtCO_2e$ over the decade 2020–2030, equivalent to the annual emissions of the UK.

Alongside the new emission reduction targets, the proposals to reform the EU ETS beyond phase III also include revised rules to address the risk of carbon leakage and to support low-carbon innovation and energy sector modernization. These proposals include:

(i) Addressing carbon leakage:
- revising the system of free allocation to focus on sectors at highest risk of relocating their production outside the EU—around 50 sectors in total
- a considerable number of free allowances set aside for new and growing installations
- more flexible rules to better align the amount of free allowances with production figures
- update of benchmarks to reflect technological advances since 2008

(ii) Incentivizing long-term investment:
- innovation fund—extending existing New Entrants' Reserve 300 support for the demonstration of innovative technologies to breakthrough innovation in industry[28]
- modernization fund—facilitating investments in modernizing the power sector and wider energy systems and boosting energy efficiency in 10 lower-income member states

Regional Greenhouse Gas Initiative

For the initial CO_2 allowance budget (2009–2011) the cap was set at 188 million short tons per year for the 10-state region (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont). For 2012–2013, the cap was 165 million short tons per year for the 9-state region (following New Jersey's exit from RGGI). These caps were seen as modest initial caps designed to facilitate system setup, relay fears of carbon leakage away from RGGI states, and encourage action by legislated entities.

Following a comprehensive program review in 2012, the nine RGGI states implemented a new and more stringent 2014 RGGI cap of 91 million short tons. The cap declines 2.5% each year from 2015 to 2020.

RGGI states issue CO_2 allowances to participants, which are distributed almost entirely through regional auctions. The auction proceeds are then subsequently reinvested in

[27] European Commission Climate Action. 2016. *2030 Climate and Energy Framework*. http://ec.europa.eu/clima/policies/strategies/2030/index_en.htm

[28] NER300 is a project based support facility funded by the monetization of 300 million allowances taken from the EU ETS New Entrant Reserve (NER)

strategic energy and consumer programs. Released periodically, the Investment of RGGI Proceeds reports track the investment of the RGGI proceeds by states and the benefits of these investments.

The 2013 report estimates that more than $1 billion in RGGI auction proceeds were invested in programs including energy efficiency, clean and renewable energy, GHG abatement, and direct bill assistance. The investments will make a return of more than $2.9 billion in lifetime energy bill savings to more than 3.7 million affected households and 17,800 affected businesses.

Lessons

Cap needs to be compatible with long-term mitigation target. Most ETSs have relatively short phases/compliance periods, ranging from one to 5 years, aligned with short-term or medium-term political targets, or simply the need to trial the ETS over a short timeframe to gain experience to inform subsequent policy design. The EU ETS has a longer timeframe, with the third phase running from 2013–2020. A challenge for policymakers is to use ETSs to provide the incentive for abatement consistent with long-term targets. This challenge is not necessarily greater for carbon market approaches compared with other policy options, but must be considered in any carbon market design.

The investment return timescales for significant high emitting assets or abatement projects can exceed the timescales over which caps are currently set, which contributes to the uncertainty for investors in the level of returns that will be realized for carbon reduction initiatives. Longer-term ETS caps provide more certainty over the required emissions trajectory, which can translate into greater confidence for investors in the level of abatement required and the associated carbon price.

However, as already discussed, absolute carbon caps can define an emissions trajectory based on expectations that are not realized, such as when a significant economic downturn leads to a reduction in emitting activity and results in an oversupply of allowances. The risk of such unforeseen events impacting the efficacy of the carbon market must be increased if carbon caps are set over longer timeframes. Thus the benefits of longer caps alone in encouraging longer-term investment may ultimately be limited. The answer to this dilemma may lie in the combination of factors that provide investors with greater confidence in a sustained carbon market price. Longer phases and caps are part of that, but so too is inbuilt flexibility, such as through reserve mechanisms and through political support for a wider policy commitment to long-term action to cut emissions.

Strong ambition is critical to ensure proper functioning of an ETS. Avoiding over allocation of allowance is the key to establishing net market demand and a strong carbon price. Some of the early experiences with existing trading systems highlight the consequences of ultimately unambitious caps in terms of the weak carbon price and low levels of domestic abatement that result. While more recent surpluses are a result of the unforeseen reduction in emissions driven by the economic crisis, two earlier examples are highlighted above, which provide lessons for future system design:

(i) EU ETS phase I targets proved unambitious, because baselines upon which caps were set were poorly understood (unverified) and the bottom-up member state driven cap setting process created an environment in which the protection of national interests could arise (although many NAPs did appear ambitious).

(ii) In the case of RGGI, a modest cap was set in order to avoid high carbon prices in the initial period, to mitigate the potential impacts of carbon price on economic growth and jobs as well as to prevent carbon leakage to other states. Unanticipated reductions in power sector emissions exacerbated the already modest ambition.

These experiences highlight the importance of defining caps based on a verified emissions baseline with a level of ambition that should drive additional abatement and support a sustained carbon price. They need to be set against the importance of a cautionary approach to ETS design in which pilot phases have proven to be very useful learning experiences in many cases. These pilot or initial phases help inform the design of a system that will be robust in the long term, and modest early ambition can help with stakeholder acceptance and management of economic risks for participant industries. Early phases of new systems should seek to strike the right balance, and later phases build on these to drive significant long-term abatement.

Allocation as a Fair System that Supports Long-Term Competitiveness

Free allocation of emission allowances can be an important mechanism for addressing competitiveness concerns over carbon pricing for trade-exposed industries and also to gain buy-in during the early stages of the implementation of the ETS.

Experience—European Union Emissions Trading System

In phases I and II, almost all allowances were distributed for free to participants in order to mitigate against the impact of allowance prices. However, installations within sectors that could pass on the cost of allowances to consumers could make windfall profits. This was based on the net benefit when the cost of the allowances is subtracted from the value of the allowances given for free, together with increased revenue from consumers. The level of such windfall profits depends on the degree to which carbon costs can be passed to consumers.

In particular, the power sector and certain industrial sectors had greater potential to make windfall profits. An analysis found that power generators passed 60%–100% of the value of free allowances to downstream consumers.[29] Research done by CE Delft and Climate Strategies found that the refinery, iron and steel, and cement sectors also passed on the full opportunity costs to its customers in the period 2005–2008, and windfall profits of €14 billion were made across the iron and steel, refineries and petrochemical sectors.[30]

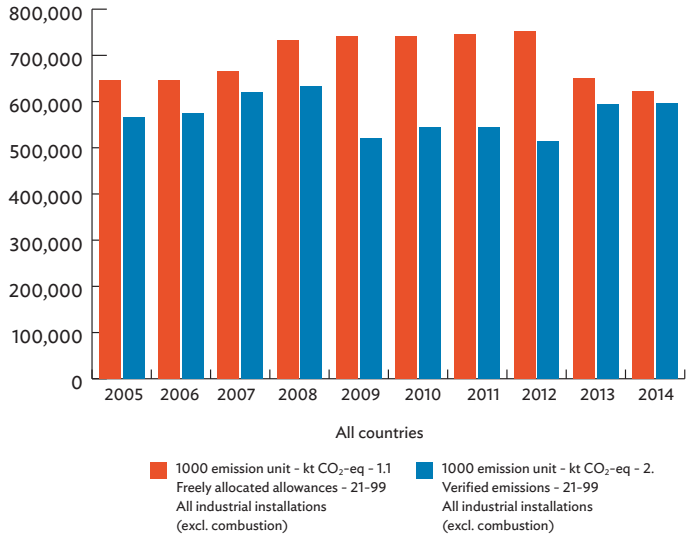
Up to 2012, the majority of installations (84%) received far more allowances than they needed to cover their emissions, a consequence of the surplus discussed above. A particularly large share of the surplus is associated with the steel sector and the cement sector, together

[29] UK Government, 2006.

[30] CE Delft. 2010. Does the energy-intensive industry obtain windfall profits through the EU ETS? An econometric analysis for products from the refineries, iron and steel and chemical sectors? http://www.ce.nl/publicatie/ does_the_energy_intensive_industry_obtain_windfall_profits_through_the_eu_ets/1038

accounting for 63% of all industry surpluses 2012 (EU Transaction Log—EUTL).[31] It is also noted that 78% of surplus allowances in the two sectors were allocated to a small number of the largest companies[32] Across the industrial sectors as a whole, the surpluses since 2005 are shown in Figure 3.5, taken from the EUTL.

Figure 3.5: Freely Allocated EUA vs. Emissions in Industrial Sectors 2005–2014



Source: EU ETS data viewer.

It is important to recognize that there are two separate but reinforcing factors contributing to the windfall profits discussed above: the decision to allocate allowances for free, even though some carbon cost recovery from consumers was possible, together with the overall allowance surplus which left some companies with more allowances than they needed. By contrast, of course, the surplus itself depressed allowance prices as discussed above and therefore acted to mitigate the level of windfall profits.

Lessons

An ETS imposes a carbon cost on the regulated sectors associated with their covered emissions. These costs may result in a loss of value of assets and reduce profitability compared with the scenario in which the trading system is not introduced. The costs to industries that operate in the same market as enterprises that do not incur the same carbon costs can result in a competitive disadvantage and lead to carbon leakage.

Free allocation of emission allowances can address the impact of carbon prices and mitigate political and industrial concerns over the introduction and continuation of an ETS. However, carbon leakage and windfall profits are two sides of the same coin. Enterprises

[31] European Environment Agency. 2016. EU Emissions Trading System (ETS) data viewer. http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer

[32] D. Morris. 2012. Europe's Flagging Carbon Market: Losing the Lead? The 2012 Environmental Outlook for the EU ETS. Sandbag Climate Campaign, UK.

that are exposed to competition from outside the carbon pricing system will be less able to pass on carbon costs, and therefore support through free allocation is more justified. Enterprises without such competition will be more likely to pass-through their carbon costs to consumers and could thus benefit from windfall profits should they be allocated for free.

Free allocations can be determined based on installation-level historic emissions or using benchmarks applied to installation-level baseline activity levels. Historic emission allocation will more closely be linked to an installations need, but also reward past inefficiencies, whereas benchmarking is by definition more standardized within a sector, and those installations that have taken early action will be rewarded relative to those that do not.

Where allowances are sold rather than freely allocated, auctions are commonly used. Auctions do not require historic data and allocate according to the value of allowances to the bidders.

Experience with ETSs to date is generally consistent with the above discussion. The EU ETS adopted free allocations based on grandfathering initially, followed by benchmarking, together with a gradual transition to auctioning. The rates of decline of free allocation vary by sector according to their risks of carbon leakage, with the power sector receiving no free allocation in phase III. RGGI is a unique example of a system that moved directly to auctioning, although this was easier for RGGI given that only the power sector is covered and carbon leakage is therefore less of an issue.

Banking May Have Longer-Term Implications for Future Emission Reduction and Carbon Price

Experience—European Union Emissions Trading System

The EU ETS at the start of phase III did not have the flexibility to accommodate the effects of lower-than-expected emissions. The Emissions Trading Directive permitted banking between phases and the phase III cap was defined as an annual reduction in emissions of 1.74% per year from the average annual cap in phase II – i.e., the over-allocation that emerged in phase II persisted into phase III because of the use of this baseline.

Table 3.2: Phase III Cap and Change of Emissions Outlook

	2013	2014	2015	2016	2017	2018	2019	2020	Total
Phase III Cap ($MtCO_2$)	**2,052**	**2,016**	**1,981**	**1,947**	**1,913**	**1,879**	**1,847**	**1,815**	**15,449**
2008 Projection of Baseline Emissions ($MtCO_2$)	2,173	2,157	2,135	2,116	2,082	2,068	2,054	2,043	16,828
2012 Projection of Baseline Emissions ($MtCO_2$)	1,965	1,979	1,987	1,997	1,984	1,992	2,001	2,002	15,907
Overstated Projection of Baseline Emissions ($MtCO_2$)	208	178	148	119	98	76	53	41	921

$MtCO_2$ = million tons carbon dioxide.

Sources: CITL, 2008 & 2012 emission projections from Sandbag's calculation in Europe's flagging carbon market: Losing the lead? The 2012 Environmental Outlook for the EU ETS (Morris, 2012)

The table below shows how projection of baseline emissions changed from 2008 to 2012 and consequently the potential surpluses that may be generated in phase III.

Regional Greenhouse Gas Initiative

The RGGI states include two interim adjustments to the RGGI cap to account for banked CO_2 allowances. The first adjustment is a reduction to each state's annual CO_2 allowance budget for 2014–2020. The second adjustment is a reduction to each state's annual CO_2 allowance budget for 2015–2020.

Lessons

Banking of allowances to future years means that allowances saved through mitigation action can have an ongoing value and thereby helps encourage early action. It provides participants with compliance flexibility, since surplus allowances that they hold can be used for later compliance periods.

However, as with offsetting discussed above, banking can provide the means to propagate allowance surpluses and thereby suppress abatement action within the system. The oversupply issue in the EU ETS will continue for many years, with current surpluses effectively banked until around 2020 and a level of surpluses continuing well beyond that point. RGGI took the decision to gradually remove some of the surpluses, by retiring unsold allowances from auctions in 2012 and 2013, although this was not a policy change regarding banking per se, but rather an ad hoc adjustment to the cap.

It is important to highlight, however, that banking is not the root cause of surpluses, but a way by which they can persist.

Institutional Setup and Operation

Experience—Regional Greenhouse Gas Initiative

RGGI has adopted a strong approach to establishing a regional carbon market through centralized design principles, decentralized implementation, a common trading platform, centralized tracking system, transparent and unified administration, and independent market oversight systems. Such a framework enables the harmonization of individual programs among states, providing operational efficiency and a level playing field for participants, while also giving individual states flexibility in how they operate each system. RGGI has created a foundation for a harmonized system design with strong market oversight, and the Western Climate Initiative (WCI) has been built on this model. Furthermore, there are similarities with the EU ETS (later phases) in which a strong centralized framework ensures harmonization, yet the system is implemented by member states according to their own regulatory arrangements.

Western Climate Initiative

Given the lack of a regional legal framework for emissions trading, the decentralized nature of the WCI means that agreement must be reached in all jurisdictions on system design

and that each jurisdiction also needs to implement programs under respective regulations in accordance with the WCI framework. There are five jurisdictions in principle, covering British Columbia, California, Manitoba, Ontario, and Quebec. This has proven to be a challenge, since a number of jurisdictions have joined and left the initiative since the agreement was signed; only two out of five active jurisdictions have passed legislation for a cap-and-trade program.

Lessons

A harmonized framework of design principles and centralized market oversight, such as under RGGI, is key to the successful development and operation of a regional carbon market. Although the WCI was based on the RGGI model, the lack of a regional legal framework to provide centralized market oversight has resulted in delays in the implementation of cap-and-trade programs by WCI jurisdictions.

Prefecture Level Trading (Tokyo Cap-and-Trade Program)

The Tokyo ETS emissions coverage is relatively small, which limits the size of the traded market. Facilities are only permitted to sell emissions allowances after they achieve their emission reduction targets. This further restricts market liquidity, and possibly restricts access to lower cost emission reductions. Until now there have been few transactions in the Tokyo ETS. From 2012–2013, participants carried out six trades for a total of 19,659 tCO_2e . In addition, Tokyo offset credits were traded at around ¥15,000 ($192) per ton in 2011. The high price is partly attributable to high domestic emissions reduction costs and the lack of access to international offset credits. Experience in Tokyo provides valuable lessons for the design of city-level ETSs, especially in regards to trading and crediting rules.

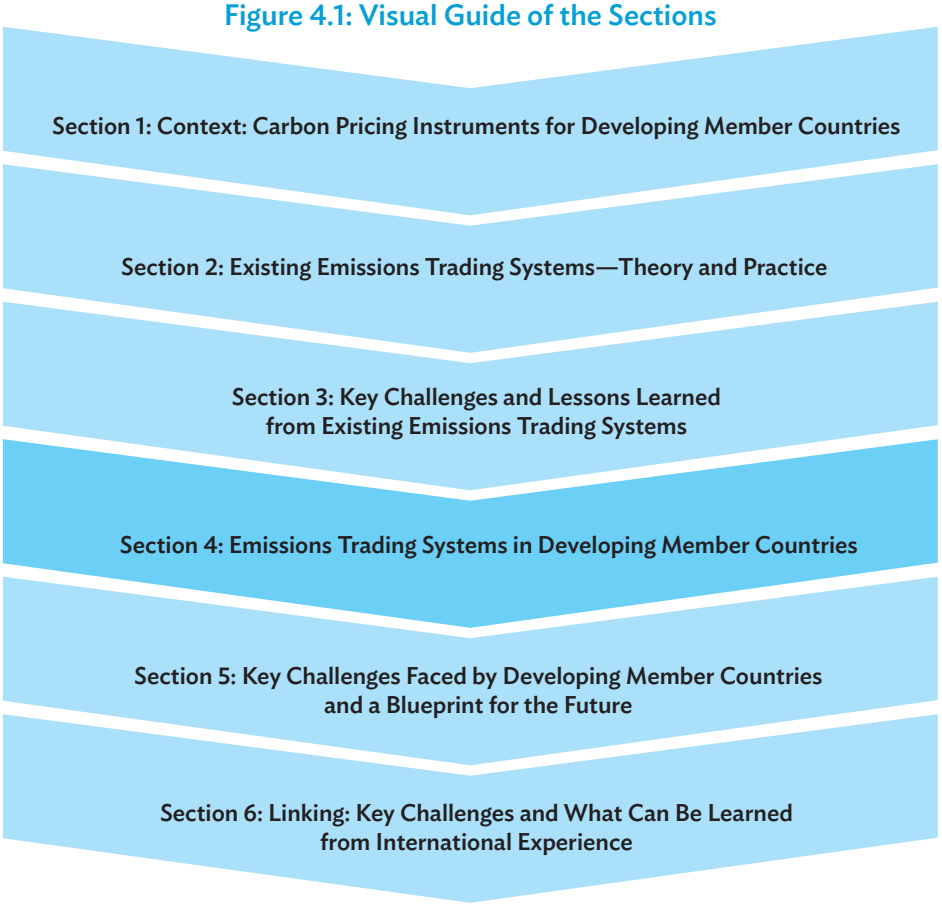
Summary on Lessons for the Future Development of Emissions Trading Systems

The problems associated with over-allocation, low carbon prices, and price volatility in the existing systems demonstrate that these systems lack the flexibility to respond to unexpected changes and events and fail to provide long-term consistent incentives for low-carbon investment. These issues have created the need for improving existing emissions trading markets as well as the need to learn lessons from this in the strategic development of future markets. An effective ETS should not only deliver long-term emissions reductions, but also have the flexibility to react to unexpected market changes and to stabilize the long-term development of the market. The key direction for reform of future ETSs would be

(i) the need for a long term ambitious cap to create constant demand on emission reduction,
(ii) the need for more flexible measures and frameworks to respond to unexpected changes, and
(iii) a commitment to the long-term value in use of emission allowances and credits.

