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Linking Emissions Trading Schemes

Considerations and Recommendations for a Joint EU-Korean Carbon Market

By Sonja Hawkins and Ingrid Jegou, ICTSD

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ICTSD welcomes feedback on this document. This can be forwarded to Sonja Hawkins: shawkins@ictsd.ch.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACCUs	Australian Carbon Credit Units
BAU	Business-as-usual
BCAs	Border carbon adjustments
CCS	Carbon capture and storage
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFI	Carbon Farming Initiative
CH_4	Methane
CO_2	Carbon dioxide
CPM	Carbon Pricing Mechanism
EEA	European Economic Area
EFTA	European Free Trade Association
EITE	Energy-intensive and trade-exposed
ERU	Emission Reduction Unit
ETS	Emissions trading scheme
EU	European Union
EUA	European Union Allowance
GDP	Gross domestic product
GHG	Greenhouse gas
HFC	Hydrofluorocarbon
ICAO	International Civil Aviation Organization
JI	Joint Implementation
LDCs	Least-developed countries
LULUCF	Land use, land use change and forestry
MBM	Market-based measure
MRV	Monitoring, reporting and verification
$MtCO_2e$	Million tonnes (metric tons) of carbon dioxide equivalent
NAP	National allocation plan
N_2O	Nitrous oxide
OECD	Organisation for Economic Co-operation and Development
PFCs	Perfluorocarbons
RMU	Removal unit
SF_6	Sulfur hexafluoride
tCO_2e	Tonnes (metric tons) of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change

FOREWORD

The Intergovernmental Panel on Climate Change has recently released its latest findings in its Fifth Assessment Report. It concluded that global warming is unequivocal, human influence on the climate system is clear and limiting climate change will require substantial and sustained reductions of greenhouse gas emissions. At a time when multilateral action on climate change is progressing slowly and observers anxiously await the 2015 deadline to reach a new global climate deal, many countries are implementing unilateral mitigation measures. Emissions trading schemes are one popular example.

Parallel to this development, a new phenomenon is emerging: the linkage between different domestic emissions trading schemes. The European Union is a pioneer in the linkage of emissions trading schemes. To date, the bloc has established a link with Norway and is finalizing links with Switzerland and Australia.

Linkage offers many advantages, like greater cost-efficiency, enhanced market liquidity, and, potentially, a lower risk of carbon leakage. However, the gains come at a cost, most evidently a loss of regulatory control. Not only does a country expose itself to developments in the other carbon market, linkage also requires adaptations in the domestic schemes in order to achieve sufficient compatibility between the linking schemes.

Linkage between emissions trading schemes has now been discussed for several years, and a good body of literature exists on the merits, demerits, and requirements for linkage. Building on this largely theoretical literature, this paper contributes to the discussion with a practical perspective and concrete policy recommendations. The authors provide an analysis of current linkage cases between the European Union and third-party countries to draw lessons from the experience to date. This insight is then applied to assess the options and make recommendations for the creation of a linked carbon market between the European Union and South Korea.

The South Korean emissions trading scheme will start in 2015. Policymakers are currently in the final design stages, and some crucial decisions remain to be taken. It is therefore a good time for policymakers to reflect on the linkage question. Considering linkage early on can influence key features of the scheme and facilitate future linkages – not only with the European Union, but also with other existing and emerging emissions trading schemes. This paper offers important insights into a potential link between the emissions trading schemes in the European Union and South Korea by comparing the systems' main features and identifying challenges and opportunities.

Linkage between emissions trading schemes can play a role in initiating more cooperation on climate change between countries. In the context of the growing emergence of emissions trading schemes, linkage has the potential to create a network of interlinked schemes and can therefore help advance international climate change cooperation.

I hope that the findings of this paper will contribute to the debate about the linkage of emissions trading schemes and help policymakers in countries with existing and emerging schemes identify the potential for and the impacts of linkage. At the international level, I hope that this paper will stimulate further discussion about the role of emissions trading schemes in climate policy cooperation.

Together with the authors, I warmly invite you to read the paper and to provide us with comments and feedback.

Ricardo Meléndez-Ortiz
Chief Executive, ICTSD

EXECUTIVE SUMMARY

Emissions trading schemes (ETSs) are continuing to emerge as a popular climate policy tool as countries look for cost-effective solutions to curb greenhouse gas (GHG) emissions. In theory, companies with relatively low abatement costs will emit less and sell surplus emissions on the carbon market, whereas companies with high abatement costs will purchase allowances to cover their emissions. As a result, emissions reductions are undertaken in the most cost-effective way.

South Korea is among the world's top GHG emitting countries. While the country has no binding reduction commitment under the Kyoto Protocol, it has pledged to reduce its emissions by thirty percent relative to its projected 2020 business-as-usual (BAU) emissions. In order to achieve this reduction target, South Korea has decided to implement an ETS from January 2015.

Parallel to the growing number of ETSs, governments are starting to link or consider linking their respective ETSs. Emissions trading schemes therefore have the potential to play an important role in international climate change cooperation.

This paper analyses the possibilities for linking the carbon markets in the European Union (EU) and South Korea. It assesses elements of the South Korean ETS to determine which features have the potential to facilitate or prevent linkage with the EU ETS. The paper draws on lessons from previous linkage examples and makes recommendations for the South Korean case.

Linkage offers several advantages, such as economic efficiency gains; the creation of a broader, more liquid carbon market; a potentially lower risk of carbon leakage; a lock-in of the climate policy; and support for multilateral climate action via a bottom-up approach. However, linkage also comes with disadvantages, including distributional issues or a loss of regulatory control. Linkage further requires a certain degree of harmonization between some elements of the schemes. Policymakers might therefore have to align certain features of their ETSs. The differences in the design of ETSs largely affect the compromises that linkage would involve. In the end, the decision whether or not to link is a trade-off between the merits and demerits of linkage in light of a government's priorities.

The decision will also be influenced by the form of linkage, which can be direct or indirect. Direct links require an active decision to accept the other system's allowances and can be unilateral, bilateral or multilateral. A unilateral link is a one-way link whereby one system decides to recognize allowances from the other system for domestic compliance obligations, but not vice versa. Allowance trading will only take place if prices are higher in the system establishing the link. A bilateral link, on the other hand, is a two-way link requiring both systems to recognize each other's allowances. The higher-price system will purchase allowances from the lower-price system until prices converge at an intermediate level. Multilateral links involve more than two systems. In addition, two systems that do not accept each other's allowances can become indirectly linked through their respective linkage to a common third system.

Bi- and multilateral linkages require a certain degree of harmonization between the ETSs. Differences in some areas are unlikely to prevent linkage, including monitoring, reporting, and verification (MRV) rules; registry systems; provisions for new entrants and plant closures; banking rules; trading periods; and allocation methods. However, others have the potential to pose barriers, such as the stringency of emissions caps, penalty regimes, the eligibility of offset credits, cost containment measures, scope and coverage, and the use of absolute versus intensity targets.

The first linkages are starting to take place. The EU ETS has been linked with Norway, Iceland, and Liechtenstein – although this is a special case that some simply consider an extension of the EU

ETS. Switzerland and the EU are in the final stages of negotiating a link, and Australia and the EU have agreed to link their ETSs in July 2018 – although this depends on whether the Carbon Pricing Mechanism and planned ETS are repealed under Australia's new Prime Minister Tony Abbott.

Despite their differences, the Norwegian, Swiss, and Australian cases show some common trends and provide interesting practical insights into the linkage issue. They show that linkage requires that the key features of ETSs be sufficiently aligned. Enforcement measures, rules for the use of offset credits, cost containment measures, and scope and coverage are areas where the EU requires sufficient harmonization. However, the cases also show that linkage with the EU does not require complete harmonization, allowing for some differences to persist in the allocation mechanisms, MRV rules, the treatment of new entrants, and trading periods.

South Korea particularly stands to gain from linkage with the EU ETS because of its expected high carbon price. Linking with the EU could reduce the carbon cost for South Korean firms. A decrease in South Korea's allowance price could in turn help reduce its risk of carbon leakage. Given the absence of a binding reduction commitment under the Kyoto Protocol, linkage would further create an institutional lock-in, thereby sending important investment signals to covered businesses.

The EU ETS and the planned South Korean ETS have some similarities, which could facilitate linkage in the future. Both ETSs are designed as cap-and-trade systems with equally stringent MRV rules and aligned banking rules.

However, there are also differences, some of which have the potential to pose barriers to linkage. The South Korean plans contain provisions for the readjustment of allocations. While requests by South Korean firms for additional allowances from the reserve pool might lead to competitiveness concerns among their EU counterparts, such concerns would exist irrespective of linkage. The scope for such requests is further very restricted. More importantly, the EU is likely to be alarmed by the ability of the South Korean authorities to increase the total amount of available allowances under exceptional economic circumstances, since this would inflate the total number of allowances in the joint carbon market. Given the EU's recent proposal for the creation of a market stability reserve that would release or withdraw allowances to prevent significant price volatility, the South Korean provision might be less problematic. The conditions for such an overall allocation readjustment would, however, most likely have to be clearly defined.

Another unique and potentially problematic feature of the South Korean ETS concerns the ability of the Government to intervene with pre-defined market stabilization measures under specified circumstances to prevent significant price hikes and crashes. However, the controversy surrounding the EU's back-loading measure and the difficulty of passing this policy show that many in the EU oppose interventions in the carbon market. South Korea might, however, have a strong interest in controlling extreme price developments in both directions, pointing to its lack of a binding reduction commitment under the Kyoto Protocol and the EU's experience with price volatility. The South Korean market stabilization measures are therefore likely to prove contentious in linkage negotiations.

The wider scope and coverage of the South Korean ETS could pose another barrier. South Korea's plan to include three additional GHGs might be less problematic, since Australia also plans to include methane, which has not proven to be an obstacle for EU-Australian linkage negotiations. However, the coverage of indirect emissions under the South Korean ETS might prove more problematic. South Korea would certainly have to provide evidence of robust accounting methods to avoid double-counting and misallocating allowances. Scope and coverage could turn into a difficult issue if the EU is unwilling to accept an extended scope and coverage or if South Korea opposes a more limited approach.

Decisions on some scheme elements remain to be taken and could further complicate linkage. The penalty regime could pose a barrier if South Korea does not impose a requirement on non-compliant businesses to surrender missing allowances in addition to paying the fine. In the absence of such a requirement, the price cap on the fine would effectively form a price ceiling for allowances in the joint carbon market.

The issue of international offsets might pose a problem for South Korea, since linkage would lead to the propagation of the EU's offset rules into South Korea, which plans to impose tighter quantitative offset limits and has yet to decide on the acceptance of Kyoto credits. However, the situation could change completely given the EU's recent announcement that emissions reductions from 2020 will have to be achieved through domestic actions alone, effectively banning international offsets from its ETS.

South Korea might further face an undesired propagation of borrowing rules into its own scheme. While it plans to limit the borrowing of allowances at ten percent of a company's compliance obligations, the EU's implicit borrowing regulation has no quantitative restrictions. Linkage between the two schemes would extend the EU's more generous regulation to South Korea.

Linkage between the EU ETS and the South Korean ETS would likely require the latter to align several key features. Previous experience shows that the EU does not implement any changes. Instead, its linkage partners have to work towards sufficient harmonization by aligning their schemes with the EU ETS. As a larger carbon market, South Korea might, however, be able to obtain some concessions, for example regarding scope and coverage.

South Korean policymakers should clearly assess their interest in a link with the EU ETS, as well as the likely benefits and disadvantages it would involve. This could help South Korea take measures to facilitate linkage in the future, either by developing some elements more closely in line with the EU ETS or by identifying a road map to do so in the future.

It is particularly recommended that South Korea and the EU enter a transparent and open dialogue early on in order to specify expectations, requirements, and barriers. This can provide parties with a clearer picture of opportunities and challenges. As the Australian case proves, such an engagement can start even before the ETS is implemented. Prior to a full bilateral link, South Korea could also establish a unilateral link to the EU ETS, just like Norway had done. This would allow the country to achieve some key benefits while its scheme is not yet fully prepared for a two-way link.

1. INTRODUCTION

A growing number of countries are developing and implementing ETSs in an effort to curb GHG emissions. Emissions trading schemes generally take the form of cap-and-trade systems. This means that a cap is in place to limit total emissions and permits – or allowances – for emitting GHGs are allocated to covered entities. Participating firms can freely trade these allowances on a carbon market. Alternatively, ETSs can be designed as baseline-and-credit systems. In this case, firms are rewarded with emissions reduction credits for emissions that fall below their performance targets – or baselines.[1] The discussion in this paper focuses on cap-and-trade systems.

Emissions trading schemes are a market-based policy tool aimed at cutting emissions in a cost-effective manner. In theory, cost-efficiency can be obtained as reductions are undertaken by firms with relatively low abatement costs, whereas firms with higher abatement costs will instead purchase additional allowances.[2] Emissions reductions therefore take place where the cost of doing so is lowest.

The EU was the first party of the United Nations Framework Convention on Climate Change (UNFCCC) to implement an ETS to curb GHG emissions back in 2005. It was intended to help the EU fulfil its Kyoto commitment of reducing GHG emissions by eight percent below 1990 levels in the period of 2008–12.[3] The EU ETS is currently the largest and most significant ETS.

Alongside the growing number of ETSs, linkage between domestic ETSs is starting to take place. The EU ETS has implemented or agreed to linkages with several schemes and has a strong interest in establishing further linkages. In 2009, the EU stated its ambition to create an OECD-wide carbon market through linkage to comparable cap-and-trade systems and to extend this to major emerging economies by 2020 with the aim of creating a global carbon market.[4]

To date, the EU ETS has been linked with the three member states of the European Economic Area and European Free Trade Association (EEA-EFTA). The link was, however, not established through the EU's linkage provision, but through the adoption of the EU's ETS Directive by these three states.[5] The EU ETS is in fact now seen as comprising the twenty-eight EU member states plus Iceland, Liechtenstein, and Norway.[6] This raises the question of whether the EEA-EFTA case should be considered an example of linkage or simply participation in an already existing scheme. Although the literature is divided on this issue, we consider the Norwegian case an example of linkage for the purpose of this paper. Negotiations to link the EU ETS with the Swiss ETS are currently under way and expected to be concluded before summer 2014.[7] Finally, in a move towards the first intercontinental link, the EU and Australia have reached an agreement to link their respective schemes.[8] However, the EU-Australian link depends on whether the planned ETS is scrapped under Australia's new Prime Minister Tony Abbott.

Linkage offers several advantages, such as economic efficiency gains; the creation of a broader, more liquid carbon market; and support for multilateral climate action via a bottom-up approach. However, linkage also comes with disadvantages, including distributional issues or a loss of regulatory control.[9] Linkage further requires a certain degree of harmonization between some scheme elements. Policymakers might therefore find themselves in a situation where they have to align certain features of their ETS with the other scheme. The differences in the design of schemes largely affect the compromises that linkage would involve. In the end, the decision whether or not to link is a trade-off between the merits and demerits of linkage.[10] These need to be seen in light of a government's priorities.

The potential for a linked EU-Korean carbon market

South Korea, which is among the top global GHG emitting countries, has decided to introduce an ETS to curb emissions in major industrial sectors. The scheme will become operational on 1 January 2015. While South Korea has no obligations to reduce GHG emissions under the Kyoto Protocol, in 2012 it passed a bill that paves the way for the introduction of an ETS in an effort to help South Korea achieve new economic growth through the transition towards a low-carbon society.[11]

The possibility of future linkages has already entered South Korean debates on the ETS. The potential of some design features to pose barriers to linkage makes it worthwhile to consider possible future linkages of the South Korean scheme early on. The size of the EU ETS, combined with its strong interest and first experience in linkage, makes the EU an interesting linkage partner. Assessing the possible linkage of the South Korean ETS with the EU ETS therefore serves as a good starting point.

Purpose and outline of the paper

The purpose of this paper is to analyse the possibilities for a linked EU-Korean carbon market. It will specifically assess elements of the South Korean ETS to determine which features have the potential to facilitate or prevent linkage with the EU ETS. The paper will draw on lessons from previous linkage examples and make recommendations for the South Korean case. This can serve to inform policymakers involved in the design of the South Korean scheme by helping them to identify their interest in linkage with the EU ETS and make decisions that would facilitate linkage in the future.