4 Emissions Trading Systems in Developing Member Countries

Figure 4.1: Visual Guide of the Sections



Six of Asian Development Bank's (ADB's) developing member countries (DMCs) within the Asia and the Pacific region are developing national emissions trading systems (ETSs). Among these, the People's Republic of China (PRC) and Kazakhstan have launched an ETS at the time of writing. The PRC has a pilot ETS in seven provinces and cities, and Kazakhstan has a single national ETS.

India, Indonesia, Thailand, and Viet Nam are preparing for the implementation of an ETS, along with other carbon market instruments (crediting mechanisms). In some cases, these DMCs plan to use voluntary or mandatory crediting mechanisms or energy efficiency trading systems, as precursors to the development of an ETS.

This section provides an overview to key design features of existing and developing systems in DMCs.

People's Republic of China Emissions Trading System

As the second largest economy and the largest carbon emitter in the world, the PRC recognized the need to decouple further economic growth from greenhouse gas (GHG) emissions, improve energy efficiency, and increase the share of alternative energy sources in its mix. The 12th five-year plan (2011–2015) first put forward the initiative to "gradually establish an emissions trading market." This is to be developed in the following stages:

(i) Preparatory stage (PP), 2014–2015: developing ETS regulation, technical standards, and building the ETS infrastructure;
(ii) Phase I (PI), 2016–2020: operation and further improvement of the system in key emission sources; and
(iii) Phase II (PII), post-2020: expanding coverage and developing new trading products, exploring the possibility of linking the PRC ETS with international carbon markets.

Under the PP, seven pilot ETSs are being implemented by separate jurisdictions, ahead of the nationwide ETS, which is planned to be rolled out in the 13th five-year plan (2016–2020).

On 25 September 2015, President Xi Jinping announced that the PRC will launch its national ETS in 2017. Plans have been underway for some time, and the national system will cover key industrial sectors such as iron and steel, power generation, chemicals, building materials and nonferrous metals.[33]

Table 4.1: Overview of Emissions Trading Systems in the People's Republic of China

Building block	Description
Legal foundation	The 12th five-year plan first put forward the initiative to "gradually establish an emissions trading market." On 10 December 2014, the National Development and Reform Commission issued the Interim Administrative Measures on Carbon Emissions Trading report providing the legal basis for building a nationwide carbon market. In the preparatory stage, five cities and two provinces—Beijing, Chongqing, Shanghai, Shenzhen, Tianjin, Guangdong Province, and Hubei Province—were approved to carry out pilot ETSs.
Coverage	**Preparatory stage:** The selected regions represent 18% of the PRC's total population and 30% of its gross domestic product. The cap of the seven pilots was about 1.24 billion tCO_2e in 2013. **GHG:** All systems cover CO_2. Only Chongqing includes the remaining five Kyoto Protocol GHGs: CH4, N2O, PFCs, HFCs, SF6. **Sectors and thresholds:** ETSs target the most emission-intensive sectors. They can be categorized by threshold level: Shenzhen and Beijing: Installations' annual emissions above 3,000 and 10,000 tCo_2e respectively, including power, heat, manufacturing, large buildings. Latter also includes transportation.

continued on next page

[33] Partnership for Market Readiness. 2015. China Carbon Market Monitor. https://www.thepmr.org/system/files/documents?destination=system/files/documents

Table 4.1 *continued*

Building block	Description
	Chongqing, Shanghai, Tianjin, Guangdong Province: Installations' annual emissions above 20,000 tCO_2e, in the power, iron, steel, ferrous metals, chemical and petrochemicals, cement sectors where present. Shanghai further includes airlines, harbors, airports, railways, and commercial sector, with Tianjin including residential buildings. Hubei Province: Installations with annual energy consumption above 60,000 tce, targeting similar sectors as above. Phase II – Pilot and improvement phase. Phase III – Stability phase (post-2020): Efforts will be made to increase market coverage.
Targets and cap	**Targets:** All areas covered have intensity-based targets for economy-wide GHG emission reduction, ranging from 17%–21% reduction by 2015 from 2010 levels, which are set at the national level. **Cap:** Following intensity-based targets and economic or sector growth projections, all ETSs have absolute caps, which in some cases permit growth in emission levels. The first compliance period is timed with the Preparatory stage, 2013–2016, lasting 2–3 years, depending on the start date in each province. The volume of the caps in $MtCo_2eq$ for 2013 were: Beijing (50), Chongqing (125), Shanghai (160), Shenzhen (33), Tianjin (160), Guangdong Province (388), and Hubei Province (324).
Allocation of allowances and carbon leakage	**Plans:** Allocation plans are established at a national level and implemented by provincial authorities, which may be more stringent with regards to free allocation. **Free allocation:** Allowances are mostly freely allocated, using benchmarking methodologies based on different base years. **Auctioning:** Guangdong, Chongqing and Hubei intended to use auctioning for a small percentage, but only Guangdong has done this so far.
Monitoring, reporting and verification	Monitoring, reporting, and verification (MRV) procedures in accordance with respective guidelines on approaches to accounting and reporting emissions are defined under each jurisdiction at the sectoral or installation level. Guidelines for verification of these emissions exist in many ETSs. Most of these guidelines are being trialed and improved during this pilot phase. Guidelines and oversight of qualification of verification bodies is done at the national level and implemented at the provincial level.
Compliance and enforcement	Penalties for noncompliance range from cash penalty (one to five times average market price in some cases with a cap of CNY50,000–100,000) plus surrendering the shortfall or deducting the shortfall from the allowance over the next 2 years (Hubei and Chongqing). Chongqing and Tianjin have no penalties for noncompliance. Compliance requirements are set at the national level and enforced at the provincial level.
Flexible Measures	**Banking:** Permitted between years in pilot period, except in Hubei province. **Borrowing:** Prohibited. **Offsets:** Qualitative restrictions: No international credits accepted. All ETSs accept domestic credits, with Beijing requiring 50% and Guangdong 70%, of credits be sourced locally, and Chongqing requiring credits be sourced through their voluntary or forest schemes. Quantitative restrictions: 5%–10% of compliance can be met by credits. **Linking:** Efforts will be made to explore options for linking with other markets in the Stability Phase (post-2020).

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Table 4.1 *continued*

Building block	Description
Institutional infrastructure	**Market oversight:** The market is managed at two levels. National level: the State Council Carbon Trading Regulatory Authority develops basic rules, e.g., setting the allowance cap and allocation plan, designing emissions MRV guidelines, and determining compliance rules. Provincial level: carbon trading regulatory authorities are responsible for the execution and management of carbon trading related activities, determining covered entities, implementing the allocation plan according to national standards, organizing and implementing emissions MRV, and managing compliance. **Registries/tracking:** Built and aggregated at national level. Provincial authorities manage sub-registries. **Trading platform:** Each province has a distinct trading platform for secondary market trades, with Hubei, Shenzhen (Shenzhen Emissions Exchange), and Beijing (China Beijing Environment Exchange) having the most trade volume to date.
Measures to manage market supply and price	**Strategic reserve:** Shenzhen, Guangdong, and Hubei have established a strategic reserve for price management. Such a reserve is also intended in Shanghai. Beijing, Chongqing, and Tianjin have not yet declared clear rules for price management. **Auction and buy-back of allowances:** Beijing and Tianjin intend to use auctioning and buy-back of allowances to control supply and prices.
Cost containment	**Transitional measures:** The approach of the PRC is to launch seven pilot ETSs, in order to test systems and prepare stakeholders, in order to improve before nationwide launch in 2017.

PRC = People's Republic of China, CH_4 = methane, CO_2 = carbon dioxide, ETS = emissions trading system, GHG = greenhouse gas, $MtCO_2e$ = millions of tons of carbon dioxide equivalent, N_2O = nitrous oxide, HFCs = hydrofluorocarbons, PFCs = perfluorocarbons, SF6 = sulfur hexafluoride, tCO_2e = tons of carbon dioxide equivalent.

Kazakhstan's Emissions Trading System

Kazakhstan has high GHG emissions per unit of gross domestic product (GDP), and emissions have climbed 81% over the past 10 years due to the burning of fossil fuels and manufacture of cement.[34] In December 2012, Kazakhstan's government approved legislation on the Kazakh ETS. The ETS began operation in August 2013 and is the first operational nationwide ETS in the DMCs in Asia and the Pacific. The design of the ETS is very similar to the EU ETS and the key design features are summarized below.

Table 4. 2 Overview of the Emissions Trading System in Kazakhstan

Building block	Description
Legal foundation	ETS was developed according to amendments to certain legislative acts of the Republic of Kazakhstan relating to environmental issues. In December 2012, Kazakhstan's government approved legislation on its ETS.
Coverage	**GHGs:** Phase I covers CO_2 only, but both CH_4 and N_2O emissions must be reported. **Sectors:** Coal, oil, and gas production; power; mining and metallurgy; chemical industries. Inclusion of agriculture and transport being considered. Threshold: Installations with annual emissions above 20,000 tCO_2e.

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[34] The World Bank Database. 2015. http://data.worldbank.org/topic and Trading Economics. CO_2 Emissions (kt) in Kazakhstan. http://www.tradingeconomics.com/kazakhstan/co2-emissions-kt-wb-data.html

Table 4.2 *continued*

Building block	Description
Targets and cap	**Target:** Reduce emissions 7% below 1990 levels by 2020. By 2030, unconditional INDC target 15% reduction relative to BAU, conditional target of 25%. **Caps:** Absolute caps: CPI: 2013. No reduction target. 147MtCO2eq CPII: 2014–2015. Y1 no target reduction. 155.4MtCO2e. Y2 1.5% reduction relative to 2014, 153MtCO2e CPIII: 2016–2020
Allocation of allowances and carbon leakage	**Free allocation:** CPI and CPII: Grandfathered (based on unverified historical emissions). CPIII based on benchmarks.
Monitoring, reporting and verification	Still under development. Significant challenges will therefore be faced in ensuring that installation-level data is properly collected in time for the launch of the second trading period, and delays may also be faced in the setting up of the allowance registry.
Compliance and enforcement	Companies that fail to submit the necessary reports and documentation to the Ministry of Environment Protection (MEP) will be subject to fines and criminal prosecution, in addition to having to submit allowances. Penalties will not be imposed on companies that do not surrender sufficient allowances during Phase I.
Flexible measures	**Banking:** The system does not allow banking from 2013 to 2014. **Offsetting:** Domestic offset credits from noncovered sectors and international offset credits such as CERs, ERUs, or other international carbon units for compliance, provided they are subject to the same strict criteria as the CDM. **Linking:** Studying the possibility of linking to other large systems such as the EU ETS and Japan.

CH_4 = methane, CO_2 = carbon dioxide, CP = compliance period, ETS = emissions trading system, GHG = greenhouse gas, N_2O = nitrous oxide, SF6 = sulfur hexafluoride, tCO_2e = tons of carbon dioxide equivalent.

Emerging Initiatives: India, Indonesia, Thailand, Viet Nam

India, Indonesia, Thailand, and Viet Nam are preparing themselves for the implementation of carbon market initiatives, including ETS and crediting mechanisms, in the coming years. The table below summarizes the targets and preparatory activities being undertaken in each country to achieve this.

Table 4.3: Overview of Emissions Trading Systems in India, Indonesia, Thailand, and Viet Nam

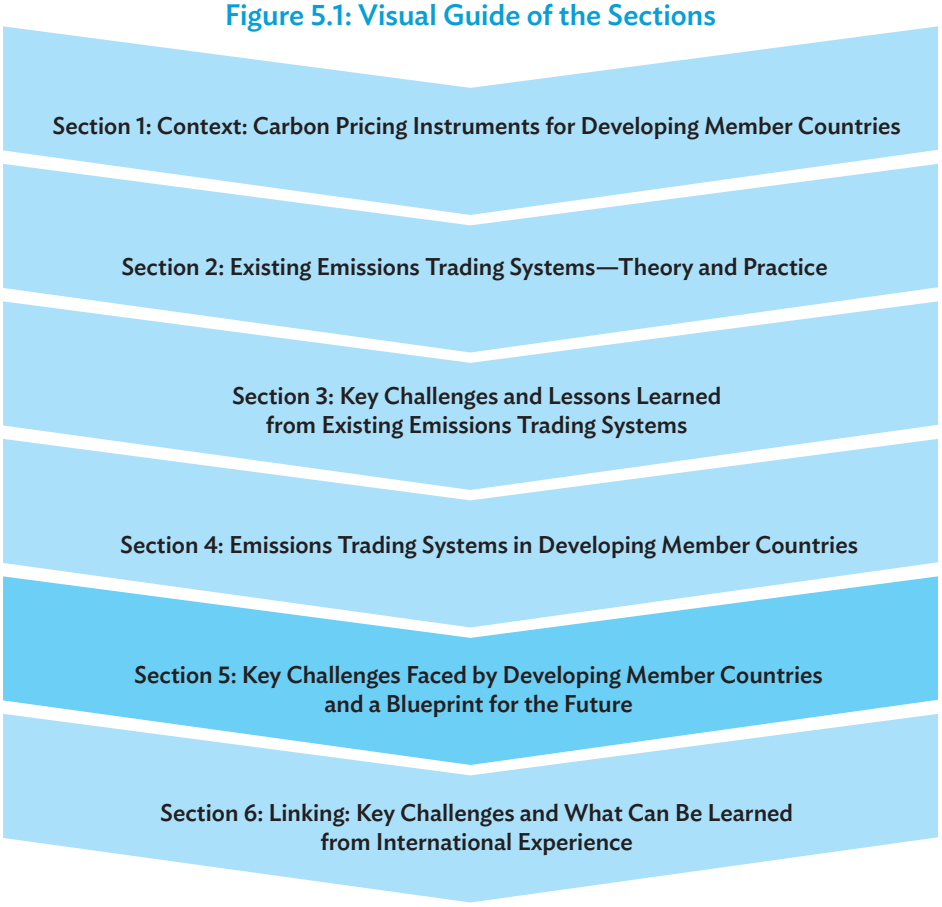
	Targets, timing, and scope of initiatives	Preparatory activities
India	Emission intensity target: Reduce emissions per unit of GDP by 20%–25% by 2020, and 33%–35% by 2030, relative to 2005 levels. Although the implementation of an ETS remains politically uncertain, under the PMR India has indicated the intention to develop new GHG crediting projects, such as wastewater treatment in the Ganga river basin.	Two market-based systems are currently in operation: Renewable Energy Certificate Scheme, based on a renewable energy purchase obligation on electricity distributors, since 2010 The Perform, Achieve, Trade energy efficiency trading scheme, for improving EE of energy-intensive industries, was created in 2012 These schemes increase readiness for a future ETS or carbon trading scheme by providing a foundation for establishing baselines and cap setting; developing basic infrastructure (institutional frameworks, trading platforms, registry system); and capacity building by key players. However, this readiness is confined to sectors that represent a limited proportion of total GHG emissions.
Indonesia	Unconditional emission reduction target: 29% by 2030 relative to BAU. Conditional: Increased to 41%. Domestic ETS and crediting mechanisms (bilateral, multilateral, regional) under consideration. By 2019, implementation of pilot systems. Sector and instrument type to be determined (ETS or crediting).	In 2013 initiated a unilateral Joint Crediting Mechanism with Japan, to encourage Japanese companies to invest in projects in Indonesia. Domestic voluntary credit scheme: Nusantara Carbon Scheme is under development Pre-2018: Building market readiness and strengthening the fundamental infrastructure for carbon markets, particularly technical readiness around MRV framework
Thailand	Unconditional emission reduction target: 20% by 2030 relative to BAU. Conditional: Increased to 25% ETS developed from energy performance certificate (EPC) scheme in large energy consumers in energy-intensive factories and buildings, post-2020	2014–2019: Preparation and implementation: Energy performance certificate scheme in energy-intensive sectors, including legal, technical, and institutional readiness Domestic voluntary crediting scheme: Low-carbon city program and fund for communities/municipalities. Builds on existing project-based scheme (Thailand offset carbon program) and offset program, which encourages voluntary commitments by private sector, launched in 2013. Expected that such credits will be permitted for compliance under future ETS. Separate registries for the two schemes will exist. EPC participants will not be able to trade, only to retire domestic credits.
Viet Nam	Unconditional emission reduction target: 8% by 2030 relative to BAU (intensity target/GDP: emission 20% relative to 2011). Conditional: 25% and 30%, respectively.[a] ETS in steel sectors, to start in 2020.	Developing nationally appropriate mitigation actions (NAMAs) in the waste, steel, cement, chemical fertilizer, wind power, and biogas sectors. MRV framework and crediting NAMA in steel and waste sectors.

BAU = business as usual; ETS = emissions trading system; GDP = gross domestic product; GHG = greenhouse gas; MRV = monitoring; reporting' and verification; PMR = Partnership for Market Readiness.

[a] ICAP, ETS Map, Viet Nam, https://icapcarbonaction.com/en/ets-map

5 Key Challenges Faced by Developing Member Countries and a Blueprint for the Future

Figure 5.1: Visual Guide of the Sections



Political Commitment and Uncertainty

With any policy, political commitment is key to enabling implementation and maximizing the effectiveness of the instrument. This is particularly true for carbon pricing instruments such as the emissions trading system (ETS), which create price signals to support investment in abatement measures. Investor confidence will depend on the long-term stability of the policy. When first implementing an ETS, particularly one that covers a large volume of emissions (by sectors or geographical coverage), a stepwise piloting approach may be chosen. While such approaches are important to create stakeholder learning, they must be balanced with strong policy signals to prove the government's commitments to such measures—such as the publication of long-term plans and enshrining such plans in national laws.

It is also important to note that an ETS is often one of a suite of policy instruments and regulations which comprise a national climate change mitigation strategy. In this context, demonstrating a coherent approach and commitment to similar policies will be important to reinforce investor confidence in an ETS.

For instance, although the role of city-level pilots in the People's Republic of China (PRC) beyond their initial phase is yet uncertain, the government has recently announced the intention to establish a national-level ETS by 2017.

Indonesia and Thailand are also developing domestic pilot carbon trading schemes in parallel, and although there is uncertainty on how and whether a nationwide scheme will be developed, this can be mitigated by a roadmap for ETS development, which Thailand has prepared. Finally, while Viet Nam is considering a nationally appropriate mitigation action crediting scheme, and national plans going forwards are yet unclear, the use of the carbon market as a tool for greenhouse gas (GHG) mitigation has been enshrined in the 2014 environmental law.

In addition, at the regional level, a vision and roadmap for the achievement of long-term emission reduction goals in Asia and the Pacific and the supporting role of carbon market measures could help with the alignment and consistency of ETSs. This would support the establishment of the preconditions for linking and the achievement of the low-cost emission reduction investment in the region. A regional approach can consider the following aspects:

(i) Elaboration of ambitions for the carbon market beyond 2020 and potential pathways for market development over time, including pilots, national systems, and options for future linking internationally;
(ii) Concerted knowledge sharing initiatives on key aspects of ETS design and implementation including coverage, target setting, monitoring, reporting, and verification (MRV) systems, allocation, compliance and enforcement mechanisms, legal frameworks, flexible mechanisms and architecture such as reporting and registry systems, and trading platforms; and
(iii) Establishing institutional networks concerning administration, coordination, and governance of individual systems in order to increase the operational efficiency of these systems.

Policy Interactions

Successful GHG mitigation requires a mix of policies appropriate to national circumstances and the nature of the sectors and abatement opportunities being targeted. The interactions and boundaries between these policies must be well defined and clearly articulated to avoid mixed or split incentives and excessive administrative burdens.

Challenges

Many countries in Asia and the Pacific are developing complex policy frameworks to encourage mitigation actions in a range of sectors. In many cases these involve the use

of multiple related market-based approaches. For example, the PRC is developing or implementing new policies for carbon reduction, renewable energy, energy conservation, and environment protection. Responsibilities for these lie in differing government departments; and a lack of coordination between these would risk inconsistent target setting, accounting rules, and a complex set of compliance arrangements and financial incentives for participants of multiple systems.

The seven carbon market pilots in PRC take different approaches to design aspects such as cap setting, thresholds for inclusion of the participants, allocation, MRV methods and mechanisms, offset limits, price control measures, and enforcement. While testing different possible alternatives is the goal of the piloting approach to rolling out ETSs in the PRC, harmonization is needed for a national system.

In India, market-based measures exist for energy efficiency in key industrial sectors Perform, Achieve, Trade and for renewable certificate trading. With the support of the Partnership for Market Readiness, the government plans to develop a carbon market. Under the National Action Plan on Climate Change, it intends to further develop existing systems to deepen the scope of coverage in currently covered sectors and extend coverage to new sectors. Coordination of these related systems would improve the effectiveness of the incentives for emission reductions that they provide.

Potential Solutions

To further harmonize the approach to market-based measures the following should be considered as options:

(i) Strengthen cooperation between ministries, central government, and local governments to ensure all involved authorities hold a common view when it comes to the role and function of emissions trading and avoid future conflict between policies.
(ii) Take an integrated approach to ETS and related policies. Assess the economic and environmental impacts of potentially implementing multiple programs such as ETSs, energy saving certificates, renewable energy certificates, and carbon taxes. Clearly define the boundaries of policies and their respective mitigation roles. If there is interaction, its impact must be taken into account when establishing the respective targets of the systems. Integrate energy planning and energy conservation planning into GHG mitigation planning and other related mitigation programs to reduce overlap or inconsistencies in these policies.
(iii) Explore the possibility of linking related programs. Mechanisms to permit the use of credits between systems, such as offsetting, can help establish a wider market for mitigation activity and create a consistent level of mitigation incentive.

The implementation of complementary policies may reduce emissions within an ETS. For example, implementation of renewable energy, energy conservation, energy efficiency, and other environmental protection policies may generate co-benefits of emission mitigation. Clear boundaries between policies need to be defined so that their expected impacts on GHG emissions are understood before determining the ETS cap.

Target Setting and Flexibility

Emissions caps must be stringent enough to ensure additional abatement in line with national targets and commitments; yet wider experience has shown that poorly set baselines and unexpected broader economic changes can lead to allowance surpluses that hinder abatement.

Challenges

Developing countries in Asia and the Pacific are experiencing higher economic growth rates than developed countries and this has implications for the nature of emissions targets. Economic development, industrialization, and increasing urbanization bring about increased energy consumption that drives an associated increase in emissions of developing member countries (DMCs). Table 5.1 shows the average annual growth rate in GDP of five DMCs along with the growth in carbon dioxide (CO_2) emissions. Table 5.1 shows the average annual growth rate in GDP of five DMCs along with the growth in carbon dioxide (CO_2) emissions. It can be seen that GDP and emissions growth rates have been high over the period from 1990.

Table 5.1: Average Annual Growth Rate in Gross Domestic Product and Carbon Dioxide Emissions (1990–2010)

	PRC	Indonesia	India	Thailand	Viet Nam
Annual GDP growth rate (%)	10.47	4.73	6.54	4.49	7.09
Annual Growth rate of CO_2 emissions (%)	6.24	5.51	5.33	5.84	10.34

PRC = People's Republic of China, GDP = gross domestic product.

Note: This table does not include Kazakhstan's data, due to unavailable emissions data from 1990–2010.

Sources: World Bank, 2014. World Development Indicators: Trends in greenhouse gas emissions, Environment 2014. http://wdi.worldbank.org/table/3.9; http://data.worldbank.org/indicator/NY.GDP.MKTP.KN?page=5; http://data.worldbank.org/indicator/EN.ATM.CO2E.KT?page=5

High economic growth supports increases in standards of living and reduction in poverty in the region, and these will remain high priorities for the longer term. Total energy consumption and CO_2 emissions are anticipated to continue increasing for many years to come even though most DMCs have implemented green growth or low-carbon growth strategies in recent years. Consequently, there has been an emphasis on intensity-based targets rather than absolute caps on emissions, for fear that the latter could inhibit economic growth. For instance, the PRC, India, Thailand, and Viet Nam have set carbon emission and/or energy intensity targets. The main challenges for target setting include:

(i) satisfying the political priorities of maintaining high economic growth and poverty reduction together with abating emissions. These are not in principle conflicting priorities, since a more carbon efficient or energy efficient economy will make better use of natural resources and can be more competitive internationally; and

(ii) setting emissions targets that are resilient to unexpected future changes in economic growth.

These points are manifested in the decision between adopting policies with absolute emission caps or ones with emissions intensity targets. An absolute cap on emissions has the advantage of predictability in the level of emissions within a system. An intensity target allows emissions to fluctuate with economic development, but brings about environmental uncertainty.

At a more practical level, emission targets need to be based on good quality baseline data. This requires robust monitoring and verification systems and oversight capability. In particular, the PRC, Thailand, and Viet Nam[35] have raised concerns over the lack of data, especially at the installation level, which lowers the robustness of cap setting and sectoral coverage decisions. Further, the issue of how to ensure consistency between data gathering activities under the ETS (emission reductions) and the national GHG inventory was also raised. It should be noted that many DMCs have ad hoc national GHG inventories, prepared for national communication requirements under the United Nations Framework Convention on Climate Change, rather than institutionalized inventories, which are systematically updated yearly.

Potential Solutions

The robustness of data used for cap setting could be improved by building on and complimenting existing GHG inventory data gathering activities. This would share resources and ensure consistency of data. The integrity of such mechanisms can be ensured by robust MRV standards, including measures like outsourcing data gathering to technically accredited and independent third-party auditors and verifiers.

The decision over whether systems involving absolute caps or intensity targets are set should take into account the relative priorities of environmental certainty and flexibility to align with and not inhibit economic growth.

For systems with absolute caps, the length over which the cap is defined is an important consideration. As discussed above, many caps are set for short periods, normally under 5 years. Such short periods are appropriate for pilot or trial phases. For established systems there are two considerations. Longer-term caps provide a stronger signal to the market for investment in abatement over longer timescales, giving greater confidence in payback for capital intensive projects. On the other hand, caps set more frequently offer greater opportunities to adjust the emission trajectory in light of changing economic circumstances. The aim in balancing these should be to adopt an approach that provides greatest confidence in meeting long-term national objectives at lower cost.

A further issue to consider with absolute cap setting is the means to introduce flexibility in the system. Possibilities for introducing flexibility are discussed in Section 4 in the context of ETS operating experience during the economic crisis. Here they are considered in the context of responding to unexpected economic outcomes generally, whether economic growth or recessions. Also, use of crediting has a different context, to that examined earlier for existing systems as DMCs can use crediting within national boundaries to support investment and abatement in non-ETS sectors of the economy, a different role compared to many developed economies. Some issues concerning flexibility mechanisms are as follows.

(i) Flexibility reserves. Consider the use of allowance reserve mechanisms, in which allowances are withheld from the market during periods of lower demand and

[35] Issues raised by PRC, Viet Nam, and Thailand, among others, in the ETS workshop in Bangkok.

released when demand is higher. The overall cap for a given phase would remain fixed. Transparent rules would be required on the conditions under which the reserve is activated and how it functions.

(ii) Price ceilings or floors could operate in a similar way to a reserve, with allowances released or withheld from the market. If a ceiling price is to be guaranteed, then that might entail releasing more allowances than the cap, which would undermine the environmental integrity of the system.

(iii) Project credits. Linking to external sources of abatement through crediting mechanisms can help mitigate the risk of high ETS allowance prices, since project credits would then be used for compliance instead of expensive abatement within the system. The approach would reduce the level of action from within the system but can be viewed as a means of using the ETS to finance investment on a project basis in other sectors. Linking to other ETS systems will result in a lower average or total cost across the linked ETSs, while the cost in individual linked ETSs could possibly rise. The use of credits has been found to exacerbate problems of oversupply, in spite of intentions that crediting would be additional to abatement within the system. Quantity or quality limits to the use of credits help underpin the integrity of the system, and mechanisms that only allow use of credits for participants that have undertaken some of their own improvements could be considered.

(iv) Banking and borrowing rules provide flexibility, since the supply of allowances determines a cap applicable over a phase of many annual compliance periods (or longer) rather than for each compliance period itself. This helps to avoid very high or low prices that could result at the end of compliance years, were allowances to not have a continuing value in later years.

Legal Framework and Enforcement

Any ETS must be built upon a strong legal foundation, with oversight and enforcement arrangements, to ensure that participants comply with their obligations. This underpins wider confidence in the allowance market. Experience with ETSs in Asia and the Pacific highlights challenges related to legal frameworks and regulatory enforcement regimes.

Challenges

Of the pilot systems in the PRC, only Shenzhen, as a special economic zone, had the legislative authority to implement laws and regulations to enforce the ETS. The remaining six jurisdictions had no legislative authority and as such had to develop administrative measures to manage the operation of the pilots instead. The administrative measures are not legally binding and do not provide authority for implementing MRV, compliance, and enforcement mechanisms defining the legal basis for allowance trading.

Experience in the first years has demonstrated that local governments have had to extend the deadlines for participants, suggesting that the existing level of capacity and legal framework were not enough to ensure high compliance rates. Table 5.2 illustrates the extensions and compliance rates that resulted.

Table 5.2: Compliance to the Emissions Trading Systems in the People's Republic of China for the First 2 Years

	First Year			Second Year		
	Compliance Deadline	Action Taken to Support Compliance	Percentage Compliance (%)	Compliance Deadline	Action Taken to Support Compliance	Percentage Compliance (%)
Beijing	15 June 2014	No	97.1	15 June 2015	No	97.0
Chongqing	N/A	N/A	N/A	23 June 2015	Deadline extended to 25 July 2015	100.0
Guangdong	20 June 2014	Deadline extended to 15 July 2014	98.9	20 June 2015	No	100.0
Hubei	N/A	N/A	N/A	30 June 2014	Deadline extended to 24 July 2015	100.0
Shanghai	30 June 2014	Auctioning at 12 times market price	100.0	30 June 2015	No	100.0
Shenzhen	30 June 2014	Auctioning allowances at half marketplace	99.4	30 June 2015	No	99.0
Tianjin	31 May 2014	Deadline extended to 10 July 2014	96.5	31 May 2015	Deadline extended to 10 July 2014	99.1

N/A = Not Applicable.

Sources: Tianjin Municipal Development and Reform Commission. 2015. http://www.tjdpc.gov.cn/dtzx/tzgg/201507/t20150713_57314.shtml; Carbon Market Observation. 2015. http://www.carbonmkt.cn; China's carbon emissions trading network. 2015. http://www.tanpaifang.com/tanjiaoyi/2015/0714/45790.html ; International Carbon Action Partnership (ICAP) Status Report. 2016. https://icapcarbonaction. com/images/StatusReport2016/ICAP_Status_Report_2016_Online.pdf

More generally in the PRC, the government has identified standards of regulation enforcement as one of the key issues for addressing environmental challenges. The 9th, 10th, 11th, and 12th five-year plans for environmental protection emphasized the need to strengthen environmental enforcement and compliance assurance.

In Viet Nam, challenges regarding institutional capacity for adequate monitoring and enforcement of energy conservation and efficiency policy were identified in the Partnership for Market Readiness Proposal, even though energy efficiency legislation in place is supported by decrees and circulars. Moreover, the targets and agreements with large energy consumers are voluntary, and hence there are no incentives to implement energy efficiency measures.[36]

Thailand has also reported challenges in the implementation of its energy efficiency policy. Although there are numerous measures in place, there remains a lack of mandatory measures

[36] Government of Viet Nam Ministry of Natural Resources and Environment, Ministry of Planning and Investment, Ministry of Industry and Trade, and Ministry of Construction. 2014. Market Readiness Proposal. https://www.thepmr.org/pmr/ documents

to push ahead the implementation of energy efficiency policies.[37] Thailand's Energy Performance Certificate Scheme system does not involve penalties for noncompliance.

More generally, PRC, Viet Nam, and Thailand have also raised concerns with regards to obtaining buy-in from the private sector and businesses in order to participate in these schemes, most of which still lack awareness of the need to reduce GHG emissions.[38] This is particularly difficult where voluntary schemes are used to create stakeholder learning, as is the case in Viet Nam.

Potential Solutions

The successful functioning of an ETS requires a robust legal framework with enforcement mechanisms and strong regulatory capacity.

The emissions trading legislation would cover, among others, the role and status of emission allowances, compliance obligations, trading rules, monitoring, reporting, verification principles, and the basis for penalties for noncompliance or infringements. Detailed technical guidance and guidelines could then be established to support the implementation and operation of the system.

Legislation can help underpin the long-term functioning of the emission market by defining rules for continued validity of allowances into later phases and, where pilot systems are adopted, indicate the subsequent role for a permanent or longer-term system.

The legal framework would also underpin the role of a regulatory body in overseeing and enforcing participant compliance. This could cover the responsibilities of the regulator, the rights of access to facilities or data, and the penalties that would be applied in the event of noncompliance. The regulatory body would have the powers to enforce the penalties, including, where applicable, pursuing criminal cases. The legislation could set out the arrangements for appeal and independent arbitration in the event of disputes.

The penalty regime should provide a strong incentive for compliance, with penalties being significantly in excess of the costs of compliance. An important consideration is whether to apply a rule requiring allowance surrender shortfalls to be made up in later years. Such a rule would ensure the environmental integrity of the system over each capped period and also prevent the noncompliance penalty price from functioning as a carbon price ceiling. Such regimes can help to ensure participation from the private sector.

In addition, legislation would define the role of the allowance market oversight body, which may be separate from the organization that regulates participant compliance.

[37] Thailand GHG Management Organization. 2014. Thailand's Market Readiness Proposal. https://www. thepmr.org/system/files/documents/Final%20MRP_Thailand_07022014.pdf

[38] Issues also raised by PRC, Viet Nam, and Thailand, among others, in the ETS workshop in Bangkok.

Institutions and Monitoring, Reporting, and Verification Capacity

The implementation of new ETSs requires the establishment of new rules and processes related to the MRV of emissions. These may be built on past measures in the country, or draw on experience elsewhere. Either way, there will likely be the need for increased capacity on MRV technical matters within the government and regulatory as well as implementation bodies.

Challenges

The experience in Kazakhstan and Thailand illustrates some challenges, with PMR updates in 2013 noting that although the system was already operating, challenges included the degree of technical preparation in system design and implementation, including the capacity and availability of verifiers; establishment of exchange arrangements; development of appropriate allocation approaches for future periods; building of the ETS registry system; and provision of technical support for the national data management system of GHG emitters.[39]

More generally, experience with Clean Development Mechanism (CDM) provides a foundation for MRV capabilities in DMCs, although, as a project-based mechanism with differing compliance obligation, provides only a limited starting point for an ETS MRV framework. Other relevant experience relates to energy auditing for energy saving objectives, but these do not normally involve direct emission monitoring as would be required for an ETS.