The paper first introduces the concept of ETSs and provides an overview of the schemes in the EU and South Korea, taking into account their main design elements. This serves to determine the similarities and differences between the EU ETS and the South Korean ETS.

Chapter three discusses the concept of linkage, introducing the different forms of linkage, the rationale for linking schemes, the disadvantages, and the barriers posed by design differences. It also touches upon some legal considerations of linkage.

The paper then moves onto specific case studies in chapter four, presenting examples of linkages between the EU ETS and other schemes. The selected cases are based on linkages that have already been implemented or agreed. This involves three countries: Norway, Switzerland, and Australia.

The previous chapters serve to draw lessons and make recommendations for the potential linkage of the EU and South Korean schemes. Chapter five analyses the specific rationale for linking these two schemes, identifies existing facilitators and barriers, discusses trade-offs, and makes some policy recommendations.

The concluding chapter summarizes the main findings and provides some insight into the role that linkage of ETSs can play in international cooperation on climate change.

2. EMISSIONS TRADING SCHEMES IN THE EU AND SOUTH KOREA

This chapter introduces the concept of emissions trading and gives an overview of the EU ETS and the South Korean ETS. These descriptions will be used to assess the similarities and differences between the two schemes.

2.1 How Do Emissions Trading Schemes Function?

Emissions trading schemes offer a cost-effective solution for achieving emissions reductions. In ETSs, covered entities obtain allowances that they can trade freely on a carbon market.[12] Scarcity is the underlying mechanism for the functioning of ETSs.[13] The quantitative limit on allowances gives them a value, since firms that use allowances to account for their own emissions lose the opportunity to sell the allowances at the current market price. This opportunity cost creates incentives for firms with relatively low abatement costs to reduce emissions in order to sell permits to firms with relatively high abatement costs. Emissions reductions are therefore undertaken where they can occur most cost-effectively.[14]

Emissions caps

Most ETSs are designed as cap-and-trade systems. In such schemes, a cap is in place to limit the total amount of GHG emissions for a given period. This cap can be absolute or relative. The former works through total emissions reduction targets, while the latter uses intensity targets expressed as emissions per unit of output or input.[15] Within the cap, allowances are allocated to the covered installations.

Allocation mechanisms

Allocation mechanisms can take the form of auctioning, free allocation, or a combination of the two. During the early stage of an ETS, governments often choose to allocate allowances free of charge in order to gradually introduce the new carbon cost. Free allocation may also be intended to address concerns about the potential risk of carbon leakage and distortions in competitiveness. Carbon leakage occurs when emissions that have been reduced in one country as a result of climate change regulations move to countries with less stringent environmental regulations. Distortions in competitiveness relate to the concerns of energy-intensive industries in countries with relatively high carbon costs, as they fear a loss of market shares to firms in countries with no or lower carbon costs. In countries where carbon costs are imposed through ETSs, free allocation of emissions allowances can help alleviate these concerns.[16] Free allocation is usually a temporary measure that is gradually replaced by an auctioning mechanism.

There are three main methods for distributing allowances free of charge: grandfathering, benchmarking, and output-based allocation. Grandfathering means that allowances are allocated based on past emissions, using average emission levels for a specific period of years. One associated risk is that installations may see no incentive to reduce emissions if they assume that future allocations will be based on current emission levels. Benchmarking addresses this risk by using an allocation mechanism based on the benchmark of the most efficient installations in a given sector. However, the benchmarking method requires that common definitions, reliable data, and good measurement and verification systems be available. Access to detailed production data is particularly challenging. In an output-based allocation system, the number of allowances a firm receives depends on its output in relation to the industry benchmark. The risk of this method is that it may incentivize entities to produce more in order to receive more free allowances, therefore inducing increased emissions.[17]

Trading of allowances

Installations covered by an ETS are required to submit allowances for every tonne of GHGs emitted in the previous year. They must therefore obtain enough allowances or reduce their GHG emissions. The choice depends on the relative costs. Permits can be obtained by trading between entities and – in many schemes – temporal trading.[18]

The opportunity costs involved in using allowances to account for emissions instead of selling them at the market price means that firms with relatively low abatement costs will sell allowances to firms with high abatement costs. The option to sell allowances incentivizes firms with low abatement costs to reduce GHG emissions.

If no restrictions exist for temporal trading within multi-year trading periods, entities can save unused allowances from the current year for compliance in future years and cover shortages in the current year by borrowing allowances from the following year. The so-called banking of allowances is usually possible across trading periods, while borrowing is restricted to the same trading period.[19] Borrowing carries the risk that important emissions reductions could be delayed or never implemented if entities can borrow indefinitely. This is why most ETSs limit borrowing to the same trading period and some impose quantitative restrictions on the amount of allowances that can be borrowed.[20]

Compliance with the ETS

Robust MRV rules are a key component in any well-functioning ETS. It is important for emissions and emissions reductions to be monitored and disclosed in an accurate and transparent manner.[21] Covered installations are usually required to monitor and report their emissions on an annual basis. Most schemes additionally require reports to be independently verified, while others request verifications on a case-by-case basis. In order to ensure compliance with the ETS, penalties are imposed on installations that fail to surrender the required amount of allowances.[22] Penalties usually involve a fine, and many schemes additionally require firms to submit missing allowances in the following year.

2.2 The EU Emissions Trading Scheme

The EU ETS is the main pillar of the EU's climate policy and its key tool for cutting GHG emissions.[23] The EU is the world's largest carbon market, accounting for over three-quarters of the trading volume in the international carbon market. It covers over 12,000 heavy energy-using power stations and manufacturing plants in the EU member states.[24] Since 2008, installations in the three EEA-EFTA states – Iceland, Liechtenstein, and Norway – are also covered by the EU ETS.[25] The EU ETS was divided into three initial trading periods. Phase I (2005–07) was a trial period. Phase II (2008–12) introduced some changes to the scheme and coincided with the EU's first compliance period under the Kyoto Protocol. However, it was Phase III (2013–20) that introduced significant reforms that particularly affect the cap-setting and the allocation of allowances.

Emissions reduction commitment

The EU ETS was introduced in 2005 through Directive 2003/87/EC in response to the EU's emissions reduction commitments under the Kyoto Protocol, with the objective of helping to achieve reductions in a "cost-effective and economically-efficient manner."[26] In 1997, the fifteen EU member states had committed to reduction targets under the Kyoto Protocol, agreeing to cut their collective GHG emissions for 2008–12 by eight percent below 1990 levels. This commitment was translated into national emissions reduction and limitation targets. All of the new member states that joined the EU after the adoption of the Kyoto Protocol – except Malta and Cyprus – committed to individual reduction targets under the Kyoto Protocol.[27]

In spite of the overall low support for a second commitment period under the Kyoto Protocol, with Canada, Japan, and the Russian Federation

deciding not to commit to any further reduction targets, the EU member states signed up for a second commitment period. The EU agreed to cut emissions by twenty percent over the 2013-20 period compared to 1990 levels – with the possibility of scaling it up to thirty percent if other major economies made fair contributions to the global emissions reduction efforts.[28]

In addition to the second commitment period under the Kyoto Protocol, the EU also made a unilateral commitment to reduce emissions by twenty percent by 2020 compared to 1990 levels, or thirty percent in the case of adequate reduction efforts from the other major economies. Unlike the Kyoto commitment, the unilateral commitment does not refer to the average over 2013-20, but only the year 2020. Moreover, the unilateral commitment covers emissions from international aviation – although this was suspended for one year as of April 2013 – while the commitment under the Kyoto Protocol covers emissions and their removal from land use, land-use change, and forestry (LULUCF), but not vice versa.[29]

Coverage

The EU ETS covers over 12,000 installations.[30] The scope has been significantly increased over the three trading periods and now covers emissions of carbon dioxide (CO_2) from power plants and many energy-intensive manufacturing sectors, such as oil refineries; steel works; and factories producing iron, coke, aluminium, metals, cement, lime, glass and glass fibre, ceramics, pulp, paper, cardboard, acids, and bulk organic chemicals.[31] International aviation was included in 2012 but, following strong international opposition, it was suspended for one year as of April 2013, limiting the aviation scope to intra-EU flights only.[32] The recent decision by the International Civil Aviation Organization (ICAO) to begin talks about implementing a global market-based measure (MBM) to address emissions from aviation by 2016 creates uncertainty about the re-introduction of aviation under the EU ETS.[33] When the EU suspended international aviation from its ETS, it said that the requirement for airlines to surrender allowances would be "reimposed automatically unless the ICAO agrees a robust market-based measure."[34] Recent developments point to the possibility of subjecting only the portion of a flight occurring within EU airspace to the ETS – irrespective of whether it originates inside or outside the EU.[35] Since Phase III, the EU ETS also covers nitrous oxide (N_2O) from the production of certain acids and perfluorocarbons (PFCs) in aluminium production.[36] Forestry, agriculture, and transportation other than aviation are not included in the EU ETS.[37] In total, the EU ETS covers approximately forty-five percent of the EU's GHG emissions.[38]

Cap-setting

The EU ETS is a cap-and-trade system with an absolute emissions cap. This means that an absolute quantity limit is in place for the emissions that can be emitted every year by the covered entities. Allowances are distributed within this cap and can be traded freely on the EU carbon market.

In the first two trading periods, the cap was determined by the sum of the member states' individual caps. Every member state suggested the quantity of European Union Allowances (EUAs) that its covered entities should receive. This quantity was submitted to the European Commission for review and final approval. National authorities were then responsible for distributing a nation's total allowances between its industries.[39] The EU-wide cap amounted to 2,181 $MtCO_2e$ per year during Phase I and to 2,083 $MtCO_2e$ during Phase II. However, Phase II included two additional countries and further installations. Without these additions, the cap would have been at 1,909 $MtCO_2e$ per year – a twelve percent reduction from Phase I.[40]

With the onset of Phase III, the Commission set a single community-wide cap at 2,039 $MtCO_2e$ for 2013. Excluding the extended scope, this would amount to an eleven percent reduction compared to the Phase II cap.[41] Every year, this cap will be reduced by 1.74 percent, so that GHG emissions in 2020 will be twenty-one percent lower than in 2005. The 2020 cap has been set at 1,777 $MtCO_2e$ per year.[42]

Allocation of allowances

The allocation mechanism under the EU ETS has changed over the course of the three trading periods. During Phase I, at least 95 percent of allowances had to be allocated for free. In practice, free allocation reached over 99 percent.[43] Phase II saw a reduction in free allocations, although member states had to allocate a minimum of 90 percent of permits for free.[44] During the first two periods, free allowances were distributed using the grandfathering method. The biggest change was introduced with the beginning of the third trading period. Free allocation no longer exists for power and heat generating facilities. These installations must now purchase all of their allowances. Exemptions have, however, been granted to the eight member states that joined the EU after 2004, allowing them to allocate a limited number of free allowances to existing power plants until 2019. In the other ETS sectors, free allocation will be phased out gradually, with the move to full auctioning set for 2027. In the manufacturing sector, for example, the share of free allowances will decrease from 80 percent at the beginning of Phase III to thirty percent by 2020. Free allocation in the manufacturing sector is now based on harmonized rules using the benchmarking method. This system rewards the most efficient facilities and, as such, creates incentives for emissions reductions.[45]

Additional exemptions exist for industries that are considered to be at significant risk of carbon leakage. In order to fall into this category, businesses must show the following characteristics: (*a*) a trade-intensity ratio above ten percent and a production-expense ratio of at least five percent as a result of the ETS; (*b*) a trade-intensity ratio over thirty percent; or (*c*) a production-expense ratio of at least thirty percent as a result of the ETS. Every five years, the European Commission revises the list that contains all the firms considered to be at significant risk of carbon leakage.[46] For the 2013–20 period, such companies will receive free allowances based on a benchmark, using the ten percent most energy-efficient installations in their product group. Installations reaching the benchmark will receive all allowances for free during Phase III. Those falling below the benchmark will receive a proportionately lower amount of free allowances.[47] In total, about half of the EUAs are to be auctioned in the third trading period.[48]

Rules for new entrants and plant closures

The EU ETS includes a reserve to distribute allowances to new entrants. During Phases I and II, member states themselves decided on the size of their reserves. As a result, there was no standardized reserve size. The allocation of reserve allowances, the rules for replenishing the reserve, and the formulas for determining the number of allowances to be allocated to new entrants also varied across member states. The onset of Phase III brought some harmonization, and a common reserve amounting to five percent of the EU-wide allowances was set up.[49]

When plants covered by the EU ETS close down, they no longer receive free allowances. The downside of this regulation is that it might keep inefficient installations running. Some member states have therefore decided to allow owners to transfer allowances from plants that are being shut down to a new replacement facility.[50]

Temporal flexibility

Temporal trading is possible under the EU ETS. Covered installations can save unused allowances from the current year to cover emissions in future years or, if needed, borrow allowances issued for the following year to cover shortages in the current year. Borrowing is implicitly possible as allowances for the new trading year are distributed two months before installations have to surrender allowances for the previous year.[51] The flexibility offered through borrowing helps control excess demand for allowances around the compliance date, therefore reducing the risk of distortions in the permit markets.[52] During Phase I, banking was only possible within the same trading period. Since Phase II, it is possible in all current and future periods. The change is a consequence of the drastic price crash towards the end of the first trading period, when spot prices

fell to almost zero while contract futures prices for the second trading period were selling at around EUR 20/tCO_2. To avoid this problem in the future, banking is no longer restricted to years within the same trading period.[53] However, unrestricted banking can also pose challenges. If excess allowances are accumulated in one trading period, they can be carried over into the next period through banking, thereby depressing prices well into future trading periods – a problem the EU is currently experiencing in its transition from Phase II to Phase III.

Rules for the use of international offset credits

Under the EU ETS, international offset credits can be used to meet domestic reduction commitments. Directive 2004/101/EC, also known as the 'Linking Directive', provides for the use of credits obtained from emissions-saving projects undertaken outside the EU. Project-based credits covered by the Directive are those generated by the Clean Development Mechanism (CDM) and the scheme for Joint Implementation (JI).[54] The CDM and the JI are the Kyoto Protocol's emissions reduction credit systems. These so-called 'flexible mechanisms' allow countries with commitments under the Kyoto Protocol (Annex B countries) to implement emissions reductions through projects in third-party countries and obtain reduction credits. The CDM is the most significant emissions reduction credit system. Under the CDM, Annex B countries carry out emissions reduction projects in developing countries for which they can receive Certified Emission Reductions (CERs). The CDM is intended to provide Annex B countries with flexibility in meeting their reduction commitments, while stimulating sustainable development and emissions reductions in developing countries.[55] Projects include, for example, building wind farms or the installation of more energy-efficient equipment in manufacturing facilities.[56] Reductions must be additional to what would have occurred in the absence of the projects, and project qualification is subject to a rigorous public registration and issuance process.[57] Joint Implementation provides Annex B countries with the opportunity to carry out emissions reductions through projects in other Annex B countries for which they can receive Emission Reduction Units (ERUs). Again, projects must meet the additionality criteria.[58] During Phase I, covered entities were only allowed to use CERs. Since 2008, companies can use both CERs and ERUs.[59]

The use of CERs and ERUs for compliance purposes under the EU ETS is, however, limited, both in terms of quantity and types of projects. For the period 2008–20, the total use of international offset credits is limited to 50 percent of the required aggregate abatement compared to 2005.[60] For Phase II, the EU imposed a quantity limit at 13.4 percent per year of the total EU cap. However, the actual use of CERs and ERUs has been below the maximum allowance and is expected to decrease further as a consequence of recent reforms.[61] At the company level, the use of CERs and ERUs is, on average, restricted to eleven percent.[62] The EU ETS does not accept credits from certain activities, such as those generated from nuclear facilities, LULUCF and – since 2013 – projects related to the destruction of industrial gases.[63] The exclusion of industrial gas destruction projects from the EU's offset eligibility is due to concerns about their environmental integrity.[64] Phase III also came with the additional requirement that CERs will only be accepted from least-developed countries (LDCs).