Some of the challenges regarding the capacity of participants are illustrated by experiences with carbon market mechanisms in the region:

(i) Thailand identified in its PMR Market Readiness Proposal that the key barriers for building a domestic market-based mechanism in both pilot sectors and pilot low-carbon cities are the lack of understanding of voluntary carbon markets. Limited awareness and information on energy efficiency costs, benefits, and technologies is also important.
(ii) Indonesia has identified lack of awareness and institutional capacity as a key barrier to development of a carbon trading mechanism.[40]
(iii) In the PRC, city-based systems such as Beijing and Shenzhen cover a large number of participants in the services sector, including government organizations, universities, hospitals, and supermarkets. This is a wide spectrum of participants, which may be less accustomed to energy management and environmental regulation than more energy-intensive industries that are covered by other pilot systems.
(iv) The inclusion of smaller enterprises raises challenges. For instance, a survey carried out by the Center of Environmental Economics and Policy Research in the Guangdong Academy of Social Sciences shows that 52% of small and

[39] G. Sergazina, E. Tanayev and D. Baigunakova. 2013. *Kazakhstan's National* ETS. Barcelona, Spain.
[40] Partnership for Market Readiness. 2014. *The PMR Partnership Assembly Meeting: Santiago November 2014, Indonesia: Recent Development of JCM*. https://www.thepmr.org/events/eventlist/pa/partnership-assembly-meeting-pa10-santiago

medium-sized enterprises (SMEs) do not understand carbon trading and carbon verification, despite being key actors in the Guangdong ETS.[41]

(v) The PRC, Thailand, and Viet Nam raised concerns on the possibility of fraud.[42] This can occur at several stages, for instance during baseline setting, calculation of emission savings, allocation and surrender of emission allowances, or use of emission credits—organization, verification, and surrender.

Potential Solutions

The adoption of international standards and best practices can underpin the robustness of a new ETS MRV mechanism. This would support recognition and acceptance of mitigation efforts by the international community and help create the conditions for crediting or linking with systems elsewhere. Since Intergovernmental Panel on Climate Change guidelines, International Organization for Standardization certification, CDM and Verified Carbon Standard standards have been applied in some sectors and some projects, these can provide a common basis for developing a set of centralized MRV mechanisms at the national level, improving harmonization with practices in other countries.

At the same time, sharing information and experiences on the development of MRV mechanisms in different countries could facilitate harmonization and help build a foundation for future linking of emerging systems.

Integration of new MRV systems with existing initiatives can help improve the robustness of energy and emission data used in support of an ETS and improve the efficiency of data collection is collected. It can mean that new data gathered for the ETS can have value in support of other systems. In particular, integration with systems such as for national GHG emission inventories, energy auditing and reporting, domestic production, and consumption data can be valuable.

Clear guidelines on MRV help improve stakeholder understanding of system requirements. For example, guidelines on monitoring would include requirements for monitoring equipment, monitoring methods, data collection methods, and emissions accounting methods. Reporting guidelines would include data and reporting formats, deadlines for submission, responsible authorities, and penalties for incorrect submissions. Verification guidelines would include the accreditation standards and process, requirements, and verification rules, etc. Furthermore, clear responsibilities should be assigned regarding the collection and compilation of emissions data, the issuance of allowances and credits, the verification of installation-level emissions data, oversight, and enforcement. In establishing the guidelines, careful consideration needs to be given to the particular circumstances of DMCs, such as where there are large numbers of SMEs with particular capacity needs or related initiatives that also require monitoring and reporting of energy use or emissions. The enforcement and use of such guidelines, standards, and institutional infrastructure (such as registries) to support the MRV system are paramount to ensuring that fraud is avoided.

Initiatives to enhance the capacity of the various parties involved in the functioning of the ETS can help to underpin its success. This is particularly important where the functions

[41] Clean Development Mechanism in China. 2015. http://cdm.ccchina.gov.cn/Detail.aspx?newsId=42783&TId=1

[42] Issues raised by PRC, Viet Nam, and Thailand, among others, in the ETS workshop in Bangkok.

of the regulatory body extend beyond the existing role or the rules and obligations for participants and verifiers are new, as with the following examples.

(i) The designated competent authority should have sufficient personnel and financial support to carry out its responsibilities for managing the collection of emission data, overseeing the MRV process, ensuring compliance, and enforcing penalties for noncompliance.
(ii) Initiatives for building capacity of participants to understand their obligations and the legal consequences of failure to comply would help improve successful compliance rates. Participants could be trained on the ETS obligations, regulatory framework, penalties, MRV rules, the use of standards, and emissions data management processes. This can be tailored to the diverse range of participants involved in the systems, helping to meet the needs of public sector organizations, service sector enterprises, and SMEs (as relevant), as well as energy-intensive industry.
(iii) Capacity building for third-party verifiers can help underpin the quality of verification determinations. This could cover standards, principles, and procedures. An accreditation regime in which verifiers meet criteria of knowledge and experience would help ensure quality.

Allocation Mechanisms

Introducing a carbon price through an ETS can lead to an increase in production costs for industry, especially in cases where allocations are not made for free. This could impact industrial competitiveness in the short term and, when taken with the impact of an economic slowdown, there can be challenges in gaining industrial acceptance for a new system. The free allocation of allowances can help mitigate this, at least partially and over an initial period of time. For DMCs there are some important considerations when developing an allocation mechanism.

Challenges

The state of economic development may differ significantly between regions covered by an ETS, as does the carbon intensity and efficiency of industrial installations. Consequently the level of carbon costs for industries, their ability to absorb those costs, the effects on the economy of reduced competitiveness, and the consequences for consumers of carbon cost pass-through may all vary by region.

Potential Solutions

In developing an allocation system to fairly address the potential impacts of carbon pricing on energy-intensive, trade-exposed industries and on the consumers in sectors covered by the ETS, the following tools can be considered:

(i) allocation mechanisms suited to regional circumstances, for example benchmarks that reflect actual carbon intensity, or use of historic emission grandfathering. Eligibility for high levels of free allocation based on trade exposure should consider regional markets; and
(ii) auctioning revenues could be used very effectively to scale up mitigation activities by being reinvested into mitigation projects outside the system. They could

also help to lessen the impact of a carbon price on consumers, either through direct subsidies or through support to activities such as demand-side energy efficiency improvements. Where the revenues from auctions are used for these specific initiatives, it can help to build the credibility of the ETS and gain public acceptance.

The Functioning of the Market

A strong and well-functioning emission allowance market is necessary to underpin significant and long-term investment in GHG mitigation activities. Experience in Asia and the Pacific highlights some important challenges to be addressed in the design of new market mechanisms.

Challenges

The level of liquidity in the pilot trading systems in the PRC has been low. During the first and second compliance years (1 July 2013–30 June 2015), the trading volume relative to caps ranged 0.2% –4.69%, as indicated in Table 5.3.

Contributing factors for this low level of trade would include the unfamiliarity of participants with carbon market operation, the relatively small size of some markets, restrictions to spot market trading rather than futures, and uncertainties about the degree of compliance and enforcement that can be expected.

Further, there has been lack of public information or guidance on supply and demand of allowances for the pilots. Although they have set the caps clearly, no pilot has released the information on how many allowances have been allocated to participants and the actual emissions of covered participants. The absence of information on allocation and emissions limits the ability of participants and investors to make price projections, and this may be another reason that participants and investors have not actively participated in trading.

Table 5.3: Trading Volume of Emissions Trading Systems in the People's Republic of China for the First 2 Years

	Cumulative Trading Volume (by 30 June 2015) (tCO_2)	Cumulative Trading Volume (by 30 June 2015) (CNY)	Average Price (CNY/t)	Cap	Cumulative trading volume relative to cap
Beijing	2,293,863	121,001,149	52.75	50 Mt for 2013	4.59%
Chongqing	233,381	6,300,302	26.32	125 Mt in 2013, decreasing 4.13% per year to 2015	0.19%
Guangdong	3,303,914	107,917,269	32.66	388 Mt in 2013 and 408 Mt in 2014	0.85%
Hubei	10,501,643	255,369,476	24.32	324 Mt in 2014	3.24%
Shanghai	3,774,491	119,910,847	31.77	150 Mt each year from 2013-2015	2.52%
Shenzhen	4,130,046	204,639,869	49.55	132 Mt from 2013-2015 (2013 cap is 33Mt)	12.52%
Tianjin	1,095,920	22,757,800	20.77	160 Mt for 2013, adjusted in 2014 and 2016	0.68%

Source: China Emission Exchange. 2015. http://www.cerx.cn

If the carbon price is passed down to consumers, it provides an incentive for more efficient use of the products concerned, or even switching to lower-carbon alternatives. For ETSs this is especially significant in the pass-through of carbon prices to electricity consumers. A high degree of regulation and state control over electricity prices would hinder the effectiveness of an ETS covering the power sector in improving the efficiency of electricity use. For instance such state control is significant in the PRC and Viet Nam.

Potential Solutions

A high degree of transparency concerning market-sensitive data, such as allocations, use of new entrant reserves, and verified emission, will help the smooth functioning of the market. The use of futures can improve liquidity and support longer-term carbon price signals.

Where highly regulated electricity markets continuing polices directly aimed at reducing consumption of electricity may be necessary; they could use market-based mechanisms.

Enabling Conditions

Mitigation actions can be costly, as they involve the use of new technology, new facilities, and fundamental changes to operational management. The prerequisite of taking mitigation actions is that entities can finance and acquire mitigation technology. Financing these activities and access to affordable mitigation technologies is a common challenge in DMCs.

Challenges

For example, in India the Bureau of Energy Efficiency clearly pointed out that micro-, small, and medium-sized enterprises had fallen behind Indian industry benchmarks in productivity, technology upgrade, and energy efficiency. This has resulted from lack of awareness and capacity to take up energy conservation and lack of understanding of effective solutions and technologies to upgrade facilities.[43]

In Viet Nam, it has been highlighted that the disparity of access to finance and general weak economic conditions of small and medium-sized enterprises compared with other competitors make it harder to thrive, and this introduces additional challenges in seeking finance and technology services in energy conservation. Despite new laws highlighting the development and encouraging the establishment of energy service companies, these have not yet taken root in Viet Nam.[44] Without finance and access to technology, participants are less able to meet mitigation targets.

Potential Solutions

ETSs by their nature provide a technology-neutral signal for low-carbon investment. This signal can help to overcome some barriers to investment, as it improves the return on low-carbon projects. Long-term political commitment to the ETS and a high degree of ambition can further enhance the effectiveness of the ETS.

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[43] India Bureau of Energy Efficiency. 2012. Quarterly Newsletter.

[44] Government of Viet Nam Ministry of Natural Resources and Environment, Ministry of Planning and Investment, Ministry of Industry and Trade, and Ministry of Construction. 2014. Market Readiness Proposal. https://www.thepmr.org/pmr/ documents

Supplementary initiatives may also be required, however, and the government can have a role in these. Initiatives could be taken to help raise awareness of mitigation options through knowledge networks, publications, resources, and events, for example. They could encourage finance through loans and loan guarantees or facilitation and awareness initiatives between participants and the investment community.

Summary—A Staged Approach

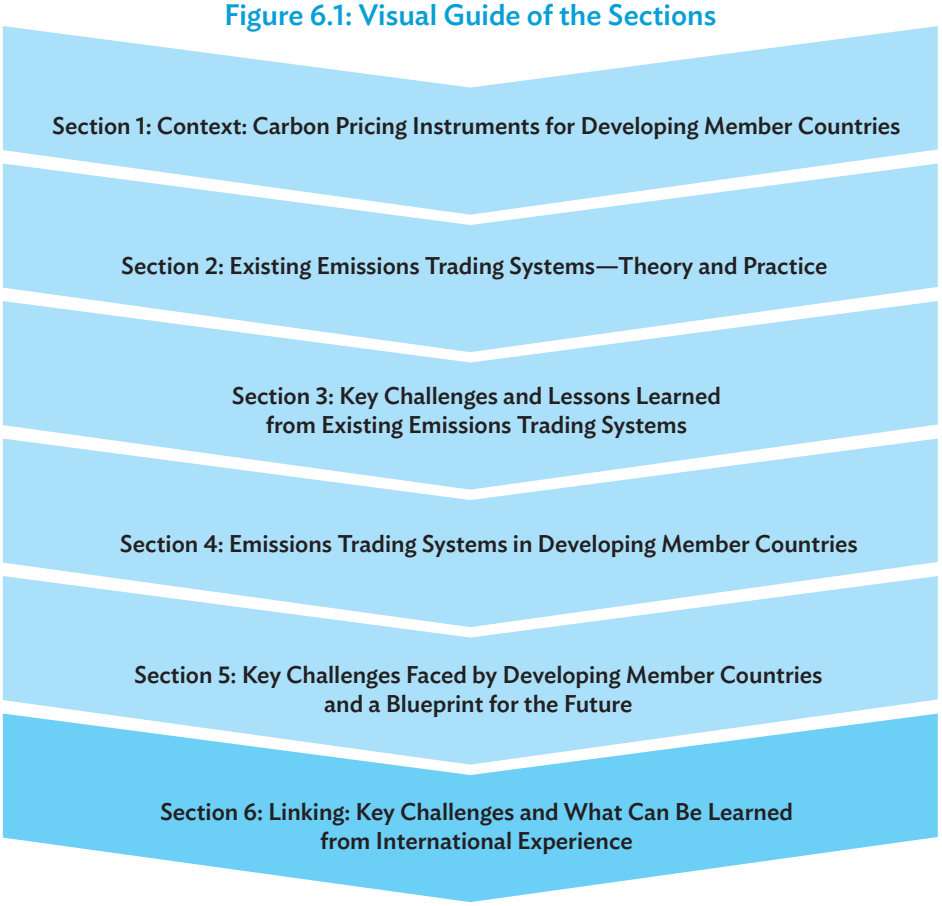
The challenges identified in this system can all be addressed in the progressive development of an ETS. The establishment of political commitment and the design of approaches that fit with other policies are underpinned legally and supported by regulatory structures and improved participant capacity. These can be achieved, as can an effective carbon allowance market and investment environment— however, they represent significant undertakings. Experience has shown that an incremental approach to the development and implementation of policies allows for testing new approaches, gathering feedback, and refinement. Two aspects to this incremental approach can be considered:

(i) **Subnational pilots evolving to a national system.** It could take many years for DMCs to build a mature national-level ETS, and the market needs to be tested and developed over time. A realistic and practical strategy for many may be to begin with regional pilots and expand to a nationwide system as capacity is built. Pilot systems are useful for testing different approaches for an ETS policy, and they have a limited impact on the economy owing to their size and coverage. Meanwhile they prepare stakeholders and regulators for a national system.

(ii) **A phased approach.** Flexibility can be built into a national system by implementing it in phases. Most notably a phased approach allows the progressive setting of caps once the impact of the system is understood, and in response to economic development over time. It also allows for the gradual expansion of scope to include additional sectors, gases, or smaller participants once the functioning market has been demonstrated for the priority sectors.

6 Linking: Key Challenges and What Can Be Learned from International Experience

Figure 6.1: Visual Guide of the Sections



This section examines the prospects for linking emissions trading systems (ETSs) in Asia and the Pacific. Linking provides the benefit that the cap in the system with highest abatement cost can be met by recognizing abatement undertaken in the system with cheaper costs. The convergence of carbon prices between the two systems minimizes competitiveness impacts for industries that operate within the same market. At a more strategic level, linking provides a strong political signal for collaborative action to price carbon within sectors of the economy.

Many ETSs are at the pilot or initial stages and others are under development; therefore linking might be seen as a longer-term aspiration. However, early design choices can establish the preconditions for linking, or, if system designs diverge, make subsequent linking more difficult. Furthermore, some ETS links have already been established, and these provide experiences that can be useful to policymakers elsewhere. These aspects are discussed in the following sections.

Lessons Learned from International Experience of Linking

European Union (EU) and California links illustrate two important high-level aspects concerning the preconditions for linking: early consideration for linking to help align system design and a strong political will supported by close trading relations between regions to be linked.

Considering Linking at an Early Stage in the System Design

If candidate linked systems are aligned in their key characteristics early in the design stages of one or both systems, then the barriers to subsequent linking can be reduced, as can the time taken to achieve the necessary level of harmonization.

Norway's ETS was formulated in the early 2000s and was introduced in 2005. It linked with the EU ETS in 2008. Linking was considered early in the design of the Norwegian ETS, and its initial similarity with the EU ETS helped facilitate the subsequent linking of the two systems. However, the EU ETS and the Swiss ETS will take much longer to reach a linking agreement, as harmonization of key design features in the two systems was not considered in the design stage. The negotiations to link the two systems started in 2010, but a linking agreement has not been reached so far.

California's ETS and Quebec's ETS adopted the same principles, the Design Recommendations for the Western Climate Initiative (WCI) Regional Cap-and-Trade Program, to design their systems. This enabled the harmonization of key design features in the two systems, and their linking occurred just 1 year after their initial operation.

Political Support

Norway's government had a strong will to link with the EU ETS, and this was reflected in the design of the Norwegian ETS at the outset, as the Norwegian system was developed in harmony with the EU ETS.

Trading relationships can also affect the political will to build a link, and existing trade treaties/agreements can make linking easier. The EU is the main trading partner of Norway, accounting for 81% of its exports and 63% of its imports. Linking with the EU ETS helped reduce differences in compliance costs between participants in the respective systems and therefore reduced any resulting competitiveness impacts.

Linking Norwegian ETS with EU ETS occurred in the European Economic Area - European Free Trade Association context. It was achieved by Norway directly adopting the EU ETS directive rather than negotiation of a linkage agreement, which reduced the difficulties and time to establish the link.

Bilateral cooperation of jurisdictions towards ETS development and improvement can help build a foundation for future linking. Many jurisdictions have actively initiated bilateral cooperation initiatives in this area, such as sharing information and experiences and building the common understanding of key design components of the systems. These initiatives could undoubtedly help create the political preconditions for linking as well as reducing technical barriers.