From 2020, the EU ETS may no longer accept international offsets for compliance. The 2030 framework, which lays out the EU's 2020–30 climate strategy, specifies that GHG reductions have to be achieved through domestic actions. This ban on international offsets may be lifted if an ambitious global climate deal is reached in 2015, which might lead the EU to increase its 2030 reduction target.[65]

Ensuring compliance

Covered entities are required to monitor and report their emissions on a yearly basis and have them checked by an independent, accredited verifier. The EU ETS uses common

MRV principles to account for emissions and emissions reductions. These principles are spelled out in the Monitoring and Reporting Regulation and the Accreditation and Verification Regulation. Covered facilities have to submit their verified emissions data by 31 March and sufficient allowances for their total annual emissions by 30 April. Failure to comply with this requirement results in a penalty.[66] Firms have to pay a fine which has increased from EUR 40 per tonne in Phase I to EUR 100 per tonne since Phase II. In addition, non-compliant firms must surrender the missing allowances in the next trading year.[67]

2.3 Performance of the EU Emissions Trading Scheme

Over the years, the EU ETS has experienced several hurdles. The main challenges concern the variability of allowance prices, particularly price crashes; low investment incentives; and the occurrence of windfall profits. Nevertheless, some experts argue that the ETS has been effective in inducing abatement activities and driving emissions reductions. However, the impact of the EU ETS on emissions reductions is heavily debated and opinions diverge. Some experts like Ellerman, Convery, and Quirion have more favourable assessments, whereas others like Sandbag, Carbon Market Watch, and the Corner House are more critical of the EU ETS's contribution to GHG reductions.

Price variability and allowance surplus

Price variability – particularly the problem of low allowance prices – has been responsible for much criticism of the EU ETS. Over the course of nine years, the EU's carbon price has greatly fluctuated. At the beginning, allowance prices were in the range of EUR 20–25/tCO_2, peaking at EUR 30.[68] However, in May 2006, prices fell abruptly, declining by more than EUR 10/tCO_2, within two days.[69] The price crash was the result of the publication of the 2005 verified emissions data which showed that emissions in 2005 were five percent below the allocated amount. The over-allocation was a consequence of a distribution that was largely based on entities' own estimates of their emissions because, in many cases, verified data was not available at that point. Once covered entities became aware of the extent of the over-supply, spot prices continued to decline, reaching almost zero at the end of Phase I.[70] The price crash was aggravated by the fact that Phase I allowances could not be banked for compliance in Phase II.[71] In addition, some studies show that actual abatement took place, thereby further contributing to the allowance surplus.[72]

For the launch of Phase II, the EU had learned its lessons and the Commission rejected most national allocation plans (NAPs) on the basis that they would have again resulted in an over-allocation of allowances. On the whole, the EU cut allocations by ten percent compared to the submitted draft NAPs. Initially, Phase II prices rose to over EUR 20/tCO_2, reaching EUR 29 in July 2008. However, with the onset of the financial crisis in autumn 2008, prices once again dropped, falling to as little as EUR 8/tCO_2 in February 2009. Towards the end of the year, prices recovered at around EUR 12–14/tCO_2. Despite the low demand for permits during the recession, they did not completely lose their value, since companies were able to carry over allowances into Phase III.[73] However, since summer 2011, allowance prices have once again declined steadily, falling to less than EUR 3/tCO_2 in April 2013.[74] This sharp price drop coincided with the failure of the European Parliament's vote on the back-loading of allowances.[75] Back-loading involves the temporary postponement of 900 million permits from auctions until demand is expected to increase. The postponement of the auctioning of these allowances from 2013–15 until 2019–20 would not reduce the total number of allowances to be auctioned during Phase III, but only the distribution of auctions over the third trading period.[76] The measure was intended to help the EU deal with its allowance surplus. Allocations for 2008–12 had assumed higher rates of economic growth, so declining economic activity resulted in an over-supply of allowances. At the same time, there was an over-supply of CERs as a backlog of projects requiring validation had been cleared.[77] Overall, the surplus of EUAs reached almost two billion at the beginning

of Phase III. This significant over-supply holds risks for the proper functioning of the EU carbon market and the ability of the EU ETS to meet more ambitious reduction targets in a cost-effective way.[78] After the initial failure, the back-loading measure was backed by the European Parliament in a second attempt, and prices have since increased slightly to about EUR 5/tCO_2.[79]

Despite the Phase III reforms, including a tighter cap, an increasing move towards auctioning, and the allocation of free allowances based on best practice benchmarks, the EU is still struggling with low allowance prices. In addition to the short-term measure of postponing the auctioning of 900 million allowances by six years, the EU has therefore started to look for more sustainable solutions to address the over-supply of allowances.[80] At the beginning of 2014, the Commission presented a legislative proposal for the creation of a market stability reserve – an automatic stabilizer to be put in place by 2021 that would adjust the supply of allowances in the EU carbon market to be auctioned. This reserve would operate independently under pre-defined rules.[81]

The price crashes show that the EU has difficulties achieving and maintaining a consistent carbon price signal. The price variability stems from the over-supply of allowances, the initial restriction on inter-phase banking, and the difficulty to adjust to the economic downturn. The problems have been partially addressed through increased auctioning, the use of verified emissions data as a basis for free allocation under the grandfathering method – and more recently its replacement with the benchmarking method – as well as the permission to bank allowances to future trading periods, and an increasing tightening of the cap.[82]

Low investment incentives

Price volatility has an additional drawback. The absence of a consistent price signal prevents firms from undertaking investments into relevant technologies.[83] A relatively stable and high price is indeed needed in order to incentivize companies to invest into climate-friendly technologies. The allocation of free allowances based on historical emissions further lowered the incentive to reduce emissions, as higher emissions would lead to greater allocations in the future.[84] During the first two trading periods, investment incentives under the EU ETS were therefore particularly low. Notwithstanding the changes in the ETS since the onset of Phase III, the EU is still plagued by price fluctuations and allowance prices that many argue are too low to stimulate significant investments into low-carbon technologies.

Windfall profits

Several studies suggest that some companies covered by the EU ETS earned windfall profits by passing the carbon price through to consumers although they had received allowances free of charge. While these windfall profits seem to have occurred, they mainly took place in the electricity sector. It also mostly affected countries with little regulatory oversight of their utility sectors. The move to auctioning from Phase III should help to reduce this problem.[85] However, some analyses of energy-intensive and trade-exposed (EITE) industries – who will continue to receive free allowances during Phase III – suggest that some of those sectors will be able to pass through added costs and reap windfall profits.[86]

Carbon leakage

Concerns about the risk of carbon leakage were frequently voiced in the context of the EU ETS. However, most studies find no evidence of carbon leakage in the first two periods of the EU ETS. In an analysis of several energy-intensive industries, Bolscher et al. find that low allowance prices and free allocations seem to have prevented carbon leakage during Phases I and II. While there is no evidence of production leakage, some sectors may be experiencing investment leakage – a relocation of investments due to the carbon policy – although this requires more detailed analysis.[87]

Success in spite of challenges

Despite these challenges, some experts claim that the ETS has been effective in helping the EU reach its Kyoto reduction target. Data from 2011 shows that emissions in the EU 15 – i.e. the EU's member states prior to the 2004 accessions – were 14.9 percent below 1990 levels. Estimates from the European Environment Agency put 2008–12 average emissions at 12.2 percent below 1990 levels. This means that the EU has significantly over-achieved its first Kyoto target. Similarly, the member states that joined the EU after the agreement of the Kyoto Protocol also met or over-achieved their individual Kyoto targets.[88] While it is difficult to attribute reductions to a specific policy and it appears that the recession also contributed to lowering emissions, some studies nevertheless show that the EU ETS has played a role in the emissions reductions. Ellerman, for example, estimates that, during Phase I, the EU ETS was responsible for reductions of 120–300 MtCO2e – or two to five percent below BAU emissions – and from 2008-09 for reductions of 340 MtCO2e – or around eight percent of BAU emissions.[89] However, such estimates depend on the methodology used, and other experts show lower emissions reductions.

Moreover, despite fears that the EU ETS would impede economic growth and involve significant costs for industry and consumers, the reductions were achieved at a fraction of the predicted cost. Estimates put the costs at 0.01 percent of the EU's GDP.[90]

In addition, in spite of the above-mentioned price fluctuations and crashes, some studies show that the EU ETS still managed to spark innovation into low-carbon technologies, pointing out that short-term price variability does not necessarily prevent investments. Long-term prices were relatively stable in the EU ETS, and some argue that they are more influential for investment decisions than short-term prices. Moreover, price volatility is part of the functioning of complex markets, and allowance prices are influenced by several factors, including changes in economic activity, weather events, fuel prices, and technological developments.[91] Nevertheless, some studies show that the impact of the EU ETS on investment decisions has been moderate: it has had an influence on low-carbon investments, but not enough to spark long-term projects at the level that is needed to meet the EU's long-term targets cost-effectively.[92]

Table 1 provides a summary overview of the EU ETS across its three phases, showing its main developments, challenges, and performance.

Table 1: Development of the EU ETS

	Phase I	Phase II	Phase III
Years	**2005-07**	**2008-12**	**2013-20**
Cap-setting	Sum of the caps of member states	Sum of the caps of member states, although the Commission rejected most initial NAPs for a lack of ambition	Single community-wide cap set by the Commission
Cap-level	2,181 $MtCO_2e$	2,083 $MtCO_2e$ (equivalent without additions: 12% below Phase I)	2,039 $MtCO_2e$, declining by 1.74% annually (equivalent without additions: 11% below Phase II)
Gases covered	CO_2	CO_2	CO_2, N_2O, PFCs

Table 1: *Continued*

	Phase I	Phase II	Phase III
Sectors covered	Power generation and energy-intensive industrial sectors (ferrous metals, cement, refineries, pulp and paper, glass, ceramics, all combustion facilities > 20MW), some opt-outs	Same as Phase I but no opt-outs, plus aviation since 2012	Same as Phase II but international aviation suspended from April 2013, plus additional sectors (non-ferrous metals; rock wool, stone wool and gypsum; chemicals; PFCs for aluminium; N_2O for acid; CCS-related emissions)
Free allocation ratio	Minimum 95%	Minimum 90%	Power generation: no free allocation; Industrial sectors: 80% to decrease to 30% by 2020; EITE industries: 100% based on benchmark
Free allocation method	Grandfathering	Grandfathering	Benchmarking
New entrants	Reserve size and rules set by member states	Reserve size and rules set by member states	EU-wide reserve at 5% of the cap
Banking	Within trading period	Within and across trading periods	Within and across trading periods
Borrowing	Implicitly within trading period	Implicitly within trading period	Implicitly within trading period
Kyoto offsets	CERs, excluding nuclear facilities and LULUCF; limited at 50% of a country's reductions compared to BAU, but none were used	CERs and ERUs, excluding nuclear facilities and LULUCF; limited at 13.4% of EU cap	CERs and ERUs, excluding nuclear facilities, LULUCF, and the destruction of industrial gases; CERs only from LDCs
Penalty	Fine of EUR 40/tCO_2e and surrender of missing allowances	Fine of EUR 100/tCO_2e and surrender of missing allowances	Fine of EUR 100/tCO_2e and surrender of missing allowances
Performance	Initial allowance prices of EUR 20-25/tCO_2e with a spike at EUR 30, before price crash in spring 2006 – reaching almost zero at the end of 2008 – when verified emissions data showed an over-supply of allowances, caused by allowances being allocated based on entities' own estimates, the inability to bank allowances to Phase II, and the implementation of actual abatement.	After the price crash in Phase I, prices climbed to more than EUR 20/tCO_2e in summer 2008. Prices crashed to EUR 8/tCO_2e with the onset of the financial crisis. Towards the end of 2009, prices recovered at around EUR 12–14/tCO_2e. Since summer 2011, prices have once again started to fall steadily.	Persisting over-supply of allowances despite reforms. Prices dropped to less than EUR 3/tCO_2e following the negative April 2013 vote on the back-loading approach. Prices recovered only slightly to about EUR 5/tCO_2e after a successful second vote.

2.4 The South Korean Emissions Trading Scheme

South Korea has seen several decades of fast economic growth and is now among the world's top GHG emitters. Within the OECD group, South Korean emissions are set to grow the fastest.[93] While South Korea has no binding reduction commitments under the Kyoto Protocol, the country intends to curb emissions as part of its recent green growth agenda. The Framework Act on Low Carbon Green Growth, enacted in 2010, forms the foundation of South Korea's transition towards low-carbon, sustainable development. The Framework Act sets out an emissions reduction target and provides for the introduction of an ETS.[94] An ETS was drafted over the following years, and the bill to enact the scheme was passed almost unanimously by the National Assembly. With the enactment of the presidential decree in November 2012, the final step towards the introduction of the law was taken.[95]

The Framework Act put into place some temporary mechanisms that are of use for the future ETS. Since 2011, South Korea has been operating the GHG and Energy Target Management System, which can be seen as a predecessor to the ETS. It covers more than 450 large emitters and energy consumers from the power, industry, waste, and agricultural sectors. Under the current scheme, covered entities must submit data on GHG emissions and energy to the Government on a yearly basis and are subsequently assigned an emissions/energy reduction target for the following year.[96] By operating this scheme, the South Korean Government and covered businesses were able to gain some valuable experience prior to the introduction of the ETS. Thanks to the current scheme, a national inventory covering 60 percent of South Korea's emissions is already in place.[97] The collection of verified emissions data for several years prior to the start of the ETS can help reduce the risk of over-allocation of allowances – a problem the EU experienced during the first trading period of its ETS.

Several elements of the South Korean ETS have yet to be finalized and will be revealed in the NAP, to be published in June 2014. The NAP will contain the detailed rules for the operation of the ETS, including the total emissions cap per allocation period, the reserve amount, and allocation standards.[98]

Emissions reduction commitment

The emissions reduction target set out in the Framework Act reflects South Korea's pledge under the Copenhagen Accord to lower GHG emissions by thirty percent relative to its projected BAU levels by 2020. According to current government projections, the 2020 BAU emissions are estimated at 776 $MtCO_2e$, an increase of sixteen percent from the 2010 level of 669 $MtCO_2e$. Under this projection, the thirty percent reduction target would put 2020 GHG emissions at 543 $MtCO_2e$, a reduction of nineteen percent from 2010 levels. The level of ambition of the commitment is, however, dependent on the BAU prediction. A lower BAU scenario would decrease the ambition implied by the reduction target. Many observers expected that the South Korean Government would revise its 2020 BAU scenario with the release of the ETS Master Plan.[99] However, the Master Plan, published in January 2014, does not show any changes in the above figures.

Coverage

According to the current draft proposal, the ETS will apply to individual installations emitting over 25,000 tCO_2e annually or entities whose combined installations emit over 125,000 tCO_2e. In addition to the mandatory participation of businesses and installations falling under the above category, firms can join the ETS voluntarily. As such, the South Korean ETS will cover approximately 470 firms and over 1,600 installations.[100] The ETS is set to include all six Kyoto Protocol GHGs. In addition to CO_2, N_2O, and PFCs, it will therefore also cover methane (CH_4), hydrofluorocarbon (HFC), and sulfur hexafluoride (SF_6). The scheme will further be applicable to both direct and indirect emissions.[101] Under the current plans, approximately 60 percent of the country's GHG emissions will be covered by the ETS.[102]

Cap-setting

The South Korean ETS will be designed as a cap-and-trade system with an absolute quantity limit on emissions, which will be lowered over time. The concrete cap will not be known until June 2014 when the first Allocation Plan will be revealed.[103] Under the current BAU scenario, Bloomberg New Energy Finance predicts a 2020 cap of 360 $MtCO_2e$.[104]

Allocation of allowances

The mechanisms for allocating allowances will be specific to the trading phase, industry, and sector. The exact rules will be determined by the 2014 NAP, leaving several details unknown at the time of writing.