Linking Enablers and Barriers in Developing Member Countries

External Enablers of Emissions Trading System Linking

Experiences of linking and bilateral and multilateral discussions around this topic have shown that it is advantageous if there is a common ambition on climate change mitigation action, there are existing and close trading relationships, and there is the political foresight and will to link.

Mutually Recognized National Mitigation Ambition Beyond 2020

A legally binding global climate agreement was adopted at Conference of the Parties 21 in December 2015, which will come into effect and be implemented beyond 2020. The countries included in the global climate agreement commit to intended nationally determined contributions to reduce greenhouse gas (GHG) emissions. This means that the emission reduction efforts and targets of these countries will be recognized by each other under the same legally binding framework and will establish mutually recognized national mitigation targets for specified periods beyond 2020. These targets will be reviewed and adjusted in 5-year cycles.

The mutually recognized national mitigation targets represent an important political foundation for setting the accepted stringency of caps among systems, which is a prerequisite of linking. This is a critical step for making the linking of emissions trading markets possible in Asia and the Pacific, and review cycles of the national commitments should be used to converge on relevant matters if ETS linking is envisaged.

Close Trading Relationships

Existing trading relationships between countries in the region will be an important factor in building ETS linkages to tackle climate change mitigation at a regional level. In practice, when governments consider linking systems, they tend to prioritize their main trading partners and emerging trade partners, where they would like to see a growth in trade.

Countries that are already close trading partners and that have undergone some degree of trade integration are more likely to become ETS linking partners. The main trading partners in the region can be seen in Table 6.1.

Table 6.1 shows significant interdependencies of all countries in the region and therefore it might be expected that linking of ETSs could emerge more readily between systems in these countries than with systems outside this region. For example, Australia, the People's Republic of China (PRC), the Republic of Korea, and Japan have the strongest trading links in the region and outside the region the EU is the biggest trading partner. Australia had been working with the EU to link with the EU ETS and was also in discussion with the PRC and the Republic of Korea on the development of carbon markets, but this cooperation has stalled since the repeal of the Australian Carbon Pricing Mechanism in July 2014. Likewise, New Zealand has close trading relationships with the PRC, and the EU and has already expressed its interest in linking with these systems.

Table 6.1: Trading Relationships between the Largest Economies in Asia and the Pacific

	Primary Trading Partner in 2011		Secondary Trading Partner in 2011		Tertiary Trading Partner in 2011	
	Import	Export	Import	Export	Import	Export
Australia	PRC	PRC	EU	Japan	US	Republic of Korea
New Zealand	PRC	Australia	Australia	PRC	EU	EU
Japan	PRC	PRC	EU	US	US	Russian Federation
Kazakhstan	Russian Federation	EU	EU	PRC	PRC	Russian Federation
Republic of Korea	PRC	PRC	Japan	US	EU	EU
PRC	EU	EU	Japan	US	Republic of Korea	Hong Kong, China
India	PRC	EU	EU	UAE	UAE	US
Indonesia	PRC	Japan	Singapore	PRC	Japan	EU
Viet Nam	PRC	US	Republic of Korea	EU	Japan	PRC
Thailand	Japan	PRC	PRC	EU	EU	Japan

Source: World Trade Organization, WTO Country Trade Profiles.

Positive Government Attitudes to Linking Emissions Trading Systems

Governments in the region are generally receptive to linking of ETSs in the long term. Already, a few countries have expressed positive views on linking, and countries with ETSs that are operational or in the design phase have included linking provisions in their ETS legislation.

(i) The New Zealand Government expressed a strong interest in linking with other domestic carbon markets, especially to develop a linked carbon market in the Asia and the Pacific region.[45]

(ii) In the Republic of Korea, the Act on Allocation and Trade of the GHG Emission Allowances and Enforcement Decree specifies that the ETS will link with ETSs in other countries, provided they are considered compatible, with credible monitoring, reporting, and verification (MRV) based on the requirements of the United Nations Framework Convention on Climate Change (UNFCCC). The Republic of Korea's government has been in discussion with New Zealand and is currently looking at linking with the EU ETS and a national system in the PRC.[46]

(iii) The PRC is showing interest in exploring the possibility of linking with the international carbon market. Chinese leaders have stated that once it establishes

[45] Government of New Zealand. 2015. *Why We Have the NZ ETS*. http://www.climatechange. govt.nz/emissions-trading-scheme/about/why.html

[46] Thomson Reuters. 2015. *Point Carbon*. http://financial.thomsonreuters.com/en/resources/articles/point-carbon.html

a nationwide carbon trading system, it would be willing to collaborate with other countries and develop harmonized rules for linking. PRC has included linking as one of its ETS design priorities in its Market Readiness Proposal[47] under the World Bank's Partnership for Market Readiness program. Although it may not be ready to link with other national ETSs before the national PRC ETS is mature, it is clear that the government is proactive in this area. Linking with international carbon markets is on the agenda of national ETS development.[48] Experts from the PRC, the Republic of Korea, and Japan are currently researching the potential for ETS linkages between the countries.

(iv) Kazakhstan has expressed a strong interest in future linking as has Viet Nam, where a schedule to link with international markets has been set for beyond 2020.[49]

It is clear that the regional governments in Asia and the Pacific are positive towards linking in the long term. This sends a political signal that there will be the possibility to establish such links among national ETSs in the region in the future.

Barriers to Linking Emissions Trading Systems in Developing Member Countries

The design features of existing ETSs are quite diversified, such as in the stringency of caps, enforcement provisions, and the eligibility of offset credits and cost containment measures. It can be expected that similar or greater diversity will remain as further systems are introduced. The diversity between systems can make linking more difficult, with some potential barriers including differences in:

(i) the stringency of national ambitions and emission caps of ETSs,
(ii) the level of penalties for noncompliance,
(iii) offset eligibility,
(iv) price control measures,
(v) capacities for the implementation of MRV,
(vi) political priorities, and
(vii) domestic legal issues.

In its recent white paper Linking Emissions Trading Systems: A Summary of Current Research, the International Climate Action Partnership (ICAP) summarized current and recent research into ETS linking and sought to categorize the numerous ETS design elements into those elements (a) that are a potential barrier, (b) where harmonization may facilitate the operation of the linked system, and (c) that are not necessarily a barrier. This is summarized in Table 6.2.[50]

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47 Partnership for Market Readiness. 2013. *China's Market Readiness Proposal under the World Bank's PMR*. https://www.thepmr.org/system/files/documents/ PA5_China_Final_MRP___presentation.pdf

48 Updates of China ETS and future development in China, Jiang Zhaoli, Climate change department of NDRC, Workshop on Learning from International Experience, Planning for the Future, 11 September 2014

49 Partnership for Market Readiness. 2013. *The PMR Partnership Assembly Meeting: Barcelona May 2013, Kazakhstan, Domestic Emissions Trading Development*, https://www.thepmr.org/events/eventlist/pa/partnership-assembly-meeting-pa6-barcelona. *The PMR Partnership Assembly Meeting: Santiago November 2014*, Viet Nam: final MRP. https://www.thepmr.org/events/eventlist/pa/partnership-assembly-meeting-pa6-barcelona

50 Kachi A. et al., 2015. Linking Emissions Trading Systems: A Summary of Current Research. International Carbon Action Partnership. https://icapcarbonaction.com/en/component/attach/?task=download&id=241

Table 6.2: International Carbon Action Partnership Research on the Relative Importance of Emissions Trading System Design Elements on Linking

(a) Potential barrier	(b) Harmonization may facilitate operation of the linked system	(c) Not necessarily a barrier
Cap level / stringency	Monitoring, reporting, and verification	Sectoral / greenhouse gas coverage
Offset eligibility rules	Registry design	Point of regulation (direct vs. indirect)
Price control measures (ceilings /floors)	Compliance periods	Opt-in / opt-out provisions
Borrowing provisions	Banking provisions	
	Enforcement/penalties	

These barriers and their applicability in the context of Asia and the Pacific are described further in the sections that follow.

Different Stringency of National Ambitions and Emission Caps of Emissions Trading Systems

Different levels of national mitigation ambition will affect the stringency of the caps, as the cap is set in line with the overall mitigation target. Table 6.3 gives an overview of the status of national emission reduction targets to 2020 and 2030. It can be seen that 2020 targets are quite diverse from country to country in Asia and the Pacific. In general, these targets are intensity-based targets or reductions based on "business as usual" for the developing countries and absolute targets for the developed countries.

The targets of the developed countries show greater variation. However, this needs to be assessed in terms of the base year taken and the variation in the level of effort already taken to reduce emissions. In general, the countries in the list are at differing stages of development. Under the Paris Agreement of the UNFCCC this is recognized through the "common but differentiated responsibilities" principle, and therefore a degree of variation reflected in the targets for ETSs could be tolerable.

Looking beyond 2020, under the Paris Agreement, mutual recognition of intended nationally determined contributions to reduce GHG emissions similarly implies that a degree of variation in national ETS caps could be tolerated for linked systems.

Table 6.3: Summary of Reduction Targets and Trading System Implementation by Country

Country	System Coverage	Level of Ambition	Target type	Status	Start date
PRC	National	Reduce carbon intensity of its GDP 40-45% below 2006 by 2020 and 60% to 65% by level achieve the peaking of CO2 emissions around 2030	GDP Intensity	Schedule to start in 2016	2016
PRC	Beijing Pilot	18% below 2010 by 2016	GDP Intensity Target	Operational	2013
PRC	Chongqing Pilot	17% below 2010 by 2015	GDP Intensity	Operational	2014
PRC	Guangdong Pilot	19.5% below 2010 by 2015	GDP Intensity Target	Operational	2013
PRC	Hubei Pilot	17% below 2010 by 2015	GDP Intensity	Operational	2014
PRC	Shanghai Pilot	19% below 2010 by 2015	GDP Intensity Target	Operational	2013
PRC	Shenzhen Pilot	21% below 2010 by 2015	GDP Intensity Target	Operational	2013
PRC	Tianjin Pilot	19% below 2010 by 2015	GDP Intensity	Operational	2013
India	Perform, Achieve and Trade	Reduce emission intensity of its GDP 20-25% below 2006 by 2020 and 33% to 35% by 2030	GDP Intensity	Operational	2012
Indonesia	Indonesia	Reduce GHG emissions 26% below BAU by 2020 and 29% by 2030	Absolute	Plan to start pilot carbon trading system in 2018	2018
Japan	Tokyo	25% below 2000 by 2020	Absolute	Operational	2010
Kazakhstan	National ETS	Reduce GHG emissions 7% below 1990 by 2022 and 15% by 2030	Absolute	Operational	2013
Republic of Korea	National	Reduce its greenhouse gas 30% below BAU by 2020 and 37% below BAU by 2030	Absolute	Operational	2015
New Zealand	National	5% unconditional emission reduction below 1990 level by 2020 reducing GHG emissions to 30% below 2005 level by 2030	Absolute	Operational	2008
Thailand	Energy Performance Certificate (EPC) Scheme	7-2-% GHG emissions reduction by 2020 below BAU in the energy and transport sectors. Reduce GHG emission by 20% from the projected BAU level by 2030	Absolute	Plan to start Pilot EPC trading program in 2017 plan to start a national ETS in 2010	2020
Viet Nam	National	Reduce GHG emission intensity of GDP by 8-10% relative to 2010 by 2020 and 20% by 2030	GDP Intensity	Plan to start Pilot carbon crediting mechanism in 2018 and plan to start a national ETS after 2020	2020

BAU = business as usual, PRC =People's Republic of China, ETS = emissions trading system, GDP = gross domestic product, GHG = greenhouse gas.

Diverse Penalties for Noncompliance

Cap enforcement is critical to ensuring that the emissions target is achieved and to provide a strong price signal to strengthen market confidence. Enforcement frameworks within existing ETSs generally deter noncompliance with system rules through the use of financial penalties and sometimes the requirement to make good allowance shortfalls. Financial penalties are set to be disproportionate to the cost of compliance and may be a fixed rate or a multiple of the market rate for allowances. The list below shows some example penalties for noncompliance with allowance surrender obligations.

(i) The pilot ETSs in the PRC have in general set low penalties for noncompliance, given that there is no ETS legislation in place (with the exception of the Shenzhen regional ETS). The penalty for noncompliance cannot be higher than administrative penalties set by national administration law. Maximum financial penalties range from CNY50,000 to CNY150,000 per tCO_2 ($7,500–$22,500), and some pilots do not implement enforcement rules for noncompliance.
(ii) In India, the financial penalty is very low in the Perform, Achieve, Trade system, with the maximum penalty being 10 Indian Lakhs (equivalent to $ 20,000) plus the value of noncompliance.
(iii) As yet, no penalty has been set for noncompliance in the Kazakhstan ETS.
(iv) The ETS of the Republic of Korea will impose a penalty at three times the allowance price with a maximum penalty of W100,000 (approximately $90/ton) per ton of CO_2e if a participant fails to meet their target.
(v) The New Zealand ETS has noncompliance rules that require participants to surrender or cancel allowances in addition to a penalty of NZ$30 per tCO_2e .

It is particularly clear that financial penalties are extremely varied across the different systems in place or in design in Asia and the Pacific. This will be an important issue for linking, as disparity in the level of compliance incentive within a linked system could lead to systematic variations in the level of compliance, or affect the level of trust between system participants.

It is unclear what compliance frameworks will be adopted in the other trading systems in Asia and the Pacific. The history of environmental enforcement in developing countries shows that penalties for noncompliance with policy mechanisms are widely used in developing countries, not least as a source of financial income for regulatory authorities. However, the penalties are often set too low due to pressures from industry and a desire to ensure the global competitiveness of local industries. Often the institutional frameworks needed to ensure that compliance is enforced are not in place in developing countries. This means that companies are often not in compliance and prefer to pay the low penalties rather than comply with the legislation.

In the PRC the rules of the pilot ETSs around noncompliance are diverse. Lessons learned from these pilots reveal that the regional governments lack effective policy tools to manage compliance and enforcement.

Enforcement may prove to be a significant challenge for the effective implementation of ETSs and other market-based instruments in developing countries, and this will be a key concern regarding linking to systems with divergent compliance and enforcement mechanisms.

Different Offset Rules and Eligibility

Several issues could be of concern when linking systems with different offset rules and eligibility criteria. These include the type of eligible projects, location of projects and the stringency of project standards. In response to these issues limitations can be applied to the number of offsets that can be used for compliance (quantitative limit), or the types of project that are eligible (qualitative limit). All current ETSs in Asian Development Bank member countries are implementing or intending to use offsets within the system—but they set different quantitative and qualitative caps on the use of offset credits.

The New Zealand ETS allows an unlimited supply of international offset credits. Given the small size of the ETS market in New Zealand and the relatively limited mitigation opportunities, the New Zealand Government has been keen to expand the market through linking. However, the New Zealand ETS faces a few challenges for linking with other international systems. These are:

(i) restrictions in the use of international Kyoto units (certified emission reduction units, emission reduction units and removal units) as of 1 June 2015 effectively making it an entirely domestic system
(ii) the inclusion of land use sectors would be a concern for other systems that do not include them in their coverage and who prohibit the use of credits generated from land use projects.

The Kazakhstan ETS also has relaxed rules for the use of offset credits. Eligible offset projects cover all non-ETS sectors and all non-ETS enterprises. There is no limit on use of domestic offset credits, and international credits may be permitted in the future.

The Republic of Korea ETS currently only allows domestic credits from reduction activities implemented by non-ETS entities under Phases I and II (2015–2020). Domestic offset credits are allowed in the scheme. Participants within the ETS can use domestic credits up to 10% of their annual compliance obligation. Starting with Phase III (2021), participants will be allowed to use international offsets up to 50% of their annual compliance obligation.

The Tokyo ETS and the PRC ETS pilots only currently allow the use of domestic credits.

Diverse offset eligibilities will be a key issue in linking ETSs in the region, given the different eligibilities and limits applied to the use of offsets. Different eligibility of offsets can create a barrier to the linking of ETSs.

Diversified Price Control Measures

Some existing ETSs in Asia and the Pacific have implemented price control measures, whereas others have not. Cost containment measures designed to operate on systems in isolation may not function effectively in linked systems. For example, rules on allowance reserve trigger levels may not apply for a larger market size and the party (e.g., government) bearing the cost of a price containment measure in one system may not wish to do so for a linked system.

New Zealand ETS's cost containment measures include a price ceiling of NZ$25. The Republic of Korea ETS sets a strategic reserve with a maximum of 2.5%–3.0% of total allowances for the stabilization of the market under three predefined price scenarios. Most of the PRC's pilot systems adopt the strategic reserves as price control measures. The PRC's proposal for the national ETS states that a price containment measure will be part of the design in a national ETS.[51] No further information is available yet on how or whether price containment measures will be designed in other proposed ETSs.

Price containment measures (i.e., ceilings and floors) are regarded as being relatively difficult to align, because they reflect the political objectives and priorities that one regulatory authority has set and could affect the ability of a cap to be achieved. Such widespread and diverse adoption of such measures is thus a potential barrier to linking in Asia and the Pacific.

Differing Capacities for the Implementation of Monitoring, Reporting, and Verification

The MRV of emissions is a core element of an ETS, since it determines the number of allowances a participant must acquire and surrender and thus underpins the demand for allowances in the market. Confidence and trust in the robustness of the MRV system is therefore critical for the environmental integrity and functioning of the ETS.

Technical dialogue and cooperation between countries in the design of systems is ongoing, and so it is possible for countries to design comparable MRV mechanisms. However, capacity shortfalls when implementing MRV mechanisms may create additional challenges in building trust in the MRV mechanisms that underpin ETSs and hence affect the potential linkage between systems.

Developed countries such as New Zealand do have some experience under both the UNFCCC process and their domestic ETS. Developing countries generally lack operational experience to date in MRV, where experience is limited to the clean development mechanism (CDM), which itself has been more widely adopted in India and PRC than in other countries in the region.