The South Korean ETS will consist of three trading periods. The first two phases – lasting from 2015–17 and 2018–20 respectively – are trial phases. The third phase will cover a longer period from 2021–26. While the allocation mechanism will change over the course of these three trading periods, significant amounts of allowances will be allocated for free during all of them. In Phase I, 100 percent of allowances will be allocated free of charge. This will be reduced to a maximum of 97 percent in Phase II, falling to a maximum of 90 percent in Phase III. Businesses considered to be at significant risk of carbon leakage will receive all of their allowances free of charge.[105]

Both grandfathering and benchmarking are currently being considered as possible methods for the allocation of free allowances. It seems however more likely that permits will be allocated according to the grandfathering method.[106]

To receive permits, firms will have to fill out an allowance application form and submit this to the Government.[107] While the allocation of allowances should generally not be changed during an allocation period, readjustments of allocations can be made to help covered firms "in the event of an important change in the economic situation which could not be predicted at the time of setting up the allocation plan."[108] The readjustment can take two forms. First, in exceptional cases, important changes in the overall economic situation might lead to an increase in the total volume of emissions allowances. Second, businesses may request readjustments by drawing on reserve allowances. However, the criteria under which businesses may request additional allowances are limited to three circumstances: (*a*) when emissions increase over the allocated allowances due to an unexpected expansion of a firm's facilities or the transfer/merger of a factory; (*b*) if emissions of a power-generating facility have increased due to the Government's request for increased power generation; and (*c*) if a firm's emissions have increased by more than thirty percent over its allocated allowances due to an unexpected change in the product line or business plan.[109]

Rules for new entrants and plant closures

The South Korean ETS will include an allowance reserve to distribute permits to new entrants.[110] The level of the reserve is unknown at the time of writing as it is one of the features that will be determined by the 2014 Allocation Plan. Similarly, there is currently no information with regard to the treatment of plant closures.

Temporal flexibility

Temporal trading will be authorized under the South Korean ETS. However, while banking of allowances will be completely unrestricted, borrowing will only be permitted between years falling into the same trading period. Borrowing will not be possible between trading periods and it will be limited to ten percent of the required allowances per business.[111]

Rules for the use of international offset credits

Under the South Korean ETS, firms will be allowed to submit carbon offset credits to meet their compliance obligations. However, the use of offset credits will be subject to a quantitative limit. Businesses will only be allowed to use carbon offsets for up to ten percent of their compliance obligations. The concrete limit

for every entity will be set by the NAP. During the first two trading periods, companies will not be able to use carbon offsets from foreign countries. International offsets will be accepted from Phase III, but only for a maximum of 50 percent of the total offset limit. A linkage with the UN offset market is currently uncertain.[112] Whether the South Korean ETS will exclude credits from certain projects is also unknown at the time of writing.

Ensuring compliance

Thanks to the GHG and Energy Target Management System, South Korea has already established a robust MRV mechanism. The current system requires covered entities to measure and report their emissions and to have the data verified by an independent institution before submitting their reports to the Government. The basics for the MRV system under the ETS are therefore already in place.[113]

Businesses that fail to surrender the required amount of allowances will face a penalty. The fine will be set at three times the market price per tonne of CO_2, with a cap at KRW 100,000 (EUR 69) per tonne. It remains to be decided whether the penalty will also require firms to surrender missing allowances in the following year. Without such a requirement, the cap on the fine would effectively form a price ceiling for the ETS. This is particularly relevant since predictions of the allowance price are well above that cap, suggesting that it could reach levels of more than KRW 150,000 (EUR 100).[114] The penalty cap would consequently become the default compliance option, turning the scheme into a de facto tax.

Market stabilization measures

According to current plans for the South Korean ETS, the Government will be allowed to intervene with market-stabilizing measures in case of significant changes in prices or trading volumes. The plans stipulate the situations under which such interventions are permitted and the type of measures that can be taken. Stabilization measures are authorized if one of following scenarios applies. First, when the price for allowances increases more than threefold for six straight months compared to the previous year or the year before that. Second, when the average price increases more than twofold compared to the average allowance price of the past two years because the trade volume increased more than twofold in a one month period compared to the average monthly volume of the previous year or the year before that. Third, when there is a 60 percent price decrease in a one month period compared to the average prices of the past two years. In those cases, the Government has permission to take the following measures to stabilize the market: (*a*) auction up to twenty-five percent of permits from the reserve; (*b*) set a maximum or minimum limit for the holding of allowances by each participant; (*c*) increase or reduce the borrowing limit; (*d*) increase or reduce the offset limit; or (*e*) set the highest or lowest price.[115]

Under certain circumstances, South Korean authorities are therefore able to intervene in the carbon market with the objective of stabilizing prices. This allows South Korea to control significant spikes in allowance prices, but also to contain price crashes. The flexibility to control the market through cost containment measures is a unique feature of the South Korean ETS.

2.5 Similarities and Differences between the EU and South Korean Emissions Trading Schemes

Several aspects of the South Korean ETS were modelled on the EU ETS. As a result, the two schemes display a few similarities. However, they also differ from each other in some important aspects.

Coverage

The EU ETS applies to specified industries. It covers over 12,000 installations from the power sector, energy-intensive manufacturing sectors, and, since 2012, aviation – although international aviation has been suspended from the ETS, which currently only covers intra-EU flights. During Phase I, sector-

specific thresholds were in place, below which installations were able to opt out if they had equivalent emissions reduction measures in place.[116] The current scheme covers forty-five percent of the EU's GHG emissions. Unlike the sector-based approach of the EU ETS, the South Korean scheme is entirely threshold-based and applicable to all sectors. Individual installations emitting more than 25,000 tCO_2e annually and companies whose installations combined emit over 125,000 tCO_2e annually will fall under the South Korean ETS, irrespective of their sectors. In this form, the South Korean scheme will cover over 1,600 installations, accounting for approximately 60 percent of the country's GHG emissions. Taking into account growth in the covered sectors, the ETS is expected to cover almost 75 percent of South Korea's GHG emissions by 2020.[117]

The two schemes also vary with regard to the emissions they cover. While the South Korean ETS intends to cover all six Kyoto GHGs, the EU ETS only applies to CO_2, N_2O, and PFCs. Unlike the EU ETS, the South Korean scheme is set to apply to both direct and indirect emissions. On the positive side, the coverage of indirect emissions can incentivize companies to improve their energy efficiency. However, it risks causing a misallocation of allowances in addition to complicating reporting and compliance procedures.[118]

Cap-setting

Both the EU ETS and the South Korean ETS are designed as cap-and-trade systems with absolute quantity limits on emissions that will be progressively lowered over time. The EU's 2020 cap is set at 1,777 $MtCO_2e$. The cap for the South Korean scheme is unknown at the time of writing. It will be revealed with the publication of the first Allocation Plan in June 2014.

Allocation of allowances

Several details about the allocation mechanisms under the South Korean ETS are unknown at the time of writing. Like the cap, they will be determined by the NAP. Decisions about the general mechanisms have, however, already been taken, allowing a comparison with the EU's allocation mechanisms. Both schemes include free allocations of allowances, which will be lowered over time, gradually moving the systems towards auctioning. Under the EU ETS, over 99 percent of allowances were allocated free of charge during Phase I and more than 90 percent during Phase II. In Phase III of the EU ETS, auctioning will be the allocation mechanism for about half of the allowances. Under the South Korean scheme, all allowances will be allocated for free during Phase I. This will be reduced to a maximum of 97 percent in Phase II and 90 percent in Phase III. As such, the proportion of allowances to be distributed free of charge during Phase III of the South Korean scheme will be higher than under the EU ETS. The trading periods under the South Korean ETS are, however, shorter.

During the first two trading periods of the EU ETS, free allowances were allocated using the grandfathering method. Since the onset of the third trading period, the EU ETS has moved to the benchmarking method. South Korea has yet to decide on the method it will apply, with both grandfathering and benchmarking currently figuring as possible mechanisms. Grandfathering seems, however, the more likely option for the first part of the South Korean scheme.

Both schemes include exemptions for industries that are considered to be at significant risk of carbon leakage. To identify such companies, the EU and South Korea apply the same definition.[119] While businesses falling into this category will continue to receive all allowances for free under the South Korean scheme, the EU ETS allocates free allowances to such companies based on best-practice industry benchmarks.

A major difference between the two schemes concerns the readjustment of allocations. While the South Korean ETS provides for the possibility to readjust allocations, this is not possible under the EU ETS. There might be several reasons for this difference, but two arguments stand out. First, unlike South Korea, the EU has binding emissions reduction commitments under the Kyoto Protocol. Changes to the allocation through an increase in the total volume of

emissions allowances might undermine efforts to achieve the binding reduction target, thereby affecting environmental effectiveness. Second, allocation readjustments at the request of individual businesses would likely lead to tensions between member states. The request for additional allowances by a firm in one member state might prompt businesses in other member states to apply for additional allowances out of equity concerns. In addition, agreement for changes would be difficult to obtain in the EU system, where such decisions require the approval of the EU Parliament, Council, and Commission. The difficulty of obtaining agreement for changes is illustrated by the EU decision on the back-loading measure. The European Parliament initially rejected the measure in April 2013 and only backed it during a second attempt in July 2013.[120] Although the back-loading decision does not change the amount of allowances, it was still difficult to pass.

Temporal flexibility

Strong similarities exist with regard to the rules for temporal trading under the EU ETS and the South Korean ETS. Both schemes allow unrestricted banking of allowances to the following year. Borrowing of allowances is also available to participants in both schemes, but only between years falling into the same trading period. Under the EU ETS, borrowing is implicitly possible as allowances for the next trading year are distributed two months before installations have to surrender allowances for the previous year. Under the South Korean scheme, borrowing is explicitly authorized, but only up to a limit of ten percent of a company's allowance requirement.

Rules for the use of international offset credits

The provisions for the use of international offset credits differ between the EU ETS and the South Korean ETS. Under the EU ETS, companies can use CERs and ERUs from the Kyoto Protocol's flexible mechanisms. The EU-wide limit for the use of international offset credits for the years 2008–20 amounts to fifty percent of the required emissions reductions compared to 2005. During Phase II, companies were allowed to use CERs and ERUs for up to 13.4 percent of the total EU cap. The rules for the use of international offset credits are different under the South Korean scheme. While covered entities will be allowed to use offsets, international credits will only be authorized from Phase III. The limit for domestic and international offset credits combined is set at ten percent of a company's compliance obligations. Within this limit, international offset credits will only be accepted for up to 50 percent. Importantly, whether the South Korean ETS will be linked to the UN offset market is currently uncertain. It is further unknown whether the South Korean scheme will exclude certain types of projects, so it is not possible to compare the two schemes in this regard. Moreover, the EU's recent announcement that the 2030 reduction target will have to be met through domestic actions alone casts doubt over the future role of international offset credits under the EU ETS. Unless an ambitious international climate agreement that might prompt the EU to commit to a steeper reduction target is reached in 2015, international offsets will not be accepted under the EU ETS from 2020 onwards.

Ensuring compliance

The MRV mechanisms of the EU ETS and the South Korean ETS are comparable. Both systems require firms to measure and report their emissions on a yearly basis, and to have the data verified by an independent, accredited institution before submitting the reports.

Both schemes further impose fines on companies that fail to surrender sufficient allowances. Under the South Korean scheme, fines will amount to three times the market price per tonne of CO_2, with a cap at approximately EUR 69 per tonne. The EU has set the fine at EUR 100 per tonne from Phase II. The fine does not, however, free EU ETS-covered entities from the obligation to surrender the missing allowances. Whether this requirement will also apply to South Korean firms is yet to be decided.

Market stabilization measures

A major difference between the EU ETS and the South Korean ETS concerns the flexibility of the Government to intervene in the carbon market. The South Korean scheme specifies events related to price hikes, demand spikes, and price crashes under which the Ministry of Environment is authorized to impose certain measures that work to control the carbon price. Unlike the South Korean ETS, the EU ETS does not provide for active market interventions. The EU ETS has experienced much price volatility – particularly price crashes – over the past nine years. Despite concerns about the impact this might have on the effectiveness of the scheme, EU policymakers were not able to intervene to stabilize prices. When the back-loading measure was suggested as a way to boost demand and hence allowance prices by temporarily withholding allowances from auctions, this required the approval of the EU Parliament, Council, and Commission. The heated debates surrounding the measure and its failure in a first attempt at voting illustrate the difficulty for policymakers to intervene in the EU ETS.[121] The potential for market-stabilizing intervention measures is therefore significantly lower under the EU ETS. South Korea seems to have learned from the EU's problem with price variability and has decided to include provisions that give it the ability to implement stabilizing measures. However, the EU's recent proposal for a market stability reserve – an automatic stabilizer that would work under pre-defined rules to withhold or release allowances – shows that the EU's strong stance against market stabilization measures is beginning to soften. Nevertheless, the market stability reserve would be a much more passive tool than the provisions under the South Korean scheme.

Table 2 summarizes the similarities and differences between the EU and the South Korean ETSs.

Table 2: A comparison of the EU ETS and South Korean ETS

	EU	Korea, Rep.
Type of ETS	Mandatory absolute cap-and-trade system	Mandatory absolute cap-and-trade system
Cap	2020: 1,777 $MtCO_2e$/year	2020: 543 $MtCO_2e$/year (estimate)
Trading periods	2005-07; 2008-12; 2013-20	2015-17; 2018-20; 2021-26
Compliance date	Annual (30 April)	Annual (date unknown)
Sectoral coverage	Sector-based approach covering over 12,000 installations: power, energy-intensive manufacturing, aviation (international aviation suspended)	Threshold-based approach covering over 1,600 installations: installations emitting >25,000 tCO_2/year and companies with combined installations emitting >125,000 tCO_2/year
Gases coverage	CO_2, N_2O, PFCs (direct)	CO_2, N_2O, PFCs, CH_4, HFCs, SF_6 (direct and indirect)
Emissions coverage	45%	60%
Free allocation (in %)	Phase I: 99%; Phase II: >90%; Phase III: no free allocations to power sector (some exceptions), manufacturing to be reduced from 80% to 30% by 2020, exemptions for EITE industries based on best-practice benchmark (100% free allocation to those reaching the benchmark)	Phase I: 100%; Phase II: < 97%; Phase III: < 90%; 100% free allocation for EITE industries during all three periods

Table 2: *Continued*

	EU	Korea, Rep.
Free allocation mechanism	Phases I and II: grandfathering; Phase III: benchmarking	Unknown
Readjustment of allocations	Not possible	Possible in case of (a) important changes in the overall economic situation; (b) individual company requests
New entrants and plant closures	Reserve for new entrants at 5% of EU-wide allowances; no free allowances to closed plants	Reserve for new entrants (size unknown); treatment of plant closures unknown
Banking of allowances	No restrictions	No restrictions
Borrowing	Implicitly possible without restrictions	Explicitly authorized up to 10% of a company's allowance requirement
Offset credits	CERs and ERUs, excluding nuclear and LULUCF projects and the destruction of industrial gases: 2008-12: limited to 13.4% of EU cap; restricted to ~ 11% of compliance obligation at the company level; since 2013 only from LDCs; from 2020 potentially none	Use of CERs and ERUs unknown; project exclusions unknown; total offset limit (domestic + international) at 10% of company compliance obligation, international offsets at no more than half of this limit
MRV	Annual monitoring and reporting required, including independent verification	Annual monitoring and reporting required, including independent verification
Penalty	Fine of EUR 100 (EUR 40 during Phase I) and requirement to surrender missing allowances	Fine at three times the market price capped at eq. EUR 69; unknown whether firms will be required to surrender missing allowances
Market stabilization measures	Very limited: back-loading decision was difficult to obtain and proposed market stability reserve would be an automatic stabilizer	Provisions to intervene with specified stabilization measures under pre-defined scenarios

3. LINKAGE OF EMISSIONS TRADING SCHEMES

As the number of ETSs grows, existing and emerging ETSs are considering linking their own schemes with those in other countries, and the first cases of such linkages are being put into place. Linking ETSs means that covered entities in one system are allowed to use allowances from another system to meet their domestic compliance obligations.

3.1 Forms of Linkage

Linkages between ETSs can be divided into direct and indirect links. Direct links can further be of unilateral, bilateral, or multilateral nature.

Direct linkage

A 'unilateral link' is a one-way link between two systems, whereby allowances from one system are accepted for domestic compliance obligations in the other system, but not vice versa. A unilateral link can exist for two reasons: first, in cap-and-trade systems, when only one of the two systems decides to recognize allowances from the other system; second, when a cap-and-trade system is linked to a baseline-and-credit system, since the latter only produces credits but does not require firms to surrender allowances. Under an unrestricted unilateral link in which system A recognizes allowances from system B, entities in system A will purchase allowances from system B if the allowance price in system B is lower than in system A. This will decrease the allowance price in system A and increase the price in system B until the two allowance prices converge. As such, more costly abatement in system A is replaced by lower-cost abatement in system B, thereby increasing emissions in system A and decreasing emissions in system B. If, however, the allowance price is higher in system B than in system A, entities in system A have no incentive to buy allowances from system B. In this case, there will be no trading in allowances.[122]

A 'bilateral link' is a two-way link, whereby both systems recognize each other's allowances for their respective compliance obligations. Allowances can therefore flow in either direction. As such, price differences will result in the sale of allowances from the system with a lower allowance price to the system with the higher price until the systems' allowance prices converge at an intermediate level. Abatement in the higher-price system will be offset by abatement in the lower-price system, thereby increasing emissions in the higher-price system while reducing emissions in the lower-price system. A 'multilateral link' requires the agreement of more than two systems.[123]

Governments can limit the convergence of allowance prices by reducing trading activity through several restrictions and conditions. Options include the imposition of a quantity limit for the use of the other system's allowances for domestic compliance purposes or the introduction of an 'exchange rate', requiring participants to surrender a higher number of allowances from the other system than domestic allowances for each tonne of their emissions. Exchange rates may also be used to ensure environmental integrity if the systems use different amounts of emissions or emission reductions for their allowances – e.g. short tons versus metric tons – or to guarantee that net emission reductions are achieved.[124]

Indirect linkage

Two systems can become 'indirectly linked' with each other if both have a direct link with a common third system. Although neither of the indirectly linked systems accepts the other system's allowances, the indirectly linked systems can have an impact on each other through their respective trading with the common third system. Indirect links can emerge if a series of bilateral links exists among several systems. If system A and system C both have a bilateral link with system B but no direct link with each other, allowance trading between systems A and B and between systems C and B will lead to a convergence of allowance prices across all three systems. As a

result, developments that affect the allowance price in system A will indirectly affect the allowance price in system C. Similarly, an increase in emissions in system A can indirectly lead to a decrease in emissions in system C, as this changes system A's supply and demand for allowances in the common system B.[125]

Indirect linkage can also exist when two separate systems A and C both have a one-way link with a common third system B, recognizing allowances from that third system. In such a case, systems A and C will compete for allowances from system B. As a result, a change in demand by system A for allowances from system B will affect the supply of allowances available for system C.[126]

An existing example of indirect linkage is the recognition of Kyoto offset credits. Systems accepting CERs and ERUs are indirectly linked through their respective trading in Kyoto units.[127]

3.2 The Rationale for Linking Schemes

Linkage between ETSs offers several benefits that make it an attractive policy option. A leading argument in favour of linkage is its potential for cost savings. Linkage increases the available abatement opportunities across the linked systems. It therefore helps minimize the total emissions reduction costs by shifting high-cost reductions from one system to lower-cost reductions in the other system. The logic for cost savings across linked systems is the same as for cost savings within the same ETS: abatement takes place where the cost of doing so is lowest.[128]

In addition to cost-efficiency gains, linkage creates a broader market for allowances and, as such, increases the liquidity and functioning of carbon markets, thereby reducing price volatility. A larger allowance market can also reduce concerns about market power as the increase in competition in a broader market lowers the potential for market manipulation.[129] These benefits can be significant if one or both systems are small.[130]

Under certain circumstances, linkage also has the potential to reduce the risk of carbon leakage. If, for example, two cap-and-trade systems are directly linked, this can lower the risk of carbon leakage for the system that sees its allowance price fall.[131] The price convergence has the potential to reduce the risk of carbon leakage not only between linked systems, but also vis-à-vis third-party countries.

In the case of two-way linkage, governments create an institutional lock-in, thereby enhancing the dynamic efficiency of climate policy by reducing time-inconsistency problems for governments with limited commitment power. If firms doubt a government's commitment to climate policy, they will refrain from investing into low-carbon technologies. Two-way linkages of schemes reduce this risk through the presence of reciprocal pressure, making a policy reversal less likely.[132]

From a political point of view, linkage can also be beneficial. At the international level, linkage can work to signal commitment to long-term climate policy action and multilateralism, thereby helping reinforce the UNFCCC process.[133] Linkage can advance international cooperation in the area of climate change and has the potential to provide a bottom-up approach to international climate policy architecture.[134] Domestically, linkage can serve to address the sensitive issue of distortions in competitiveness between schemes with different carbon prices and, as such, reduce opposition to the scheme from domestic business circles and the general public.[135] Moreover, linkage can enhance the acceptability of the domestic scheme by showing that serious mitigation efforts are also under way in other countries.

3.3 Disadvantages of Linkage

While linkage between ETSs helps achieve overall net gains, it also raises distributional issues. Just like international trade in general, trade in emissions allowances has positive effects on some participants and negative effects on others. The change in a system's allowance

price, together with the role of participants as net buyers or sellers of allowances, determines whether participants win or lose as a result of linkage. Buyers in the pre-linkage higher-price scheme and sellers in the pre-linkage lower-price scheme will benefit from linkage as the former will be able to purchase allowances at a lower price while the latter will receive a higher price for the allowances they sell. Conversely, sellers in the pre-linkage higher-price system and buyers in the pre-linkage lower-price system will see their situation deteriorate as the former will receive a lower price for the allowances they sell while the latter will have to pay a higher price for the allowances they purchase.[136]

Distributional issues can have effects beyond the entities covered by an ETS. Allowance prices have an impact on the price of energy and other energy-intensive goods. If allowance prices increase in one country as a result of linkage, this can increase the price of energy and other energy-intensive goods, thereby affecting households and firms that do not directly participate in the ETS. Linkage can also alter the production costs of emissions-intensive firms and companies that rely on emissions-intensive inputs, thereby affecting their competitiveness.[137]

A major concern with regard to linkage is the reduced control a government may have over the design and impact of its ETS. Through linkage, a system's allowance price and impact on emissions will be influenced by developments in the other system. A system's relative size is an important factor in this case. The convergence of allowance prices tends to be closer to the pre-linkage price of the larger system. The smaller system becomes a price-taker, with its allowance price rising or falling to the level of the larger system's pre-linkage price. Decisions taken by the government of the smaller system will have little impact in a post-linkage scenario.[138] However, the larger system is not entirely isolated from developments in the smaller system. Price shocks originating in either system will have an effect on the entire market. Moreover, certain design features – such as price caps and other cost containment measures – can propagate into the linked system, even if they originate from the smaller system.[139] Measures such as price caps might be in conflict with the other scheme's objectives, which might prioritize emissions reductions over price stabilization. Consequently, governments wishing to link their ETSs might have to give up certain design features of their schemes.

The degree to which a government loses control over its own system depends on the type of linkage. Unilateral links usually only reduce the allowance price in the system that establishes the link, as the system will only purchase allowances from the other system if its own allowance price is higher.[140] The system that did not establish the link might, however, find the increase in its allowance price undesirable. If, for example, a large cap-and-trade system establishes a unilateral link with a smaller one, the small system might experience a withdrawal of a large number of allowances for use in the larger scheme and, as such, see its allowance price rise. The small scheme can prevent an undesired withdrawal of allowances by changing its registry rules, preventing non-domestic entities from opening accounts and holding allowances.[141] In the case of unilateral linkage, cost containment measures will only propagate in one direction: from the system with which the link is established to the system that establishes the link. Two-way linkages, on the other hand, can increase or decrease the price and result in a full propagation of cost containment measures across the linked systems.[142]

As mentioned above, linkage has the potential to reduce the risk of carbon leakage under certain circumstances. However, under other circumstances, it could also increase the risk of carbon leakage. Countries that see their carbon price rise as a result of linkage may indeed face a higher risk of carbon leakage.[143]

In certain situations, linkage could carry the risk of increasing global emissions. For example, linking a cap-and-trade system with a baseline-and-credit system raises the problem of additionality. However, some emissions

reduction credits offered by the baseline-and-credit system may not actually represent additional reductions, given the difficulty of establishing a baseline against which reductions can be measured.[144]

Linkage might also create perverse incentives to relax the emissions cap in order to generate revenue through the sale of allowances to the other system. This would undermine aggregate emissions reductions compared to a non-linkage scenario in which countries would not face a trade-off between the value generation of allowance sales and the marginal environmental damage resulting from a less stringent emissions cap.[145] Nevertheless, this effect is dampened by the risk of reputational damage, the threat of import quotas or other penalties, and the fear that the linkage partner might defect from cooperation in other areas. Moreover, governments can lower the risk for such allowance adjustments by requiring a transparent disclosure of mid- and long-term cap plans prior to establishing the link.[146]

The trading of allowances leads to large capital flows between countries. Although these flows benefit the entities participating in the trading, others might have objections.[147] A country that becomes a net exporter of allowances will see a large inflow of foreign currency. This could increase domestic wages and consumption, resulting in an appreciation of its currency, and could therefore weaken its export competitiveness.[148]

Another negative side effect of linkage is that lower abatement as a result of linkage in one system reduces the other benefits associated with abatement activities, such as decreases in local air pollution or increased energy security through reduced dependence on fossil fuels and development of low-carbon technologies.[149] However, many countries have additional climate policies in place to achieve these related but distinct climate objectives.

Politically, linkage is not necessarily purely beneficial. While it has the potential to complement the UNFCCC process, it could also be perceived as a substitute to global climate change negotiations. Instead of strengthening the UNFCCC process, it might then weaken multilateral climate action.[150]

3.4 Challenges: Differences in Scheme Designs and Policy Priorities

Existing and emerging ETSs are the result of different political, economic, and environmental priorities. These differences are reflected in the design variations of schemes. While linkage does not require complete harmonization between systems, some design aspects are more likely to pose barriers to linkage than others.

Differences with no or little impact

Robust MRV rules are crucial for a credible, well-functioning ETS. While some variations in the MRV methods and procedures are likely to exist between countries, slight differences will not prevent linkage. What matters is that the MRV systems are robust, transparent, and ensure integrity.[151]

While the existence of alternative registries across systems poses a technical problem, it is unlikely to act as a significant barrier, since it can be resolved through technical means. Different measures in the treatment of new entrants and installation closures could lead to distortions by affecting the overall cap within linked systems. In countries that continue to allocate allowances to closed plants, companies have an incentive to shut down production, while systems that allocate free allowances to new entrants give companies incentives to start or expand production. Again, inconsistencies with regard to the treatment of new entrants and installation closures can be solved through technical means. The EU example, where member states had different rules for the treatment of new entrants and plant closures during the first two trading periods, further shows that a lack of harmonization in this area is unlikely to pose a barrier.[152]

In principle, differences in banking provisions could act as a barrier, since linkage extends the most generous banking rules to all other

systems. Schemes that do not authorize the banking of allowances might therefore be unwilling to link with schemes where banking is permitted, given that linkage would enable their companies to bank through swaps with companies in the system that allows banking.[153] Currently, this is not a problem in practice as all of the existing and emerging schemes contain banking provisions. Should differences in banking provisions arise in the future between systems seeking linkage, it may lead to 'bankable' allowances from the more flexible systems being sold at a premium compared to 'non-bankable' allowances from the more restrictive system, which may in turn sell at a slight penalty.

While trading periods are likely to differ between ETSs, this does not pose a significant barrier to linkage. Different trading periods can be advantageous by improving the liquidity of the combined carbon market. If one system experiences a shortage of allowances at the end of its trading period, purchases of permits from the other scheme that is at the beginning or in the middle of its trading period can ease the shortage.[154] However, differences may undermine changes introduced with the new trading period in one system if comparable changes in the other system do not occur for a while.

Finally, differences in the allocation of allowances do not affect the environmental effectiveness of a linked carbon market per se and, as such, should not pose a significant barrier to linkage. While comparability and equity concerns may arise if one system allocates allowances for free, this inequality exists irrespective of linkage. As the allowance price will be determined by supply and demand after the initial allocation, free allocation should not have any effects on competitiveness apart from the initial transfer of wealth.[155] This could, however, have political implications, potentially weakening support for the ETS and other mitigation policies.

Differences acting as barriers

Certain design features of ETSs have the potential to pose significant barriers to linkage. The challenge therefore lies in facilitating "sufficient common elements that it becomes both technically possible and politically acceptable" to link systems.[156]

Linking systems with absolute targets to those with intensity targets is possible, but it involves significant technical complexities. At the same time, it has the potential to raise concerns about competitiveness, cap integrity, and liquidity shocks.[157] We will not further elaborate this as all selected case studies concern linkages between cap-and-trade systems with absolute targets.

The relative stringency of caps is a critical issue from a political point of view. While a perfect balance between the caps of different schemes is unlikely and unnecessary, significant differences in the level of ambition might render linkage politically unacceptable to both systems. The less ambitious system would experience a large increase in allowance prices, while the more ambitious system would experience significant financial outflows.[158] From a technical point of view, this is not problematic, since it would simply lead to an equalization of prices across the linked system. The more ambitious system would buy flexibility by paying the less ambitious system to abate. It is, however, unclear whether a significant difference in the stringency of the cap would make linkage politically possible. Moreover, if, under such a scenario, firms in the ambitious system met their compliance obligations largely through purchases of allowances from the less stringent system, this would result in a violation of the Kyoto Protocol's supplementarity principle. A particularly strong barrier to linkage would exist if one scheme's cap was above the BAU emission level, as this would undermine the environmental effectiveness in the linked market. The existence of sufficiently comparable caps might therefore be a precondition for the linkage of ETSs from a political point of view.[159]

Robust enforcement measures are crucial to deter covered entities from non-compliance. Governments are therefore likely to request a minimum level of stringency with regard to enforcement. While penalty rates do not need to be identical between linking schemes, it is important that the rates in both systems be high enough to ensure overall compliance and avoid making the penalty the default option.[160] However, the actual barrier to linkage results from a fundamental difference in the design of the penalty regime. If one system does not require non-compliant entities to surrender the missing allowances in addition to paying a set fine, then the fine will effectively act as a price cap.[161] Through linkage, such a price cap would propagate into the other system, potentially rendering linkage unacceptable.

Different rules for the eligibility of offset credits in ETSs could act as a barrier to linkage. Existing and emerging schemes have different rules for the types of offset credits they accept. If credits excluded in one system are eligible in the other system, linkage might be unacceptable, given that it creates a common pool of offset credits for the linked schemes, thereby affecting the overall supply of units and, consequently, prices.[162] Reductions in a system excluding LULUCF credits might, for example, indirectly support the use of such credits in the other system by reducing the amount of other credits that are available to participants in that ETS. Linkage is therefore likely to require some harmonization with regard to the offset eligibility criteria.