Capacity shortfalls can arise within an appointed regulatory body, among verification bodies, or both, depending on system design. These shortfalls would have a detrimental impact on the robust implementation of MRV measures if there were insufficient oversight of installations—such as through inspections by the regulatory body or third-party verification by verifiers. Under the EU ETS, some member state competent authorities continue to have limited capacity to undertake a significant number of annual inspections of installations, instead relying on verifiers to monitor adherence to the MRV regulations that underpin the system. Given the challenges of regulatory enforcement in developed countries discussed above, it can be expected that capacity aspects will be a challenge for developing countries in Asia and the Pacific.

[51] J. Zhaoli. 2014. Department of Climate Change of the National Development Reform Commission.

A shortfall in capacity among verification bodies can weaken the robustness of verifications performed, as verifiers seek to reduce the time spent on each verification in order to meet the significant demand for their services.

Lack of capacity to strictly implement MRV mechanisms could contribute to the misreporting of emissions (deliberately or otherwise), which would affect trust in the environmental integrity and allowance market between linked systems. Capacity does and will vary across developing member countries (DMCs), and such capacity shortfalls create a big challenge for linking of the systems. Harmonization of MRV systems is also an important condition for ETS linking.

Domestic Legal Issues

ETSs are founded on a legal architecture composed of rules, principles, and procedures by formal legislation; and any changes to emissions trading legislation has to pass through normal domestic legislative procedures.

Among the existing ETSs in Asia and the Pacific, many are sub-national systems. The lack of legal autonomy of sub-national regulatory bodies implementing ETSs could hinder linking with other sub-regional systems, nationally or internationally, unless the sub-region is authorized to do so.

For example, a potential legal barrier could arise in Japan if the government in Tokyo seeks to link with other domestic or international systems without the consent of the national government, as the Japanese Constitution limits a region's power to make such diplomatic treaties. Such treaties in Japan can only be made by the national government. Similarly, legal issues will be a significant obstacle for the PRC's ETS pilots to link with one another without passing through a national legislation process.

Strategic Approach Toward Linking Emissions Trading Systems in Asia and the Pacific

The previous section examined the enablers for, and barriers to, linking. The prospect of building ETS linkages will fundamentally rely on political efforts to overcome the barriers. This section explores strategic approaches for addressing the challenges facing linking of ETSs in the region.

Context and Outlook for Linking Emissions Trading Systems

The development of ETSs in DMCs in Asia and the Pacific is at a very early stage, with most scheduled to start operating between 2018 and 2020 (except for the PRC); and therefore the desire to link will be limited in the short term, as many ETSs in the region are still under development or need to be improved over time (such as in the PRC).

The priorities for these countries up to 2020 are building market readiness, developing domestic carbon trading systems, testing the systems, and adjusting and improving the systems. Thus, it is not anticipated that there will be any major market linkages before 2020.

In the longer term, linking of ETSs is expected to be a progressive process and can be framed in the context of development within a country or the Asia and the Pacific region. Pilot systems at a sub-national level, for a limited number of sectors or for short initial test periods, can form an important basis for subsequent evolution to a national system. That evolution could comprise the linking or expansion of the pilots or the development of a new national system. Regional linking would most likely connect one or more full national systems, since the pilots themselves would not necessarily provide the stable long-term basis for linking. The move towards a global market system would be a longer-term development, and the extent to which it covers countries outside Asia and the Pacific would depend on the future nature of international agreements. In any case, for many countries in Asia and the Pacific, widespread linking within the region may predate any links further afield, not least for the reasons of close regional ties discussed earlier. In simple terms the progression may look as in Figure 6.2.

Figure 6.2: Approach to Harmonization and Linking of Systems

Strategic Approach to Harmonization and Linking of Systems

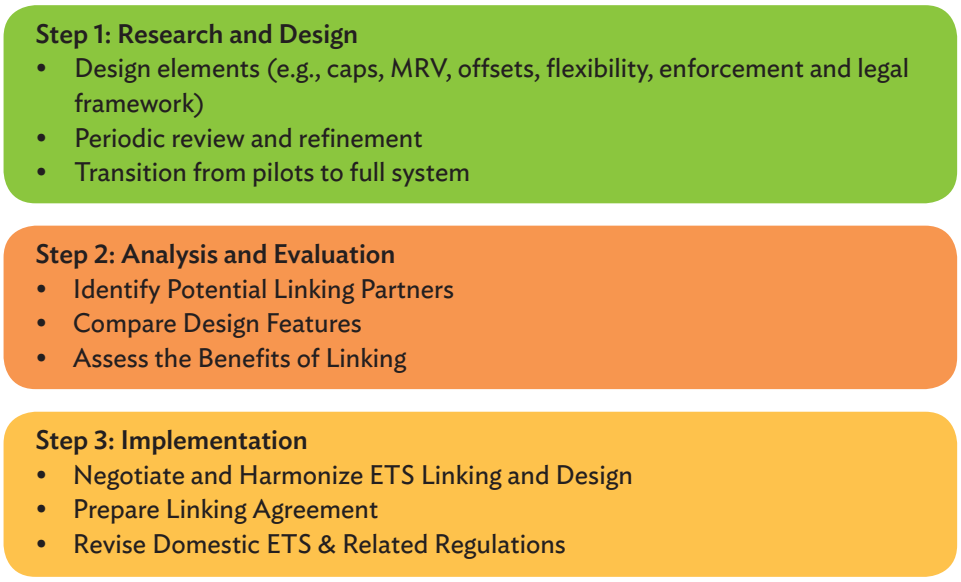
Countries will pursue ETS approaches suited to their particular circumstances and the political environment. Although linking is usually considered only once a domestic market is functioning well, it would be beneficial to have some consideration of future linking requirements at the early, piloting stages. Linking is a process that will evolve over time and would need to progress in a stepwise process. This report proposes the following three steps to approach linking:

STEP 1: RESEARCH AND DESIGN. BUILD A FOUNDATION FOR LINKING EARLY IN THE DESIGN PROCESS

In the very early stages in designing a system, it is not necessarily realistic to achieve a high level of harmonization with other systems that may be subsequent linking candidates. Such harmonization would require either ETS development under a common framework or the transposition of existing system designs. However significant differences in the economic development of each country and the need to develop a system that is focused on meeting national needs would lead to significant differences.

Nevertheless, there will be design choices early on that could be consistent with the design of other possible linking candidate systems. Countries can lay the foundations for linking during the research and development phase. For instance governments should, where possible, be applying international standards and best practices in critical design features such as MRV systems. It is possible to include provisions within national or subnational legislation for later harmonization across any number of linked systems. Some of the main issues for which early design choices can set the preconditions for linking are discussed (Figure 6.3).

Figure 6.3. Steps to Approach Linking



ETS = emissions trading system, MRV = monitoring, reporting, and verification.

Cap Setting

Setting a long-term, ambitious cap demonstrates political commitment to the role of the ETS and establishes the foundations for the carbon market as a driver for long-term investment in abatement activity. The benefits of a long-term cap should be balanced against the value of having a shorter pilot phase to inform later design, and it is in the full operational phase that longer-term targets may be more appropriate. However, wider long-term political commitment to emission savings can help build confidence in the role of the ETS even if the caps themselves are set on a shorter basis.

Consider the type of cap. An absolute cap can provide certainty for achieving GHG emission reduction targets, while an intensity approach sets the targets in relation to economic output and can therefore accommodate changes in economic performance more easily. For example, if growth were to be greater than anticipated when the cap was set, the relative approach would self-correct, whereas the absolute cap would require additional abatement at a potentially high cost. For DMCs in which economic growth plays such an important role in improving living standards and eradicating poverty, the relative approach can be more attractive. However, a relative approach makes systems less comparable and linking much more difficult, if possible at all.

Flexibility mechanisms can be important to adjust the volume of allowances in the market should economic performance change from expectations. The use of reserves in which allowances are withheld or released but an absolute cap is preserved would be more amenable to linking, since the environmental integrity of the system is stronger. Mechanisms to adjust the cap or apply floor or ceiling prices are more problematic for linking. In either case, any rules that adjust the volume or price of allowances in the market should be transparent and predictable.

Standards and Capacity for Implementing Mechanism for Monitoring, Reporting, and Verification

International standards in MRV. A robust MRV mechanism, with strict rules and transparent processes, is the core building block of an ETS. International standards and utilization of best / common practices for the design of MRV guidelines can help minimize incompatibility between systems.

For example, Intergovernmental Panel on Climate Change (IPCC) guidelines and other internationally recognized guidance such as International Organization for Standardization (ISO), CDM, and Verified Carbon Standard protocols and standards can provide a common basis for the development of national MRV guidelines and processes, as well as implementation at the installation level. Using a common system such as this would greatly improve the ability to link later on.

Capacity building for MRV implementation. For emerging systems it is extremely important for countries to put effort into building the necessary capacity and culture for executing MRV and compliance mechanisms. Enhancing capacity is particularly relevant to developing countries where there is often a shortage of capacity. Building capacity and enabling an environment for the execution of robust MRV and compliance is a long-term task for all countries, which requires consistent efforts by the regulatory body or bodies and needs cooperation between countries for the sharing of knowledge and experience. In addition, extensive international support and advice is critical to help developing countries build robust MRV and compliance mechanisms.

Offset Rules

There are two key elements to consider regarding the use and eligibility of offsets:

(i) the creation of appropriate quantitative limits on the use of offset credits, and
(ii) setting rigorous criteria (qualitative limits) on the use of offset credits in an ETS.

Differences in these two elements could pose a potential barrier to linking, since rules in one system allowing use of credits that would not be permitted in a linked system undermine the restrictions that the linked system applies. From an early stage, design choices can help set the conditions for linking:

Quantitative criteria. Quantitative limits help demonstrate application of "supplementarity," which indicates that mitigation through the use of offsets is supplemental to action taken by ETS sectors and not a substitute to abatement in ETS sectors. It also means the system is less exposed to falls in the offset price reducing the incentive for abatement within the system, or contributing to surpluses in the event that the cap exceeds business-as-usual emissions.

Rigorous offset criteria. Rigorous criteria for the generation of offset credits should be adopted and maintained over time. Linking requires that standards and principles for offset credits should be comparable, and this means that linking partners need to use common rules based on international standards such as CDM and Joint Implementation, IPCC, or ISO standards. Countries are advised to develop their own criteria in line with international standards or adopt JI and the CDM in order to assess additionality, baselines, and verify emissions.

Clear plans to phase in or phase out certain offset credits. Offsets may serve a particular function such as supporting abatement in domestic non-ETS sectors or providing price risk management in the early stage of a system. It may be the policy intent that the rules around use of offsets will change as the system develops. A plan—including a timetable or timetables, changes in offset limits (quantitative limits), changes to offset criteria (qualitative limits), the phase in or out of specific sectors (sectoral limits), and/or changes to the use of domestic and international offset credits (geographical limits)—would provide clarity and certainty to ETS participants, as well as developers of offset projects and other market participants. It would also help provide clarity to policy discussions around linking.

Carbon Leakage Risk Mitigation

Mechanisms to mitigate impacts of carbon pricing on emission-intensive, trade-exposed industries may differ between systems and create barriers to alignment and linking. Existing systems provide models for carbon leakage risk exposure determination and the use of free allocation to mitigate that risk. Use of common approaches can help create the conditions for linking.

Strong Compliance and Enforcement Provisions

An ETS can only function effectively with a strict compliance framework. If compliance frameworks are not robust enough, then the environmental effectiveness of the cap would be questioned, creating political barriers for linking. A strict compliance and enforcement framework should be established in the design phase of the system and needs to be maintained at all times.

Penalty rates should be harmonized in linked systems to create a common incentive for compliance. It may therefore be necessary that penalties are adjusted prior to or upon the point of linking. Early standardization would help minimize the impacts of this.

Robust Legal Framework

Emissions trading is established based on a political commitment to reduce GHG emissions. It is implemented through a number of rules, principles, and standards, with compliance required by law and supervision by an appointed body or bodies. Only when an ETS is properly functioning can the system link to other systems, and this requires a robust legal framework.

When establishing the legal framework, the inclusion of a linking provision, even if it is not yet proposed, could define the conditions for linking, including any formal restrictions and criteria for linking. It would pave the way for subsequent linking agreements.

STEP 2: ANALYSIS AND EVALUATION. ASSESSING THE LINKING OPPORTUNITY

Linking can offer benefits, particularly with regard to reducing the cost of achieving emission abatement. However, linking does come at a cost, particularly with regard to the administrative processes and the regulatory control. A thorough assessment of potential linking opportunities is therefore necessary to inform the decision on linking. Three elements are important: the potential linked systems, the degree of alignment between systems, and the economic rationale for linking.

Identify potential linking partners

Any decision to link with other systems will depend on the alignment of political, environmental, and economic objectives for the systems between candidate linking countries. Identifying strong potential partners will be critical.

Existing trade partners. It may be easier to negotiate between countries where the political will is already there. Linking ETSs in the same region, such as Asia and the Pacific, can be more straightforward, and countries bound by the same legal trade framework will find linking ETSs easier to negotiate. Examples are the Association of Southeast Asian Nations Free Trade Area (AFTA), of which the PRC, Indonesia, Thailand, and Viet Nam are members; and the free trade agreement between the PRC and New Zealand.

Partners with similar emission reduction opportunities. It may be easier to link systems where opportunities for emissions reductions are similar. For example, New Zealand and Indonesia have a great deal of opportunity in the agricultural and forestry sectors, whereas the PRC and India both have very energy-intensive manufacturing industries.

Compare design features

It is important to compare similar and contrasting design features of potential linked systems in order to make a comprehensive assessment on the ease of linking. The systems with a high degree of similarity and potential for harmonization are good linking candidates.

Assess the benefits and costs of linking

Economic analysis to weigh the costs and benefits associated with linking would be important. The cost/benefit assessment may include the following elements:

(i) Analysis of caps, demand for allowances, and costs of abatement, to understand the net economic impacts for participants of possible allowance price changes and flow of allowances between systems. Analysis of the extent of cheaper cost abatement and the benefits this provides.
(ii) Analysis of price impacts on the wider economy, for example, small business, individual consumers, local governments, central governments, and relevant agencies.
(iii) Assessment of administrative costs of linking, including costs of making adjustments to the ETS design.
(iv) Impacts of required adjustment to other existing policies and regulations that are complementary to the ETS.

STEP 3: IMPLEMENTATION. ESTABLISHING A LINKING FRAMEWORK

As linking of carbon markets will reduce the control a single regulator has over a market, some coordination of market regulation will be necessary for linked systems. Therefore, a legal framework is needed to establish and maintain such coordination and oversee operation of the linked systems. The legal framework can be a formal agreement such as a binding international treaty or an informal agreement, which may take the form of reciprocal domestic legislation accompanied by an informal memorandum of understanding or other negotiated expression of intention.[52]

[52] M. Mehling, K. Anttonen, and K. Upston-Hooper. 2007. Breathing Life into the Carbon Market: Legal Frameworks of Emissions Trading in Europe. 16 European Environmental Law Review. 2007(4):96-115 and M. J. Mace et.al. 2008. Analysis of the Legal and Organisational Issues Arising in Linking the EU Emissions Trading Scheme to Other Existing and Emerging Emissions Trading Schemes. Foundation for International Environmental Law and Development, Institute for European Environmental policy, World Resources Institute, pp. 58-59.

Negotiation and harmonizing system design and implementation of emissions trading system linking

The objective of the negotiation would be to achieve harmonization between systems. Countries would therefore need to agree which features need to be the same or consistent and which can be different. As discussed, important design features include cap setting, allocation method related to industrial competitiveness, principles and criteria of offset credits, regulatory process or MRV and cap enforcement, and price containment measures.

Regarding the architecture of linked systems, the use of a uniform trading infrastructure and common market oversight can ensure operational efficiency and transparency and maintain the transparent operation of linked systems. Connections between reporting infrastructure, allowance trading registries, auction platforms, and transaction logs would need to be considered. Joint coordination and administration of the link arrangements would be required.

Further, arrangements for information exchange would need to be established. This would cover treatment of market sensitive data, market oversight, and experiences related to the operation of the systems that help inform future policy developments.

Thus, linking partners need to agree to develop and use common infrastructure, including but not limited to a registry system, auction, and trading platform. However, this infrastructure should conform to the requirements of the respective emissions trading regulations and operating procedures.

Development and adoption of a linking agreement

A linking agreement would establish a common framework on recognition of trading and compliance units; harmonization of the key design features of the linked systems; rules and procedure for future changes, possible suspension or termination of the agreement, developing new linking partners, and withdrawal of linked partners; trading rules and market oversight; institutional arrangements; and operational management.

Based on the agreed changes in the linking agreement, linking partners need to make corresponding modifications to existing regulations including respective ETS regulations and associated domestic legislation. Amendment of ETS regulations may involve adjustment of key design features and potentially the modification of the trading infrastructure such as the auction, trading, and tracking systems.

Cooperation and Coordination on Emissions Trading System Development

The establishment of cooperation and coordination institutions among countries would help facilitate an agreement on linking later on in the development process. For example, establishing a knowledge sharing mechanism among countries could provide experience with design and implementation of key ETS features and institutional arrangements including enforcement and functioning of the market. Experiences from linked systems elsewhere would be valuable to such collaborative initiatives. All of these can help build a common understanding of ETS design and hence promote a common framework for linking of ETSs in the future. Mechanisms for collaboration would facilitate policy and technical dialogues among countries and enhance long-term cooperation towards developing a more integrated carbon market in Asia and the Pacific.