In addition, other cost containment measures, such as borrowing and price caps, might prevent linkage. If such measures exist in one system, linkage would lead to a propagation of these measures into the other system. High rates of borrowing can delay abatement activities, potentially leading to a situation where future abatement is more costly. Governments might consequently relax the cap. This would undermine the environmental effectiveness of the scheme, and linkage might consequently become unacceptable for some countries.[163] If a price cap is in place in one scheme but not in the other, the former will determine the level of compliance costs for entities in both systems. A price cap at a low level might undermine the environmental effectiveness of the linked schemes, potentially rendering linkage unacceptable for the scheme without a price cap.[164]

Existing and emerging ETSs vary in their scope and coverage, subjecting different sectors and GHGs to the compliance system. In general, differences in scope and coverage do not prevent linkage, as the associated competitiveness concerns would exist regardless of linkage. On the contrary, such differences might actually improve economic efficiency, as linking systems with different sectoral coverage might lead to larger cost savings.[165] If, however, a scheme covers gases or sectors that cannot be monitored with comparable accuracy, then this might prevent other systems from linking with it.[166] A similar problem arises for linkage between a system that only covers direct emissions and one that also includes indirect emissions. While linkage is possible under such a scenario, robust accounting procedures would be required to avoid the risk of double-counting.[167] The associated difficulty of accurate accounting makes linkages with systems that cover direct and indirect emissions less likely.[168] Moreover, linking systems that differ in sectoral coverage reduces the ability to achieve the potential benefit of eliminating competitive distortions between the two systems, as such distortions will still prevail for sectors that are subject to the ETS in one system but not in the other.[169]

Finally, differences regarding voluntary opt-in provisions could affect the likelihood for linkage between two schemes. If a system provides for voluntary opt-ins, a firm that faces a high compliance burden outside the ETS but whose abatement costs are significantly lower than the market price for allowances might have an incentive to join the ETS if it received sufficient allowances to become a net seller. This would lower the average abatement costs of covered entities, while increasing them for sectors outside the scheme. Overly generous permit allocations can result in a high level of opt-ins,

leading to higher emission levels than under a scenario without opt-ins. A system without opt-in provisions might therefore find it undesirable to link with a system that allows opt-ins.[170]

The decision to link or not to link

The preceding discussion shows that linking ETSs has its advantages and disadvantages. A government's decision to link with another scheme depends on the compatibility of design features of both schemes and the government's priorities. Linking involves trade-offs, such as a loss of regulatory control, adjustments in the allowance price, or changes in design features. Whether a government is willing to compromise in these areas ultimately depends on its priorities. The EU, for example, places high priority on emissions reductions. For this reason, the EU would be more likely to accept price increases but be more cautious about trade-offs that might undermine the environmental integrity of the system. Other governments might, however, place more importance on price stabilization and predictability.

3.5 Legal Considerations of Linkage

The legal considerations vary according to the form of linkage. Unilateral links only involve a one-sided decision from the Government initiating the link. A unilateral link can be established through a clause that stipulates the conditions for accepting foreign allowances. Its legal nature will generally be the same as for the instrument establishing the ETS in the first place, in most cases statutory legislation. As the amendment remains within the scope of national jurisdiction, a government can terminate or adjust a unilateral link at any time if it considers developments in the other scheme to have an adverse impact on its own scheme. Unilateral links therefore involve a high degree of uncertainty for participants, but offer more flexibility and consequently more control to the implementing authorities.[171]

Bi- and multilateral links, on the other hand, require coordination between systems to harmonize relevant aspects of their respective schemes. The coordination can be formal and binding, or informal and non-binding. A formal international treaty will bind the participants and can only be amended according to the terms of the treaty. Treaties are a recognized form of international law and, as such, any violation of duties under a treaty constitutes a breach of international law, involving state responsibility and the possibility of sanctions. Provisions for adjusting the link over time need to be included under the treaty. The advantage of treaties is that they offer transparency and predictability to governments and participants in the linked schemes. However, governments may instead wish to opt for an informal alternative through reciprocal changes to their domestic legislation, together with a memorandum of understanding or another negotiated expression of intent. This approach effectively involves the establishment of reciprocal unilateral links and therefore offers more flexibility in terms of termination and adjustment. An additional benefit is that it prevents lengthy negotiation and ratification procedures. The downside, however, is the higher degree of uncertainty for participants.[172]

4. LEARNING FROM CURRENT EXAMPLES OF LINKAGE WITH THE EU EMISSIONS TRADING SCHEME

The EU ETS provides for linkage through Article 25 in Directive 2003/87/EC, and the 2008 amendment specifies that links may be established with other schemes that are mandatory and have absolute emissions caps in place.[173] This section analyses linkages between the EU ETS and schemes in third-party countries that have been implemented or are being negotiated.

4.1 Norway

On 26 October 2007, the EU ETS was expanded to the three EEA-EFTA states – Norway, Iceland, and Liechtenstein. At this point, Norway had already been running a national ETS for almost three years. Like the EU, Norway had decided to introduce an ETS to help the country meet its binding emissions reduction commitment under the Kyoto Protocol. Norway had pledged to limit its GHG emissions to no more than one percent above its 1990 levels for 2008–12.[174] Under the Copenhagen Accord, Norway further pledged to reduce its GHG emissions by thirty percent by 2020 compared to 1990 levels, or by forty percent in the case of an international climate agreement. Alongside a carbon tax, the Pollution Control Act, and the Petroleum Act, Norway chose to introduce an ETS to meet its target in a cost-effective manner.[175]

Since the beginning, Norwegian policymakers had shown a strong interest in linkage with the EU ETS. The Norwegian ETS was consequently largely designed with future EU-compatibility in mind. However, as a result of differences over how to establish the link, negotiations took some time before a deal was finally reached in 2006. Norway was seeking to negotiate a link according to Article 25 of EU Directive 2003/87/EC. The European Commission, on the other hand, insisted that Norway – as an EEA-EFTA member state – link by adopting the EU Directive.[176] This did, however, require some amendments to the Norwegian ETS to bring its design features even further in line with the EU ETS. Nevertheless, Norway agreed to adopt the EU Directive and undertook several adjustments to its own ETS.[177] The extension of the EU scheme to Norway is the first example of linkage between two ETSs. Prior to the bilateral link, which became operational in 2008, Norway had established a unilateral link with the EU ETS.[178] This allowed entities covered by the Norwegian ETS to surrender EUAs for domestic compliance obligations.

Pre-existing similarities between the Norwegian ETS and the EU ETS

Norway opted for a cap-and-trade system with an absolute target and chose the same trading periods as the EU ETS.[179] Although there are differences between Norway and the EU in the number of allowances allocated for free, the mechanism for doing so is the same across both schemes. During the first two trading periods, free allocations were distributed using the grandfathering method. Since Phase III, free allocation is based on industry benchmarks of GHG performance.[180] The rules for temporal trading were already the same prior to linkage. Borrowing of allowances is implicitly possible, as permits for the new calendar year are transferred to the operator's account two months prior to the deadline for surrendering allowances for the previous year.[181] Banking of allowances is permitted between trading years, even across multi-year trading period since Phase II.[182] Norway chose a yearly compliance period with an almost identical deadline as the EU – 1 May under the Norwegian ETS and 30 April under the EU ETS.[183] The penalty for non-compliance under the Norwegian ETS was also designed in the same way as under the EU scheme. It consists of a fine, but nevertheless requires non-compliant entities to surrender the missing allowances in the subsequent year. The fine has been the same in Norway and the EU, amounting to the equivalent of EUR 40 per tonne during the first trading period and EUR 100 since Phase II.[184]

Features harmonized through amendments to the Norwegian Act

Despite these pre-existing similarities, there were differences between both schemes and some required amendments. Given the nature of the linkage agreement, in which Norway adopted the EU Directive, the changes were implemented by Norway.

The most significant change concerns the sectoral coverage of the ETS. During Phase I, the coverage of the Norwegian ETS was limited, as it did not include any sectors that were subject to the country's CO_2 tax. Prior to linkage with the EU ETS, the Norwegian ETS did not cover the following sectors: gasoline, light and heavy fuel oil, oil and gas in the North Sea, pulp and paper, fishmeal, domestic aviation, and domestic shipping. As such, only 51 entities fell under the ETS, accounting for only eleven percent of the country's 2005 GHG emissions.[185] The 2007 amendment of the Norwegian Greenhouse Gas Emissions Trading Act significantly extended the scope of the ETS, which has, since then, included the following sectors: energy production; the refining of mineral oil; coke production; the production and processing of iron and steel, including the roasting and sintering of iron ore; the production of cement, lime, glass, glass fibre, and ceramic products; and the production of paper, board, and pulp from timber and other fibrous materials.[186] Through these amendments, the sectoral coverage of the Norwegian ETS has been largely harmonized with the EU scheme. Moreover, the Norwegian ETS covered forty percent of the country's projected 2008–12 GHG emissions, a similar figure to the EU.[187]

Persisting differences between the Norwegian ETS and the EU ETS

Although Norway made several amendments to its ETS in order to further enhance harmonization with the EU ETS, Norway negotiated some variations for its scheme with regard to the allocation of free allowances and auctioning. The degree of auctioning is significantly higher in Norway, which is to a large extent driven by the absence of free allocations to offshore oil and gas production – a sector that accounts for 64 percent of Norway's capped emissions.[188] Norwegian policymakers are strongly convinced that operators and investors should face the full environmental cost of their emissions. Norway therefore decided that, for Phase II of the ETS, more than 50 percent of allowances could be sold through auctions or other market mechanisms and around one-third of allowances would be allocated free of charge.[189] While offshore oil and gas production are not eligible for free allocation, the proportion of allowances distributed for free to land-based industries is relatively high in Norway compared to the rest of the EU, amounting to 92 percent of annual average emissions during the 1998–2011 base-year period. From the onset of the third trading period in 2013, 100 percent of allowances will be sold through auctions or secondary markets.[190]

Both Norway and the EU have quantitative and qualitative limits in place for the use of international offset credits. For 2008–12, Norway set the quantitative limit for the use of offsets at twenty percent of the annual total quantity of allowances, while the EU's limit for the same period amounted to 13.4 percent of the total EU ETS cap. The restrictions on the type of project credits are similar under the two schemes. Both of them exclude offsets from nuclear projects and LULUCF. However, while credits from large-scale hydropower projects are subject to conditions under the EU ETS, they are completely banned under the Norwegian scheme.[191]

Like the EU, Norway has an allowance reserve for new entrants. During the first trading period, it was, however, reserved for new gas-fired power plants based on carbon capture and storage (CCS) technology, as well as highly efficient combined heat and power plants. This has been amended, and now only highly efficient combined heat or power plants entering the system after 1 January 2008 are eligible for free allocations.[192]

The MRV rules that are in place in Norway are similar to the ones under the EU ETS, requiring covered entities to measure and report their emissions on a yearly basis and submit them

to a designated authority. The Norwegian rules are, however, less stringent in that they do not require companies to have their reported emissions independently verified prior to submission. Instead, Norwegian authorities can request independent verification on a case-by-case basis.[193]

Lessons from the Norwegian experience

The linkage between the ETSs in Norway and the EU constitutes a special case. First, from the outset, Norwegian policymakers had a strong interest in linking with the EU ETS, and the design of the Norwegian scheme reflects this intention. Many features were developed in a way that made them compatible with the EU ETS. Second, the establishment of the link took place in the EEA-EFTA context, meaning that Norway linked to the EU scheme by adopting the EU ETS Directive instead of a linkage agreement. The few existing barriers between the two schemes were therefore eliminated through amendments to the Norwegian scheme. The two schemes are now largely harmonized, with only some negotiated exceptions for Norway. To sum up, there were not many potential barriers to a linked EU-Norwegian carbon market in the first place, and those that existed were removed through amendments to the Norwegian scheme.

Some differences between the EU ETS and the Norwegian ETS were unlikely to pose barriers. Although the Norwegian MRV rules are slightly less stringent due to the absence of a mandatory requirement for independent verification, they were nevertheless robust enough for linkage with the EU ETS. Differences in the quantity of allowances allocated for free were also unlikely to pose an obstacle. While the Norwegian scheme has allocated fewer allowances for free from the beginning, therefore requiring a higher proportion of permits to be obtained through auctions or other market mechanisms, this difference would exist irrespective of linkage. Other differences that could have complicated linkage did not pose barriers in practice, since they were either small or resolved. The biggest barrier was the limited sectoral coverage under Phase I of the Norwegian scheme. Norway eliminated this barrier by extending its sectoral coverage, aligning it with the scope of the EU ETS.

In light of the short time during which the Norwegian ETS was in place without linkage to the EU ETS, it is difficult to assess the concrete impact of the link. Both schemes only completed a three-year trial phase before linking up. As a consequence, changes in Norway since linking to the EU ETS at the beginning of its second trading period cannot be attributed to linkage itself. Instead, they may have resulted from changes made in response to lessons learned during the first period. For example, just like in the EU, allowance prices fell to almost zero during Norway's first trading period.[194] An increase in the allowance price since the establishment of the link with the EU ETS can therefore not be solely ascribed to the linkage. Instead, it likely reflects corrections to the over-allocation of allowances. Similarly, it would not be possible to attribute changes in prices of energy and energy-intensive goods to linkage between the two schemes. Such changes could be the result of many factors that would need to be controlled for. The impact on carbon leakage would be another interesting aspect to analyse. However, given the uncertainty regarding the occurrence of carbon leakage and the difficulties involved in measuring this potential phenomenon, such an analysis cannot be undertaken at this point in time.

Nevertheless, it is possible to make some observations with regard to the linkage between the EU ETS and the Norwegian ETS. For the EU, linkage with the Norwegian scheme did not involve negative effects. Not only is the EU ETS the bigger of the two schemes and – apart from price shocks – therefore less exposed to developments in the Norwegian ETS, it also imposed its ETS legislation on Norway by establishing the link in the EEA-EFTA context. This resulted in a strong alignment of the Norwegian scheme with the EU ETS. Most importantly for the EU, the linkage allowed it to advance its commitment to international climate action by sending a signal to other countries and the international community.

The Norwegian policymakers, on the other hand, were the ones to face a trade-off. Against Norway's wish to establish the link according to Article 25 of EU Directive 2003/87/EC, the EU insisted that Norway adopt the EU ETS Directive and therefore harmonize existing differences through amendments to its ETS. As a result, Norway clearly faced a loss of regulatory control over its own ETS. Norwegian policymakers are now restricted in their decision-making as they are bound by the EU ETS legislation. However, the required changes were relatively small. The biggest adjustment was the extension of the sectoral scope; however, given that the newly covered sectors were previously subject to the country's CO_2 tax, the trade-off affected the Norwegian Government more than the covered entities.

As a small country, Norway had much to gain from linkage with the large EU carbon market through the potential for greater cost-efficiency, enhanced market liquidity, and more flexibility in achieving its targets. Moreover, as the EU is Norway's main trading partner, accounting for 81 percent of its exports and 63 percent of its imports, linkage to the EU ETS may have helped address domestic competitiveness concerns vis-à-vis companies in the EU market.[195] Norway's establishment of a unilateral link to the EU ETS during the first trading period clearly illustrates the country's interest in linking to a bigger carbon market.

Given the circumstances under which the link between the Norwegian ETS and the EU ETS was established, it becomes clear that this example represents a special case. Indeed, some see it as an integration of the Norwegian scheme into the EU ETS. Nevertheless, the EU-Norwegian case shows that schemes do not need to be entirely harmonized and that small differences can prevail in certain areas without compromising linkage.

4.2 Switzerland

The EU and Switzerland are currently in the final stages of negotiating a link between their ETSs. The aim is to conclude the agreement before summer 2014.[196] The Swiss ETS has been in place since 1 January 2008, with the first trading period lasting from 2008–12 and the second period scheduled for 2013–20.[197] Swiss policymakers have undertaken important changes to their ETS in 2012, which significantly increased its compatibility with the EU ETS. Many of the initial design features of the Swiss ETS would have posed significant barriers to linkage with the EU's scheme, including the voluntary nature of the Swiss ETS, its enforcement regime, and the rules for the use of international offset credits.

The Swiss ETS from 2008 to 2012: a voluntary scheme

Under the Kyoto Protocol, Switzerland had committed to reducing GHG emissions by eight percent relative to its 1990 levels for 2008–12,[198] the same pledge as the EU. Switzerland's 2020 target is to reduce GHG emissions by twenty percent relative to 1990, or by forty percent in case of an international climate deal.[199] In 1999, Switzerland adopted the Act on the Reduction of CO_2 emissions (CO_2 Act), which introduced two instruments: a CO_2 levy for heating, industrial processes and transportation fuels; and a national ETS.[200]

However, during the first trading period from 2008–12, the Swiss ETS differed significantly from the EU ETS. The Swiss ETS was designed as a voluntary scheme that offered companies an alternative to the CO_2 levy. Instead of paying the CO_2 levy, companies could opt to voluntarily set an absolute emissions target – subject to approval by the federal authorities – receive allowances, and participate in the ETS. The emissions threshold for companies to participate directly in the ETS was set at 25,000 tCO_2e per year. Companies falling below that threshold could set voluntary absolute emissions targets. However, they were not allocated allowances. Instead, they had to purchase allowances if they exceeded their cap.[201] The following sectors were covered by the voluntary Swiss ETS: ceramics, paper, plastics, aluminium, glass, chemistry, metal-working and engineering, foodstuffs, lime, foundries, printers, and haymakers. Companies from these sectors that met the threshold and chose to participate in

the Swiss ETS received free allowances based on a 'bottom-up' approach, whereby federal authorities assessed a company's potential to reduce CO_2 emissions from a technical and economic point of view.[202]

During Phase I of the Swiss ETS, companies were able to use removal units (RMUs) generated through net removals from LULUCF , in addition to CERs and ERUs. Temporary certificates from carbon sink projects were accepted but could not be banked for future commitment periods. Swiss authorities were allowed to ask for additional offsets once temporary credits expired.[203]

The penalty regime under the voluntary Swiss ETS varied significantly from the EU ETS. Companies that failed to comply had to retroactively pay the CO_2 levy plus interest.[204] The CO_2 levy therefore effectively formed a price cap for the Swiss ETS.

These differences demonstrate that the design of the Swiss ETS made it largely incompatible with the EU ETS. The voluntary nature of the scheme and the design of the penalty regime would have likely rendered linkage unacceptable for the EU, as these features effectively created a price cap, which would have propagated into the EU ETS in case of linkage. The acceptance of international offset credits from LULUCF would have also made linkage difficult.

The Swiss ETS since 2013: enhanced compatibility with the EU ETS

Negotiations between Switzerland and the EU to link their respective ETSs officially began in March 2011, but were preceded by exploratory talks from 2008 onwards. Swiss policymakers were aware of the potential barriers posed by the design differences between the two schemes, and the Swiss Federal Council recommended that "the Swiss ETS be adapted in the context of the ongoing complete revision of the CO_2 Act with a view of attaining a high level of compatibility with the EU ETS [as this] would pave the way for a successful linking of the two systems."[205] The federal law on the reduction of CO_2 emissions and the regulation on the reduction of CO_2 emissions clearly show that significant amendments were made to the Swiss ETS as of 1 January 2013, which enhanced its compatibility with the EU ETS.

One of the most important changes concerns the move from a voluntary scheme to a mandatory one. Companies falling under the following sectors are now required to participate in the ETS: energy production; the refining of mineral oil; coke production; the production and processing of iron and steel, including roasting and sintering of iron ore; metals; aluminium; cement; lime; glass and glass fibre; ceramic products; the production of insulation materials from mineral wool; gypsum; pulp, paper, and cardboard; acids; ammonia production; bulk organic chemicals; the production of hydrogen and syngas; and the production of soda and sodium.[206] The revised CO_2 Act also provides the Federal Council with the option to include aviation under the ETS.[207] Designated sectors not covered by the mandatory ETS are still able to apply to participate in the ETS.[208] While voluntary opt-in provisions have the potential to act as barriers to linkage, the voluntary opt-in for small and medium enterprises under the Swiss ETS does not seem to pose a problem for linkage with the EU scheme. While companies choosing to join the scheme are able to purchase allowances if their emissions exceed their voluntarily set cap, they are not part of initial allocations, which eliminates concerns about high levels of opt-ins and increases in emissions. With regard to the GHGs covered, the Swiss ETS only applies to CO_2 emissions. The EU ETS, on the other hand, also covers N_2O and PFCs. Nevertheless, this difference does not pose a barrier as neither scheme includes gases that cannot be accurately monitored.

An important change made by Switzerland was the amendment of its penalty regime. Non-compliant companies now face a fine of CHF 125 (EUR 100) per tonne and are required to submit the missing allowances in the subsequent year.[209] Together with the move towards a mandatory ETS, this effectively removes the price cap that existed under the voluntary scheme, and fully aligns the Swiss penalty regime with the EU ETS.

Harmonization also took place with regard to the allocation of allowances. For the period 2013–20, it will combine free distribution and auctioning. From 2013, free allocation under the Swiss ETS will be based on industry benchmarks, reflecting the average emissions of ten percent of the most efficient installations. Free allocation for companies considered to be at high risk of carbon leakage will be determined through an adjustment factor that will be gradually reduced until 2020.[210] According to Article 19(3) of the Federal Law on the Reduction of CO_2 emissions, the Federal Council may take into account comparable international regulations to specify the details of the allowance allocation.[211] This provides Swiss authorities with the option to further align the allocation mechanisms with the EU ETS. As in the EU ETS, the Swiss ETS includes an allowance reserve for new entrants, set at five percent of the cap.[212]

The Swiss rules for the use of international offset credits have also been changed and are now more compatible with the EU rules. Since 2013, companies covered by the Swiss ETS can only surrender CERs and ERUs for compliance, which excludes credits generated from nuclear facilities, LULUCF, and the destruction of industrial gases. Just like the EU ETS, Switzerland now only accepts CERs from LDCs. Moreover, the Swiss scheme excludes additional offsets, such as credits generated from large hydropower projects.[213] As this difference also exists between the EU and Norway, it should not pose a barrier to linkage. The Swiss ETS also has a quantitative limit in place for the use of international offset credits. For companies that participated in the ETS during the first trading period, the limit is set at eleven percent of the emissions allowances issued during 2008–12, minus the offsets used during that time. For new participants, the limit amounts to 4.5 percent of their effective emissions in the second trading period.[214]

Entities covered by the Swiss ETS are required to measure their emissions and report them to the Swiss authorities on an annual basis. Unlike the EU ETS, the Swiss ETS does not require reports to be independently verified. Instead, Swiss authorities reserve the right to request independent verification on a case-by-case basis.[215] However, since the Swiss MRV rules correspond to the Norwegian ones – which did not pose an obstacle – the absence of the requirement to have emissions reports independently verified prior to submitting them to national authorities should not pose a barrier.

No differences exist between the Swiss ETS and the EU ETS with regard to banking and borrowing of allowances. The Swiss ETS allows banking within and between trading periods and borrowing within the same trading period.[216]

The determination of the cap under the Swiss ETS differs from the EU's procedure. While the EU cap is set by the European Commission, the Swiss cap is the sum of the caps of the entities covered by the ETS.[217] This difference should not pose any difficulties as both systems have absolute caps in place and the Swiss cap – like the EU cap – will be gradually reduced over the period 2013–20.

Aviation was a contentious issue in the Swiss-EU linkage negotiations due to Switzerland's initial reluctance to include this sector under the ETS. If Switzerland did not include aviation in the ETS, Swiss airports would become an exempted hub in the centre of Europe, competing with EU airports and potentially undermining the inclusion of aviation under the EU ETS. This could have posed a serious barrier to linkage. However, following the EU's insistence on the inclusion of aviation, it is now part of the proposed agreement.[218]

Lessons from the Swiss experience

During Phase I of the Swiss ETS, there were few similarities with the EU ETS. However, the recent amendments to the Swiss ETS have rendered it largely compatible with the EU ETS. Nevertheless, the changes discussed above show the compromises Switzerland had to make to facilitate linkage with the EU ETS. The loss of regulatory control manifests itself in the alignment of the Swiss system, such as the move to a mandatory system, the adoption

of a more stringent penalty regime and the elimination of the price cap associated with the old scheme, the introduction of additional restrictions for the use of international offset credits, the inclusion of aviation, and changes made to the allocation mechanisms.

However, the Swiss amendments are not necessarily a mere consequence of the planned linkage. With the first trading period ending in 2012, the Swiss CO_2 Act was to be revised, irrespective of potential linkage. At just over 3 $MtCO_2e$, the Swiss carbon market is extremely small.[219] Switzerland therefore stands to gain much from linking with the EU ETS. Linkage with the EU ETS would give Swiss companies access to a broader, more liquid carbon market and provide them with more flexibility in meeting their target. Research conducted in 2010 on the linkage of the Swiss ETS with the EU ETS shows several benefits for Switzerland. First, the EU can reduce emissions in a more cost-effective way than Switzerland. Through linkage, prices will converge, thereby reducing allowance prices for Swiss companies. Second, in theory, the allowance price should be more predictable in the EU, as the small size of the Swiss market hinders trade and price formation. Linking to the EU ETS should therefore enhance price predictability for Swiss companies.[220] However, in practice, the EU's carbon price volatility currently renders this argument irrelevant. Third, without linkage, the higher allowance price in Switzerland could lead to increased carbon leakage from Switzerland to the EU – a risk that could be addressed through linkage.[221]

Moreover, another potential benefit arises from the importance of the EU market for Swiss trade. Linking to their main trading partner – accounting for 60 percent of their exports and 78 percent of their imports – could address the competitiveness concerns of Swiss companies that might exist in the absence of linkage.[222]

For the EU, linkage with the Swiss ETS does not involve any real compromises, since all necessary adaptations to harmonize the two systems have been implemented by Switzerland. Linkage with the Swiss ETS is therefore primarily an attractive option for the EU as it establishes the first real link with an ETS in a third-party country, given the special circumstances of the Norwegian case.

4.3 Australia

Carbon pricing and emissions trading have been politically contentious issues in Australia over the past decade. Amidst strong opposition, the Carbon Pricing Mechanism (CPM) was introduced on 1 July 2012 under the Labour Party's rule. It consists of a fixed carbon price of AUD 23 (EUR 16), rising at 2.5 percent a year in real terms, at which covered entities can purchase allowances from the Government. It also provides for the use of offset credits. It was planned that, as of 1 July 2015, the CPM would be transformed into an ETS.[223] In this context, the EU and Australia agreed to link their respective schemes. In light of the recent election results, the future of the Australian ETS – and consequently the linkage to the EU ETS – is uncertain at the time of writing. The September 2013 national elections resulted in a change of government, with opposition leader Tony Abbott taking over as Prime Minister. Abbott has been a strong opponent of the carbon tax and ETS in the absence of similar policies in other countries and had vowed to scrap these tools if he came to power.[224]

Despite the uncertainty regarding the introduction of the Australian ETS and its linkage to the EU ETS, it is worth analysing the Australian case. First, out of all the implemented and proposed linkages, the linkage between the EU and Australia would be the first intercontinental one. Second, compared to the previous two cases, Australia has a relatively large carbon market at 560 $MtCO_2e$ per year and would thus provide the first opportunity for the EU to link with a big market.

The Australian scheme: from carbon tax to emissions trading and linkage with the EU ETS

Under the Copenhagen Accord, Australia had pledged to reduce GHG emissions by five percent relative to 2000 levels by 2020. In case of an international climate deal, the target could be increased to twenty-five percent.[225]

Australia planned to establish a unilateral link to the EU ETS while moving from the carbon tax to the ETS. The 2015 transition to the ETS would involve several changes, and additional amendments were planned from 2018 onwards when the full bilateral link between the Australian ETS and the EU ETS was to take effect. In order to enhance the compatibility of the Australian ETS with the EU ETS, Australia had already agreed to undertake amendments with regard to cost containment measures and its rules for the use of Kyoto credits.

In a first move, the fixed price system would be replaced by a flexible price mechanism in July 2015. The Australian Government would, however, set a price ceiling at AUD 20 (EUR 14) above the EUA price, increasing by five percent annually. In light of the planned linkage with the EU ETS, Australia had agreed to refrain from introducing a price floor when the flexible price phase is scheduled to begin in 2015. Moreover, the price ceiling planned for the 2015–18 period would be removed as of 1 July 2018 when the bilateral link should take effect.[226]

Regarding international offset credits, Australia has agreed to impose a quantitative limit on the use of CERs and ERUs at 12.5 percent of a company's compliance obligations in order to enhance compatibility with the EU rules in this area.[227] Like the EU ETS, the Australian ETS would also exclude CERs and ERUs generated from nuclear projects, the destruction of industrial gases, and large-scale hydropower projects that are inconsistent with EU criteria.[228] An ongoing topic in the EU-Australian linkage discussions that would need to be addressed concerns the use of Australian Carbon Credit Units (ACCUs) – domestic credits generated through the Carbon Farming Initiative (CFI), which includes projects in agriculture and land-use management. The use of ACCUs is currently limited to five percent of a company's compliance obligation, but no limits are foreseen once Australia moves to the flexible price system.[229] As credits generated through agricultural and land-use management activities are not accepted under the EU ETS, the role of ACCUs would require clarification prior to the establishment of a bilateral link between the two schemes.

As of 2015, the Australian scheme would allow unlimited banking of allowances. There would therefore be no difference between the EU and Australia in this regard. Australia plans, however, to limit borrowing at five percent of a company's compliance obligation.[230] While borrowing is only implicitly possible under the EU ETS, there are no quantitative restrictions. Linking the Australian ETS and the EU ETS would extend the EU's more generous rules to Australia, thereby eliminating the planned quantitative limit.

The penalty regime for non-compliance would also be amended with the transition to the ETS. Under the current regime, companies that fail to comply with their obligations are required to pay a penalty of 1.3 times the fixed allowance price. This would be replaced by a fine of double the benchmark average auction charge for that particular year.[231]

The move from the carbon tax to the ETS would not affect the sectoral coverage. As under the carbon tax, the ETS would cover most sectors above a threshold of 25,000 tCO_2e per year.[232] The transport sector would be partly covered through an equivalent carbon price, calculated every six months based on the average carbon price over that period. It is expected that the ETS would cover 60 percent of Australia's emissions. In addition to CO_2, N_2O and PFCs, the Australian ETS would also cover methane.[233]

Just like the EU ETS, the distribution of allowances under the Australian scheme would be a mix of free allocation and auctioning. Energy-intensive trade-exposed industries would be entitled to free allocations. Like the EU regulation, Australia would base its free allowances on industry benchmarks. Highly emissions-intensive industries would receive up to 94.5 percent of the industry average baseline, and moderately emission-intensive industries up to 66 percent.[234]

Lessons from the Australian experience

The planned transition to the ETS in July 2015 would already entail several changes as outlined above, even in the absence of linkage.

The linkage negotiations have, however, prompted Australia to undertake some additional amendments to facilitate linkage with the EU ETS. The adaptations concern price containment measures and the rules for the use of international offset credits. Australia has agreed to refrain from introducing a price floor and to abandon the price ceiling as of July 2018. In addition, Australian policymakers introduced a quantitative limit on the use of Kyoto units and largely aligned the qualitative requirements with those applicable under the EU ETS. The issue of offsets may, however, change further in light of the EU's recent announcement that emissions reductions between 2020 and 2030 will have to be achieved domestically. So far, Australia has had to cede some regulatory control over its own scheme in order to facilitate future linkage with the EU ETS. Linkage would also remove Australia's planned quantitative limit on borrowing, as this does not exist under the EU ETS.

As some important differences persist between the two schemes, Australia would likely have to accept further concessions before a full bilateral link could be established with the EU ETS. The use of ACCUs generated through projects in agriculture and land-use management under the CFI would likely be raised as an issue by EU policymakers in future negotiation rounds, requiring further compromise from Australia's side. Measurement, reporting, and verification rules are also expected to play a role in linkage negotiations.[235]

Linkage could further lead to competitiveness concerns in Australia due to slight differences in sectoral coverage, the allocation methods, and particularly the inclusion of methane under the Australian scheme – a gas that is not covered under the EU ETS. The coverage of methane under the Australian ETS might raise carbon leakage and competitiveness concerns in the Australian coal industry which – unlike its EU counterpart – would have to pay for its methane emissions.[236] Nevertheless, these concerns would exist irrespective of linkage and should therefore not prevent linkage per se.

Despite these concessions and concerns, Australia has much to gain from linkage with the EU ETS. According to estimates from the Australian Government, its abatement costs would be doubled if all reductions were carried out domestically.[237] The lower abatement costs in the EU would reduce the allowance price faced by Australian entities. Consequently, Australia would be able to reach its emissions reduction target in a more cost-effective way.

An additional benefit for Australia would be the institutional lock-in a linkage agreement would create. The current developments show that Australia is divided over its carbon tax and the planned ETS, and that changes in government threaten to reverse decisions taken by previous governments. This creates uncertainty for businesses and can delay important low-carbon investments. If the ETS is introduced, international linkage would make its removal less likely and therefore enhance certainty and predictability for Australian businesses.