APPENDIX 1

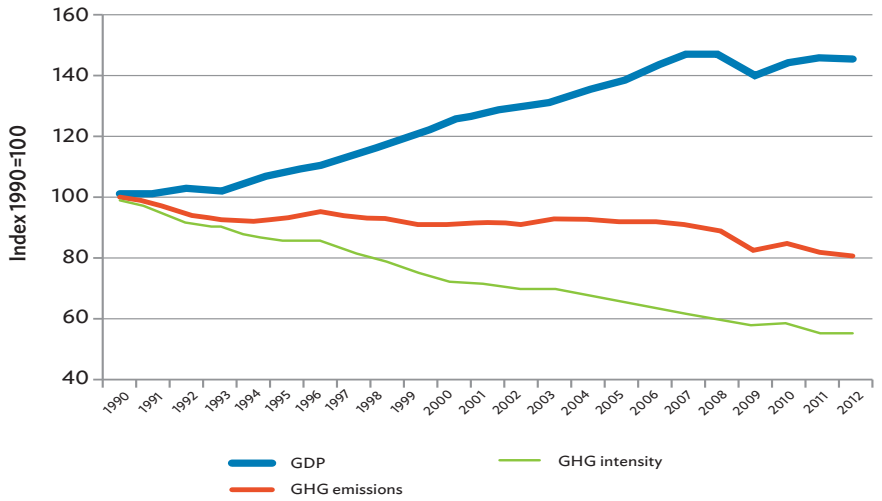
Track Record of Existing Emissions Trading Systems

This section presents the key impacts of existing emissions trading systems (ETSs).

European Union Emissions Trading System

Reduced the emission intensity per unit of GDP in a cost-effective manner. Figure A1.1 shows that the trend of European Union (EU) emissions has decreased with increasing gross domestic product (GDP). The EU economy grew by more than 44% from 1990–2012, while emissions decreased by 19%. As a result, greenhouse gas (GHG) emissions intensity in the EU (ratio of emissions per unit of GDP) was also reduced by almost half. The emission reduction in GHG emissions is largely driven by implementation of EU climate and energy policies, e.g., EU ETS, energy efficiency measures, legislation promoting renewable energy, leading to improved efficiency and increase in share of renewable energy.[1]

Figure A1.1: Evolution of Gross Domestic Product (in Real Terms), Greenhouse Gas Emissions, and Emissions Intensity



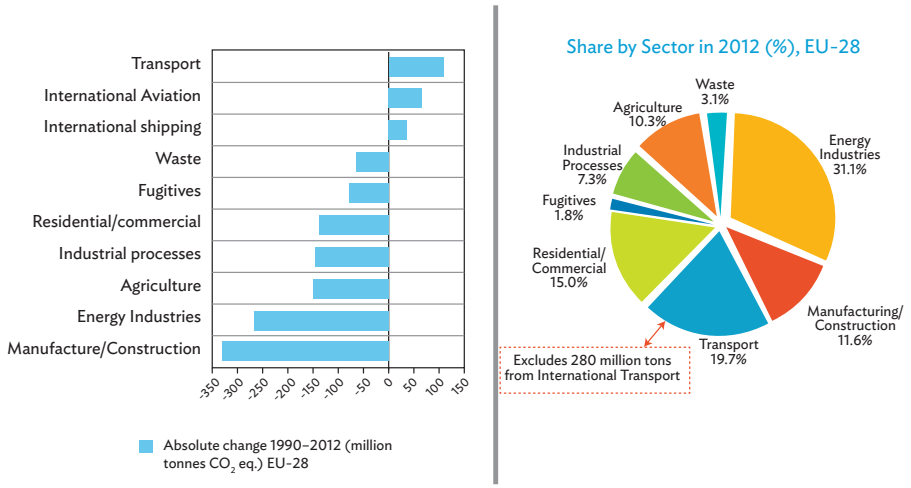
GDP = gross domestic product, GHG = greenhouse gas.

Source: EC. Closing the pre-2020 'ambition gap': the EU contribution, progress made in cutting emissions, http://ec.europa.eu/clima/policies/strategies/progress/documentation_en.htm#Reports

[1] EEA, 2014.

Most of the emission reduction has taken place in the sectors of the EU ETS, i.e., industrial sectors (combustion and processes), electricity, and heat production (see Figure A1.2). The EU-28 (plus Iceland, Lichtenstein, and Norway) overachieved its emission reduction targets, with emission reduction of 4.2 gigatonnes of carbon dioxide equivalent eq. during 2008–2012, representing an average reduction of 22.1% compared to base-year levels, of which emissions of GHGs from installations participating in the EU ETS are estimated to have decreased by at least 3% in 2013.

Figure A1.2: Greenhouse Gas Emissions by Main Sector in European Union-28, Change 1990–2012 and 2012 Shares



Source: EEA.

Although the economic recession has contributed to emissions reduction across Europe, emission reductions were not only achieved by reductions in the economic activity of firms during phase II of the EU ETS. Emissions reduction is the result of the compounded effect of multiple factors. Figure A1.3 shows the effect of each factor on changes in GHG emissions from the combustion of fossil fuels.

Indeed, as a result of the economic recession, both the economy and industrial production contracted. A decline in GDP has reduced energy demand from industry and road transportation since 2008 and contributed to the decline in carbon dioxide (CO_2) emissions. GDP was only one of the key factors bringing emissions down, with energy intensity and carbon intensity playing a bigger role.[2]

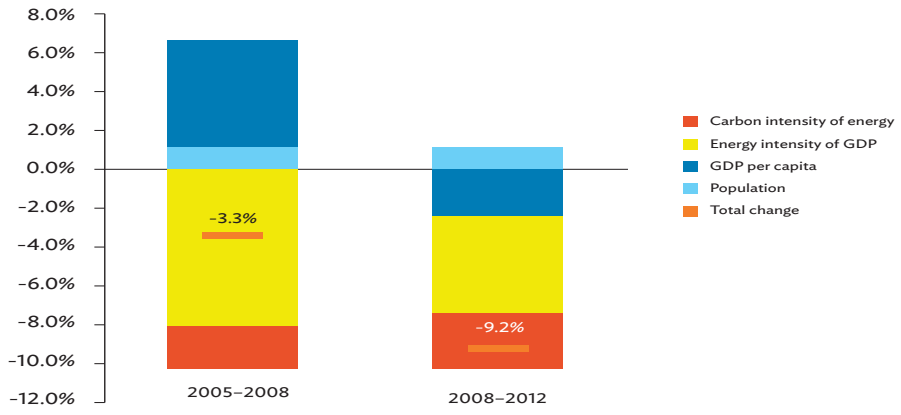
An early European Commission study estimated that the Kyoto Protocol target from 2008–2012 could be achieved at an annual cost of €2.9 to €3.7 billion, less than 0.1% of EU GDP. Without the ETS, the cost would be €6.8 billion.[3] More recent analysis shows that the actual cost was just 0.01% of EU GDP.[4] If auctioning revenues are used to

2 EEA, 2014.

3 Questions & answers on emissions trading and national allocation plans, MEMO/05/84, Brussels, 8 March 2005, http://europa.eu/rapid/press-release_MEMO-05-84_en.htm

4 A. D. Ellerman, F. Convery, and C. de Perthuis. 2010. Pricing Carbon: The European Union Emissions Trading Scheme. Cambridge University Press.

Figure A1.3: Aggregate Change in Total CO_2 Emissions from Fossil Fuel Combustion in the EU-28, during Phase I and Phase II of the European Union Emissions Trading System



CO_2 = carbon dioxide, EU = European Union, GDP = gross domestic product.
Source: EEA.

fund low-carbon investments, the cost impact on the economy could be eliminated. Implementation of clean development mechanism (CDM) saved mitigation costs of $3.6 billion for Annex I countries from 2008 to 2012 through Certified Emissions Reductions purchases.[5]

Stimulated low-carbon transformation in key sectors. By capping overall GHG emissions from major sectors, the EU ETS is driving the low-carbon transformation of key sectors. The greatest degree of abatement has taken place in the power sector through fuel switching from coal or oil to gas and energy efficiency improvements.[6] Similarly, in the cement sector, some kilns have moved to alternative fuels through utilization of waste heat, waste gases, and biomass.

Cobenefit: funded mitigation projects. In phase III, the revenue raised from auctioning 300 million allowances is being used to co-finance large-scale demonstration projects in low-carbon technologies: carbon capture and storage and innovative renewable energy technologies.

Drove demand for global carbon markets. The EU ETS has played an important role in financing climate actions. As the largest buyer of credits from the Joint Implementation and CDM projects, the EU ETS has channeled substantial investment into clean energy and low-carbon technologies in developing countries, achieving a reduction in CO_2 emissions of over 1 billion tons during phase II. In 2013, auction revenues in the EU totaled €3.6 billion, of which on average 87% was used or is planned to be used for climate and energy-related purposes.

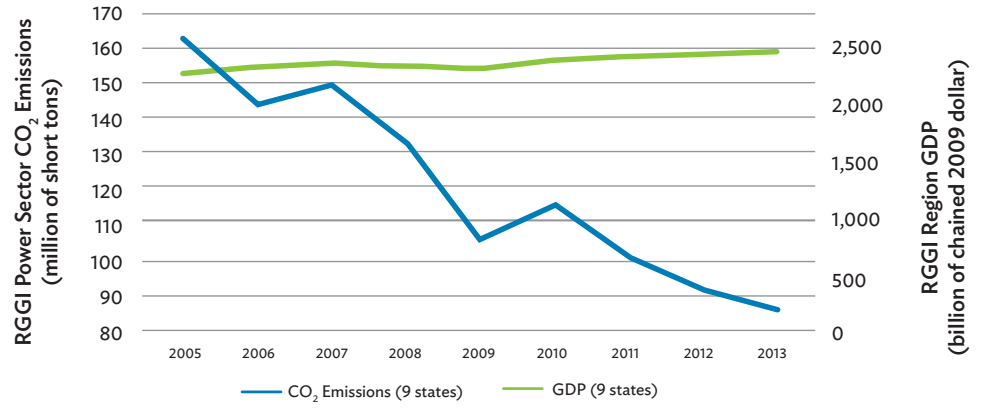
[5] United Nations Framework Convention on Climate Change. 2011. *Investment and Financial Flows to Address Climate Change*. https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/pub_07_financial_flows.pdf

[6] Footnote 4.

Regional Greenhouse Gas Initiative

Decoupled CO_2 emissions from economic growth. Figure A1.4 shows that CO_2 emissions from the power sector, covered under Regional Greenhouse Gas Initiative (RGGI), have declined by more than 40% since 2005 while, overall, the regional economy has grown by 8% (adjusted for inflation) from 2005–2013. This shows that the decoupling of CO_2 emissions from economic growth is possible.

Figure A1.4: Regional Greenhouse Gas Initiative: Emissions and Economic Growth



CO_2 = carbon dioxide, GDP = gross domestic product, RGGI = Regional Greenhouse Gas Initiative.

Source: http://www.rggi.org

Positive Net Present Value. The analysis also shows that RGGI produced an economic benefit of about $1.6 billion Net Present Value using a public discount rate over the first compliance period. This was the combined effect of direct impacts associated with the reinvestment of RGGI auction revenues, the positive impacts associated with cost savings on electricity and energy supply expenditures, and the negative impacts associated with power plant owners' net revenues from allowance purchases and increased energy bills of consumers, etc. Additionally, implementation of RGGI created over 16,000 new job–years in the first 3 years of the program.[7]

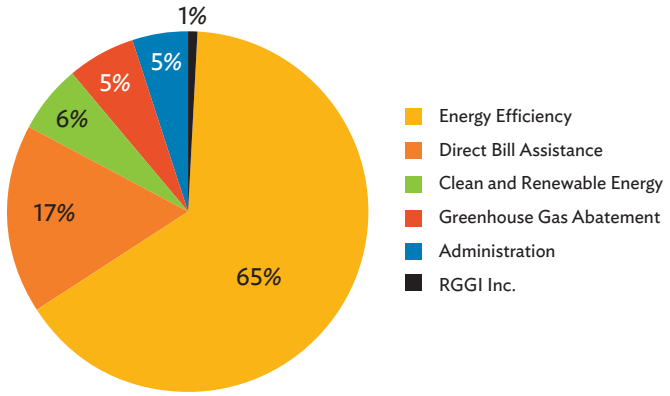
Co-benefit: recycling auction proceeds. Pricing carbon increases the production cost of electricity and hence the electricity price. However, RGGI auctions most of the system's allowances and recycles the auction proceeds through clean energy and other consumer benefit programs, including improvements in energy efficiency, development of renewable energy direct bill assistance, GHG abatement and climate change adaptation programs, and creation of jobs in the region. All of these, in turn, further reduce GHG emissions and generate important consumer benefits, including reducing the impact of the carbon price,

[7] P. J. Hibbard et al. 2011. The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States Review of the Use of RGGI Auction Proceeds from the First Three-Year Compliance Period. Analysis Group. http://www.analysisgroup.com/ uploadedFiles/Publishing/Articles/Economic_Impact_RGGI_Report.pdf

lowering energy bills, supporting electric system reliability, and stimulating job growth. As such, implementation of RGGI has boosted sustainable economic growth.

By 2013, $1 billion of auction proceeds was invested in residential, business, and commercial efficiency and clean energy; business programs; direct bill assistance programs; and clean technology development programs, etc. (Figure A1.5).

Figure A1.5: Distribution of Auction Revenues 2009–2012



RGGI = Regional Greenhouse Gas Initiative.

Source: RGGI, 2015: Investment of RGGI Proceeds Through 2013. www.rggi.org

Up to 2013, the reinvestment of auction proceeds rendered more than $2.9 billion in lifetime energy bill savings to more than 3.7 million households and 17,800 businesses in the region, reducing approximately 11.5 million megawatt hours (MWh) of electricity generation, saving more than 48.7 million British Thermal Units of fossil fuels, and avoiding the release of approximately 10.3 million short tons of CO_2. These investments, in combination with the energy policies of each RGGI state, are making the region a leader in energy efficiency, clean and renewable energy, and GHG emissions abatement. Six RGGI states were ranked among the top ten US states for energy efficiency investments by the American Council for an Energy Efficient Economy in 2012.[8]

Alberta Greenhouse Gas Reduction Program

Achieved emission reductions. The results in the Alberta GHG reduction program show that a total emissions reduction of 61.19 million metric tons of carbon dioxide equivalent ($MtCO_2e$) was achieved over the period 2007–2014 from operational improvements and offset credits. Commitment to a further saving of 38.65 $MtCO_2e$ was met through payment to the Climate Change and Emissions Management Fund, which will in turn generate emission reductions through investment in transformative technologies.[9] (Table A1.1)

[8] Regional Greenhouse Gas Initiative. 2014. RGGI *Investments Provide Region's Families and Businesses with $2 Billion in Lifetime Energy Bill Savings*. https://www.rggi.org/docs/PressReleases/PR022414_2012ProceedsReport.pdf

[9] Alberta Environment and Parks. 2015. Specified Gas Emitters Regulation Results. http://esrd.alberta.ca/climate-change/programs-and-services/industrial-emissions-management.aspx

Table A1.1: Aggregated Compliance Outcome of the Alberta Greenhouse Gas Project, 2007–2014

Compliance cycle	Emissions reductions from improvement to operation (million tCO_2e)	Offset credits (million tCO_2e)	Subtotal (million tCO_2e)	Fund payment (million tCO_2e / Can$m)	Total (million tCO_2e)
2007 (6 months)	2.88	0.88	3.76	2.75 (Can$41.3m)	6.21
2008	3.93	2.68	6.61	5.69 (Can$85.4m)	12.30
2009	3.55	3.74	7.29	4.08 (Can$61.3m)	11.37
2010	3.57	3.85	7.42	4.49 (Can$67.4m)	11.91
2011	5.57	5.4	10.97	3.66 (Can$54.9m)	14.63
2012	4.61	3.2	7.81	5.85 (Can$87.7m)	13.65
2013	4.62	2.04	6.66	6.57 (Can$98.6m)	13.23
2014	8.12	2.55	10.67	5.56 (Can$83.4m)	16.23
Total	**36.85**	**24.34**	**61.19**	**38.65**	**99.53**
Percentage	37%	24%		39%	100%

tCO_2e = tons of carbon dioxide equivalent.

Source: Specified Gas Emitters Regulation Results. http://esrd.alberta.ca/climate-change/programs-and-services/industrial-emissions-management.aspx

Promoted low-carbon investment. Since 2010, the fund has financed projects from early stages to commercialization. With a mandate to reduce GHG emissions and adapt to climate change, the fund has supported innovation in the following key areas: carbon capture and storage, renewable energy, cleaner energy production, energy efficiency, adaptation, and biomass.

In total, up to July 2015, Can$577m has been paid into the clean energy technology fund, with more than Can$350 million of that already invested into more than 109 clean energy and adaptation projects.[10]

New Zealand Emissions Trading System

Created a disincentive to deforest. Data reported from the system shows that the amount of forested land in the ETS has risen every year from 2010–2012. The amount of forested land rose from 2.027 million hectares in 2010 to 2.051 million hectares in 2011 to 2.077 million hectares in 2012.[11] The statistics show that from 2008–2011 the ETS contributed to cumulative new

[10] Alberta Environment and Parks. 2016. *Investing in Science, Technology and Innovation*. http://esrd.alberta.ca/climate-change/programs-and-services/investing-in-science-technology-and-innovation.aspx

[11] Government of New Zealand, Ministry for the Environment. 2011–2013. NZ ETS 2011, 2012, 2013 – Facts and Figures. www.eur.govt.nz

plantings spanning 12,000 hectares by 2011.[12] The figures suggest that the forestry component of the ETS has deterred deforestation. As a result, 71.6 Mt CO_2e of sequestration from forestry offset 19.23% of New Zealand's gross GHG emissions during Phase I of the Kyoto Protocol, which largely contributed to New Zealand meeting its Kyoto target.

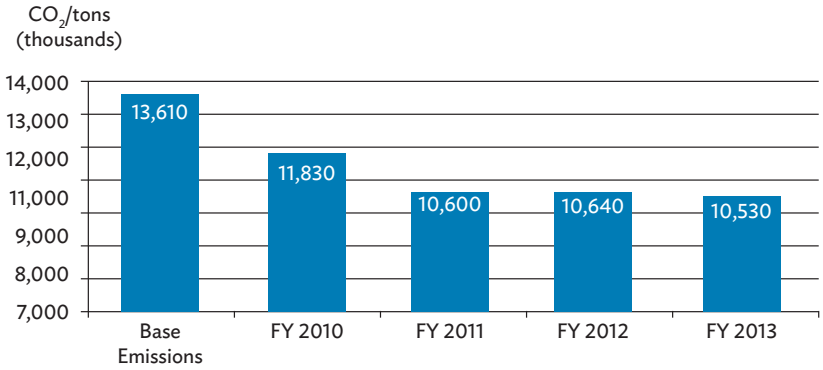
From 2010–2011 there was a fivefold increase in renewable energy capacity activated, as compared to pre-ETS levels.[13]

Cost-effective measure. It is estimated that the NZ ETS would cost between 0.1% and 1.0% of GDP in 2020.[14] It was also estimated that the average cost of emission reduction for a household was about NZ$165/year in the period 2010–2012.[15] However, the price of New Zealand Units (NZU) has fallen from above NZ$20 in 2011 to below NZ$2 in May 2013.[16] The prices have slightly recovered to around NZ$6 in 2015. With this lower NZU price, the impact of the ETS on GDP and cost for meeting its Kyoto target would be much lower than expected.

Tokyo Cap-and-Trade Program

Achieved emission reductions. The Tokyo ETS has shown good success in cutting emissions (Figure A1.6). The system achieved a 23% emission reduction in the first 4 years. Over 90% of the covered facilities achieved their emission reduction targets for the first compliance period, and 69% of facilities achieved second period targets.

Figure A1.6: Changes in Emissions 2010–2013



CO_2 = carbon dioxide, FY = fiscal year.

Source: Tokyo cap-and-trade program achieves 23% reduction after 4th year, http://www.kankyo.metro.tokyo.jp/en/climate/attachement/Tokyo_CAT_4th_Year_Results.pdf

[12] Government of New Zealand, Ministry for the Environment. 2011–2012.Report on the New Zealand Emission Trading Scheme. NZ ETS 2011 Facts and Figures; NZ ETS 2012 Facts and Figures. http://www.climatechange.govt.nz/emissions-trading-scheme

[13] Government of New Zealand, Ministry for the Environment. 2012. Updating the New Zealand Emission Trading Scheme: A Consultation Document. http://www.climatechange.govt.nz/consultation/ets/consultation-ets-changes.pdf

[14] J. Ballingall, C. Schilling, and A. Stroombergen. 2011. Macroeconomic impacts of the New Zealand Emission trading Scheme. NZIER and Infometrics. http://www.climatechange. govt.nz/emissions-trading-scheme/ets-review-2011/supporting-info/macro- economic-impacts-of-thenzets.pdf

[15] New Zealand Business Roundtable. 2009. *Submission on the Climate Change Response (Moderated Emission trading) Amendment* Bill. http://www.nzbr.org.nz/site/nzbr/files/NZBR%20Sub%20on%20the%20Review%20of%20The%20Emissions%20Trading%20Scheme.pdf

[16] Thomson Reuters. 2013. *Point Carbon*. http://financial.thomsonreuters.com/en/resources/articles/point-carbon.html

APPENDIX 2

Advantages and Disadvantages of Linking Emissions Trading Systems

Advantages

Enlarge the coverage of emissions trading system. Compared to prelinking, linking would enlarge coverage of each emissions trading system (ETS), including more participants with more diverse mitigation options across systems, and hence it would reduce greenhouse gas (GHG) emissions cost effectively through shifting high-cost mitigation from one system to lower-cost mitigation in another system.[17]

For example, according to the 2014 study conducted by Tsinghua University and the Institute of Global Environment Strategy, in meeting its 2020 mitigation target of reducing carbon intensity by 40%–45%, the People's Republic of China's (PRC's) carbon price was estimated at $17 per ton of carbon dioxide equivalent (tCO_2e). And for meeting its 2020 mitigation target of cutting its emissions 30% below business as usual level, the Republic of Korea's carbon price was estimated at W100,000/tCO_2e, about $92/$tCO_2e$. In linking the PRC's ETS with the Republic of Korea's ETS, entities under the Republic of Korea's ETS would be able to buy emissions allowances and credits from PRC's ETS for compliance. The Republic of Korea's carbon price would decrease, whereas the PRC's carbon price would rise. Thus the entities under The Republic of Korea's ETS would reduce mitigation at lower cost, while the PRC would receive capital inflow to offset rising carbon prices.

Increase market liquidity and mitigates price volatility. Linking enables allowances or carbon credits to be traded between systems and hence increases market liquidity and helps to mitigate market volatility. Linking also dampens the effect of unanticipated price shocks by broadening the supply of allowances and emission reduction opportunities.[18]

Table A2.1 shows that emissions from countries in the region with existing or potential emissions trading markets represent 41% of the world's emissions, demonstrating the potential scale of a regional trading system in the Asia and the Pacific region. Linking existing and potential ETSs in this region will create a large market where carbon prices fluctuate less, compared to a smaller market. For example, the 2017 cap on the Republic of Korea's ETS is 551 $MtCO_2e$,[19] while the cap on the PRC's ETS will be 3–4 billion (3-4$GtCO_2e$).[20] The size of

[17] W. Blyth and M. Bosi. 2004. Linking Non-EU Domestic Emissions Trading Schemes with the EU Emissions Trading Scheme. IEA/OECD and N. Anger. 2008. Emissions Trading Beyond Europe: Linking Schemes in a Post-Kyoto World. Energy Economics. 30 pp. 2028-2049.

[18] J. Jaffe and R. Stavins. 2007. Linking Tradable Permit Schemes for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges. Geneva, Switzerland: International Emissions Trading Association and Electric Power Research Institute.

[19] Presentation on ETS in the Republic of Korea. Jihyun Lee, Ministry of Korea.

[20] Updates of China's ETS and future development in China. Jiang Zhaoli. Climate change department of NDRC. Workshop on Learning from International Experience, Planning for the Future, 11 September 2014.

the PRC ETS is five to seven times of the size of the market in the Republic of Korea. Linking Republic of Korea's ETS with the PRC's ETS would provide entities of the Republic of Korea's ETS with access to a broader, more liquid carbon market and reduce price volatility.

Table A2.1: 2011 Key Economic Indicators and Carbon Emissions Indicators in the Countries with Carbon Trading Potentials in Asia and the Pacific

	GDP per capita ($/capita)	Service, Value Added (% of GDP)	Industry, Value Added (% of GDP)	Agriculture, Value Added (% of GDP)	Total Emissions (Mt CO_2)	Emissions per capita (metric tCO_2/capita)
PRC	5,574	44	46	10	9,019	7
India	1,472	49	33	18	2,074	2
Indonesia	3,648	41	45	14	564	2
Japan	46,204	73	26	1	1,188	9
Kazkhstan	11,358	54	41	6	262	16
Republic of Korea	24,156	59	38	3	589	12
New Zealand	37,867	70	23	7	31	7
Thailand	5,167	44	43	13	303	5
Viet Nam	1,543	42	39	20	173	3
Total					14,203	
Global					34,650	

GDP = gross domestic product, $MtCO_2e$ = million tons of carbon dioxide equivalent, tCO_2e = tons of carbon dioxide equivalent.

Source: World Bank, http://data.worldbank.org/indicator/EN.ATM.CO2E.KT/countries?display=default

Linking may provide greater access to cost-effective mitigation options. The economic benefit from linking is related to prelink mitigation costs. The greater potential economic gain could be given the greater difference of prelink mitigation costs.

Table A2.2 shows the differences in the economic development, industrial profile, emissions profile, and emissions per capita among countries that have implemented or plan to implement an ETS. This means significant differences in mitigation costs among the systems. Diversified mitigation costs offers a unique opportunity to maximize the economic benefit by linking systems. A smaller market with higher mitigation cost would gain more from linking when it links with a large market.

Reduce risk of carbon leakage. As an additional benefit, linking would bring about convergence of carbon prices. One carbon price would create a fair competitive environment among participants of linked systems. This would reduce the risk of carbon-intensive production shifting from the system with a higher carbon price to the system with a lower carbon price.

Without linking, international trade could increase carbon-intensive production in the system with the lower carbon price. For example, the PRC's carbon price is lower than the prices in Japan and the Republic of Korea. Without linking, participants in Japan and the Republic of Korea may be incentivized to import carbon-intensive products from the PRC, rather than manufacture them domestically, and carbon-intensive production would surge in the PRC. Thus this would lead to an emissions increase in PRC and carbon leakage.

Linking would also reduce compliance costs for firms in Japan and the Republic of Korea. The lower price, in turn, could potentially decrease the risk of carbon leakage.

Enhance regional cooperation on climate change. Linking can facilitate regional cooperation to address climate change issues by finding areas of synergy and facilitating opportunities for investment, technology transfer, and financial flows in the region, therefore contributing to innovation, employment generation, energy security, and sustainable development more broadly in the region. This in turn enhances the capacity of the Asia and the Pacific region in addressing climate change.

A regional link between systems in Asia and the Pacific can lay the groundwork for the pursuit of a comprehensive global climate agreement through building a mutual understanding of respective mitigation objectives and policy actions among the countries. Such bottom-up cooperation between countries for addressing climate change is likely to be politically easier than an overarching international regime using the United Nations Framework Convention on Climate Change negotiations' top-down approach.

Disadvantages

Distributional effects. Linking would lead to redistribution of mitigation costs between linked systems due to convergence of allowance and credit prices in linked systems. Allowance and credit prices would rise in one system and decrease in the other. In the system with the higher original price, linking would benefit buyers but sellers would be worse off after linking. In the system with the lower original price, this would benefit sellers and buyers would be worse off after linking. Therefore, even though linked trading systems yield an economic benefit and reduced compliance cost, some participants may be worse off.

Linking may indirectly impact the prices of fossil fuel and other emissions-intensive products through changes to the carbon price. The price of fossil fuel, energy, and emission-intensive products would increase along with an increase in carbon price; and conversely the price would decrease if the carbon price falls. This would have an indirect impact on consumers of carbon-intensive products, including business and households.

Changes to the carbon price and carbon-intensive products and services would redistribute operational costs within a business and hence the competitiveness of that business.

Trading allowances or carbon credits between two systems increases the emissions in a system that is the net buyer and decreases the emissions in a system that is the net seller, but leaves total emissions caps of linked systems unchanged.

There are also other important considerations around environmental effectiveness and integrity resulting from differing design features, specifically the stringency of the cap, MRV standards and processes, the compliance framework and cap enforcement, and offset provisions and price control measures. Any weaknesses in these key features in a potential partner's system can undermine the environmental objectives of a system after linking has occurred.

May weaken a country's ability to control ETS and related policy. Linking may weaken a country's ability to control its domestic ETS and related climate objectives and policies. A domestic ETS is usually tailored to a country's or state's particular circumstances in order to meet national policy objectives. To link to another system a country may need to amend or harmonize its system with other systems. The system also may be affected by decisions made in other systems. For example, if the system is linked with a third system, e.g., an international offset credit system, this will feed through to the system and may influence its price. Therefore linking could dilute a country's control over its own ETS.

APPENDIX 3

Energy, Greenhouse Gas, and Renewable Energy Policy Instruments

Worldwide, countries have sought to integrate carbon pricing instruments with other energy efficiency and renewable energy certificate trading systems, known as target and trade or white certificate schemes. Targets or obligations are set on certain participants, and they must be met by surrendering a tradeable commodity or by participants undertaking compliance measures. Some developing member countries (DMCs) are considering use of such instruments to complement or create readiness for an emissions trading system (ETS):

(i) **Thailand:** Implementation of energy efficiency trading in 2014 to help build core market readiness components for establishing an ETS in the future.
(ii) **India:** Considering implementation of an ETS to complement existing energy efficiency and renewable energy trading (Perform, Achieve, Trade and Renewable Energy Certificate (REC)) schemes. Facing difficulties with overlap between schemes and with institutional readiness and MRV capacity.

Experience shows that schemes can be designed well to avoid overlap. While existing schemes can create a level of readiness, particularly among stakeholders—and there will be complementarity in monitoring, reporting, and verification (MRV) systems—institutional structures and alterations to MRV systems will be required to implement an ETS.

(iii) **People's Republic of China (PRC):** Considering adoption of a nationwide energy efficiency trading system, complementary to the ETS but avoiding instrument overlap.

The section below provides an overview of these instruments and highlights key issues to consider when seeking to use them to complement an ETS.

Energy Efficiency and Renewable Energy Systems

Energy efficiency certificate trading systems (EETS): Variations on the implementation of such systems exist where obligations are placed on either electricity distributors or instead on energy-intensive consumers, to reduce their energy consumption. For distributors, these can target particular sectors, such as the supply of electricity to residential customers. In both cases, obligated entities may either comply with the target by undertaking EE measures, or surrender energy saving certificates, representing verified savings achieved by other participants in the system. The existing PAT system in India is an example of this in place since 2012, and Thailand is currently developing a similar voluntary

system, the Energy Performance Certificate Scheme, under the World Bank's Partnership for Market Readiness program.

Renewable energy certificate trading systems: Typically an obligation is placed on electricity distribution companies to purchase a fixed percentage of total power supply from renewable sources of energy, often called a renewable purchase obligation (RPO). Eligible renewable energy generators receive one REC per megawatt hour of electricity produced. Distributors must purchase RECs up to the level required by the RPO. For example, the REC scheme in India has been in place since 2010.

Complementarity of Energy, Greenhouse Gas, and Renewable Instruments to Emissions Trading Systems

A number of factors should be taken into consideration[21] regarding the interaction of these systems with an ETS when considering their joint implementation.

Sectors and participants covered. The obligation of an ETS typically prioritizes energy-intensive industry and power generation sectors—emission-intensive consumers.

Renewable energy certificate trading systems (RETS) naturally cover electricity suppliers. EETS can cover either energy suppliers or energy-intensive consumers.

Avoiding instrument overlap. If systems apply to the same sectors and obligated parties, specific rules should be introduced to avoid overlap of energy coverage. The key is to have institutional coordination at the top policy level. Specifically, there may be situations in which EE obligations and GHG reduction obligations cover the same entities, typically energy-intensive industries. These two can avoid overlap if carefully designed. In the United Kingdom, the EETS covers electricity used by the site, whereas the European Union (EU) ETS covers emissions generated by the site (which exclude emissions from electricity generation).

Target setting. To achieve carbon savings that are additional to those that would be achieved as a result of the energy saving system, it would be necessary to take account the energy saving target when setting the ETS carbon cap.

Incremental cost pass-through. Participants are likely to pass their costs through to final consumers where permitted, which may result in the costs of multiple systems being passed-through to the same consumer. Electricity generation and consumption exemplifies this.

(i) Generators are typically covered by ETS, and in liberalized electricity markets pass carbon costs through in electricity retail prices.
(ii) In RETS, suppliers pass costs through to consumers in retail pricing
(iii) In EETS, suppliers may pass costs through to consumers in retail pricing. Obligated consumers (e.g., large industry) cover the cost themselves.

[21] Ricardo Energy & Environment, China: International Review of Trading Schemes for Energy Savings and Carbon Emission Reductions, World Bank, September 2013.

The impact of cost pass-through on retail consumers may be mitigated by system design.

Double carbon and electricity incentives. In pass-through situations there can be an incentive for electricity use savings from both carbon trading (ETS) and energy saving systems (EETS). This can reinforce the price signal for electricity savings and increase the attractiveness of electricity use savings compared with fuel switching as a means of reducing carbon emissions.

In cases where the pass-through of the carbon cost of electricity generation is not possible, due to the nature of market regulation, EETS offers the opportunity to incentivize electricity saving measures that may not otherwise arise.

MRV, institutional, and stakeholder requirements. Generally speaking, EETS and ETS have highly complementary MRV requirements, with some distinctions highlighted below. Regarding institutional requirements, they require separate registries and trading platforms. Stakeholder learning, however, for both regulators and participants, can be very complementary.

(i) **Verification.** ETSs often have more onerous third-party verification requirements relative to EETSs. Under EETS there is a range of verification requirements, from full verification (India) to audit and sampling (as for the United Kingdom) or ex-ante program approval (in California).
(ii) **Installation or project level.** ETS and consumer obligating EETS often focus on the participant-level MRV, whereas crediting systems and supplier obligating ETSs may focus on projects or programs of measures. This also has implications for periodicity of reporting—whether annual (former) or lifetime of measure (latter).
(iii) **Methodologies.** For calculating emission reductions, whether through physically avoided emissions or from estimated savings relative to a baseline, the methodologies are complementary.

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Emissions Trading Schemes and their Linking

Challenges and Opportunities in Asia and the Pacific

Asia and the Pacific has achieved rapid economic expansion in the recent years and has become a major source of greenhouse gas (GHG) emissions. With more than half of the world's population and high rates of economic growth, the region is especially vulnerable to the effects of climate change and therefore must play its part in cutting GHG emissions. The Paris Agreement adopted last December 2015 at the United Nations Framework Convention on Climate Change COP21 aims to restrict global warming to well below 2° C above preindustrial levels and to pursue efforts to reach 1.5°C – which is especially relevant to Asia and the Pacific region given its vulnerability. This knowledge product highlights how robust policies on emissions trading systems (ETS) can be important tools in reducing GHG emissions in a cost-effective manner, as well as supporting the mobilization of finance together with deployment of innovative technologies. There are currently 17 ETSs in place in four continents and account for nearly 40% of global gross domestic product. In Asia and the Pacific region, there are 11 systems operating, with more being planned. The growing wealth of experience on ETSs can be valuable to support DMCs that are planning and designing new systems of their own. This knowledge product summarizes some of the most significant learning experiences to date and discusses some of the solutions to alleviate challenges that have been faced. It also examines the possibilities for future linked carbon markets in the region.

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