For the EU, linkage with the Australian ETS would represent significant progress. As expressed by the European Commissioner for Climate Action, Connie Hedegaard, linkage between the EU ETS and the Australian ETS provides "evidence of strong international cooperation on climate change and will build further momentum towards establishing a robust international carbon market."[238] Compared to the previous two cases, the size of the Australian carbon market means that linkage would significantly extend the size of the carbon market that entities covered by the EU ETS can access. Australia would also exert a bigger influence on allowance prices in the linked market. As prices are expected to be higher in Australia, linkage to the Australian scheme would likely increase the price for EUAs, thereby partly offering a solution to the EU's problem of low allowance prices.

Similar to the previous examples, the Australian case shows that linkage does not require complete harmonization between schemes. Some differences and associated concerns,

such as slight differences in sectoral coverage or in the allocation of allowances, would exist irrespective of linkage and therefore do not pose barriers. However, the Australian case also illustrates that certain differences have to be overcome and that amendments take place in the scheme that wants to link to the EU ETS. The EU requirement to remove price control measures and adapt the rules for the acceptance of Kyoto credits, followed by amendments in the Australian scheme, illustrates this point.

4.4 Lessons Learned from Existing Examples of Linkages between ETSs

Despite their differences, some interesting conclusions can be drawn from the Norwegian, Swiss, and Australian cases, which provide valuable lessons for the linkage of ETSs.

First, the cases show that linkage with the EU ETS does not require complete harmonization between schemes. Some differences do not pose barriers, either because they are small or easy to overcome or because their associated concerns would exist irrespective of linkage. This reasoning applies to MRV rules, the treatment of new entrants, trading periods, and allocation mechanisms. The Norwegian and Swiss examples show, for example, that slight differences in MRV arrangements do not prevent linkage as long as the regimes are robust. In all the cases, there were differences regarding the allocation of allowances, but this was not an obstacle.

However, and second, the EU asks for certain differences to be overcome in order to render linkage politically acceptable and environmentally effective. The EU requires largely harmonized penalty regimes and rules for the use of international offsets, as well as the removal of cost containment measures. The scope and coverage can differ slightly, but the case of Norway shows that the EU will usually require some harmonization in this regard.

Third, all of the cases analysed show that the amendments do not take place in the EU ETS but in the schemes linking to it. Norway, Switzerland, and Australia had to implement several changes in order to facilitate linkage with the EU ETS. The EU is becoming a model to which other ETSs converge. Consequently, the schemes linking to the EU will be faced with trade-offs.

Fourth, despite the required concessions, schemes stand to gain much from linking to the EU ETS. They benefit from access to a broader, more liquid market and linkage to the EU enables them to reduce emissions in a more cost-effective way. The Norwegian and Swiss cases also show that, as a significant trading partner, linkage to the EU ETS can help ease domestic competitiveness concerns that might exist in the presence of different carbon prices between the country's own scheme and the EU ETS. Depending on the context, linkage to the EU might provide additional benefits. The Australian case shows, for example, that it can enhance the certainty and predictability of the ETS policy by creating an institutional lock-in.

Finally, while the EU does not face a real trade-off through linkage, it has a strong interest in linking to other domestic ETSs in order to show that such schemes are not only a popular and effective climate policy tool, but that ETSs – through linkage – can also help advance international cooperation in the area of climate change.

5. LINKING THE EU AND SOUTH KOREAN EMISSIONS TRADING SCHEMES

The South Korean ETS is scheduled to begin in 2015. The potential linkage to other schemes has already featured in the debates. It is therefore timely to assess linkage options for the South Korean scheme, particularly at a time when decisions about certain features of the scheme are still being taken. The size of the EU carbon market and its previous experience with linkage make the EU an attractive partner.

5.1 Rationale for a Linked EU-Korean Carbon Market

A linked EU-Korean carbon market holds potential benefits for both South Korea and the EU. While some of the benefits are the same as for the other linkage cases, the EU-Korean case offers additional advantages for both sides.

Benefits from a South Korean perspective

For South Korea, linking to the world's largest carbon market could be an attractive option for several reasons. First, like in any linkage case, GHG reductions would be achieved more cost-effectively, allowing South Korea to realize overall efficiency gains. These gains could be particularly significant for South Korea, where the carbon price is expected to be high compared to other schemes. Under the proposed design of the South Korean ETS, the low-cost abatement options in the power and industry sectors are most likely insufficient to meet the reduction target, and abatement costs could reach levels of more than EUR 100/tCO_2e.[239] Linkage to the EU ETS would reduce the South Korean carbon price through price convergence, thereby lowering compliance costs for covered entities. Second, linkage with the EU ETS would provide firms covered by the South Korean ETS with access to a broader, more liquid carbon market. At more than three times the size of the South Korean market, the EU carbon market would provide South Korean participants with a significantly wider range of abatement opportunities. Third, linkage has the potential to reduce the risk of carbon leakage. As mentioned above, the South Korean carbon price is expected to be high compared to other schemes. Linking with the EU ETS, where the carbon price is relatively low, would reduce compliance costs for South Korean firms. The lower price, in turn, could potentially decrease the risk of carbon leakage. Finally, South Korea could significantly benefit from the signalling effect that linkage to the EU ETS would create. The absence of a binding reduction commitment under the Kyoto Protocol could create a time-inconsistency problem for the South Korean Government. Linkage to the EU ETS would, however, make a policy reversal less likely and provide companies with more assurance that the ETS will prevail, thereby encouraging investments into low-carbon technologies.

Benefits from an EU perspective

Linkage would not only benefit South Korea, but also the EU. First, it would significantly extend the size of the carbon market to which EU-covered entities have access. If the link with Australia goes ahead as planned, then linkage to the South Korean ETS and the Australian ETS would create a joint carbon market of approximately 1.5 times the size of the current EU carbon market. The potential for cost-efficiency gains would be significant. The expected high abatement costs in South Korea mean that many net-selling entities in the EU would benefit from higher prices for the allowances they would sell to South Korean installations. Second, through the size of its carbon market, South Korea would have a non-negligible influence on the allowance price in the EU. As the South Korean carbon price is expected to be relatively high, linkage could increase allowance prices in the EU. It could therefore be part of the solution to the EU's problem with low carbon prices. Finally, linkage with the South Korean ETS would be very interesting for the EU from an international policy perspective. It would provide another case of intercontinental linkage – or the first case if the Australian link does not go ahead – and the first example of linkage with a non-Annex I country.

5.2 Existing Facilitators for a Linked EU-Korean Carbon Market

The current plans for the South Korean ETS contain some features that would facilitate linkage with the EU ETS. The intention to design the South Korean scheme as a cap-and-trade system with an absolute emissions target would simplify linkage with the EU ETS by making it technically less complex. It would also give less room to concerns about cap integrity, competitiveness issues, and liquidity shocks that would be more pronounced if the South Korean ETS were to use intensity targets. Moreover, the banking rules under the EU ETS and the South Korean ETS are already aligned, therefore requiring no compromise in this area. Another facilitator for linkage is the high level of stringency with regard to the respective MRV rules. In light of the importance of robust MRV frameworks, this would contribute to the acceptance and effectiveness of linkage between the two schemes. Finally, while differences in the allocation of allowances do not prevent linkage, similar allocation mechanisms can reduce competitiveness concerns. The South Korean ETS and the EU ETS both contain special provisions for the free allocation of allowances to industries that are considered to be at significant risk of carbon leakage and the definitions for identifying such firms are the same in both systems.

5.3 Likely Barriers to a Linked EU-Korean Carbon Market

The current plans for the South Korean ETS contain some features that would likely pose barriers to linkage with the EU ETS. In addition, several elements of the scheme are yet to be developed, which, depending on the choices, could further complicate linkage.

Readjustment of allocations

A potentially significant barrier to linkage could result from the South Korean provision that allows for the readjustment of allocations. The ability of South Korean firms to request additional allowances from the reserve pool might raise competitiveness concerns among their EU counterparts. However, the criteria under which additional allowances may be granted to businesses are limited to three pre-defined circumstances. More problematic would be the fact that the South Korean authorities have the right to increase the total volume of available allowances under exceptional economic circumstances. After linkage, this would increase the total volume of allowances available in the joint carbon market. The ability of the South Korean Government to readjust the allocation could therefore prevent linkage with the EU ETS. While the recent EU proposal for a carbon market stability reserve would also provide an opportunity to adjust allowances in the EU's carbon market, the EU's proposal foresees an automatic stabilizer working under pre-defined rules. It is therefore more restricted than the South Korean provision.

Market stabilization measures

The provisions under the South Korean ETS that allow the Government to intervene with market-stabilizing measures might pose an important barrier to linkage. The difficulty involved in obtaining approval for the back-loading plan under the EU ETS and the debate surrounding the decision show that many in the EU oppose interventions in the carbon market – despite repeated problems with price volatility and crashes. The European Parliament only supported the back-loading measure in a second attempt with the assurance that the move would not be repeated. The flexibility under the South Korean ETS, which allows the Government to intervene if there are significant pre-defined changes in prices or trading volumes, is therefore likely to face EU opposition. Several of the market stabilization measures under the South Korean scheme are intended to prevent significant increases in allowance prices. In light of the EU's problem with low allowance prices, EU policymakers might find it unacceptable to link to a scheme that provides for cost containment measures. On the other hand, the South Korean provisions for market interventions are also intended to address significant price crashes. Given the EU's problem in this area, linkage could provide

part of the solution. Moreover, South Korean policymakers might not be willing to give up these flexibilities. The EU's experience with price fluctuations might have taught South Korea a lesson, and the country might be committed to avoiding the EU's problems. The EU's stance on market stabilization measures may, however, be softening, as evidenced by the Commission's recent legislative proposal for a market stability reserve. Nevertheless, even if implemented, this would be a more passive tool than the South Korean market stabilization provisions.

Scope and coverage

The difference in scope and coverage between the EU ETS and the South Korean ETS risks creating a significant barrier to linkage. The inclusion of three additional GHGs – CH_4, HFCs, and SF_6 – as well as indirect emissions under the South Korean ETS could face opposition from the EU. The extended scope and coverage of the South Korean scheme involves monitoring and accounting difficulties, which could therefore complicate linkage. The inclusion of some additional GHGs could perhaps be acceptable for the EU. Australia intends to cover methane emissions under its ETS, a move that has not faced any opposition from the EU during linkage negotiations. However, the ability to monitor all covered gases with high accuracy would be crucial for the acceptance of additional GHGs under a linked system. In this regard, the difficulty involved in accurately accounting for indirect emissions could be a particular challenge. Not only does the inclusion of indirect emissions complicate the reporting and compliance processes, it can also result in a misallocation of allowances.[240] In light of these risks and difficulties, the EU might not be willing to link with the South Korean ETS in its currently planned form. However, if the EU accepted the inclusion of indirect emissions under the South Korean scheme, it would certainly require extremely accurate accounting methods.

However, the EU is not the only entity that might find linkage unacceptable under the given circumstances. South Korean policymakers might consider the scope and coverage of the EU ETS too limited. The impact of the additional GHGs on global warming and the potential to improve energy efficiency through the inclusion of indirect emissions might lower South Korea's desire to link with the EU ETS. In addition, the differences in scope and coverage might also provoke resistance from South Korean business circles who could oppose linkage due to competitiveness concerns. Certain South Korean firms would see their GHG emissions covered, while their EU counterparts would not. While these concerns would exist irrespective of linkage, the difference in scope and coverage might nevertheless lead to strong resistance to linkage in South Korea, where businesses have already voiced strong opposition to the introduction of the ETS.[241]

Penalty regime

The design of the South Korean penalty regime has the potential to create a barrier to linkage. So far, only the fine for non-compliant companies has been agreed on. However, the most relevant decision on the design of the penalty rules remains to be taken, namely whether non-compliant companies will, in addition, be required to surrender the missing allowances. In the absence of such a requirement, linkage with the EU ETS might prove difficult. This is due to the fact that the cap on the South Korean fine would effectively form a price ceiling for the ETS if firms are not required to submit missing allowances. Linkage means that the price cap would propagate into the EU ETS – something EU policymakers would most likely find unacceptable, given the EU's resistance to price control measures. If South Korea decided to add the requirement to surrender missing allowances, this would facilitate linkage.

Borrowing of allowances

Another potential barrier to linkage between the ETSs in the EU and South Korea is related to the rules for the borrowing of allowances. South Korea intends to limit borrowing at ten percent of a firm's compliance requirement. While borrowing under the EU ETS is only implicitly possible, there are no quantitative restrictions. In light of the absence of a quantity limit for

borrowing under the EU ETS, South Korean policymakers might find linkage unacceptable, as the EU feature would propagate into the South Korean ETS, thereby effectively removing the restriction.

Rules for the use of international offset credits

The rules for the use of international offset credits could also complicate linkage. The preceding analysis shows that linkage requires some harmonization between schemes with regard to the use of offset credits, since linkage creates a common pool of allowances. South Korea's quantitative restrictions are likely to be more stringent. Entities covered by the South Korean ETS will only be allowed to use international credits from Phase III for a maximum of 50 percent of the total offset limit – domestic and international – set at ten percent of a company's compliance obligations. The eligibility criteria for international offset credits are unknown at the time of writing. However, it is likely that the EU would expect South Korea to exclude similar credits, namely those generated from projects related to nuclear facilities, LULUCF, and the destruction of industrial gases. Linkage to the UN's offset market, and therefore the acceptance of CERs and ERUs under the South Korean ETS, is uncertain at the time of writing. Reservations by South Korean policymakers with regard to Kyoto credits could prevent them from linking to the EU ETS, which is linked to the UN offset market. However, this problem is likely to change given the EU's recent announcement that emissions reductions for 2020–30 will have to be met through domestic actions alone – unless an ambitious global climate deal under which the EU might commit to a steeper reduction target and re-introduce the acceptance of offsets is reached in 2015. The EU's potential ban of international offset credits could result in a situation where the EU does not accept international offsets but South Korea does. In case of linkage, EU and South Korean policymakers would have to find a solution to deal with this difference.

5.4 Acceptable Differences for Linkage

While some differences have the potential to prevent linkage between the EU ETS and the South Korean ETS, linkage would not require complete harmonization between the two schemes.

The rules for the treatment of new entrants and plant closures are unlikely to create an obstacle. South Korean plans show that an allowance reserve will be created for new entrants. However, the size of the reserve and the rules for allocating reserve allowances have yet to be determined. The regulation for the treatment of plant closures is also unknown at the time of writing. Nevertheless, the preceding case studies, as well as initial differences in the rules between EU member states themselves, show that this is an area that does not require full harmonization.

Differences will certainly exist with regard to the allocation of allowances. First, free allocations will be higher under the South Korean ETS, where the scheme will only start in 2015, while free allocations under the EU ETS, which has now been in place for eight years, are increasingly being replaced by auctioning. Mechanisms for the free allocation of allowances will also differ with regard to companies considered to be at significant risk of carbon leakage. While South Korean firms falling under this category will receive all their allowances for free, their EU counterparts will be allocated free allowances based on an industry benchmark method. However, previous experience has shown that differences in allocation mechanisms exist in most cases without preventing linkage per se. Such differences might raise equity concerns because of the initial transfer of wealth through free allocations, but the concerns would also exist in the absence of linkage. Therefore, the EU and South Korea do not have to align their allocation mechanisms.

5.5 Trade-offs for South Korea

Several differences would be unacceptable for the EU and would require changes to the

South Korean ETS in order to facilitate linkage. Consequently, South Korean policymakers need to weigh the benefits against the compromises and potential losses the country would face as a result of linkage. The trade-offs need to be considered in light of South Korea's policy priorities.

Considering benefits

Despite the absence of a binding reduction commitment under the Kyoto Protocol, South Korea is committed to emissions reductions in order to help the country achieve new growth and guarantee its competitive position in the world economy. At the same time, price stability and predictability are of relatively great importance. At the beginning of the ETS, South Korea is therefore unlikely to accept significant price increases as a result of linkage. However, linkage with the EU ETS is unlikely to raise the South Korean carbon price. On the contrary, linking the South Korean ETS with the EU ETS would most likely decrease permit prices for South Korean entities, allowing them to meet their reduction targets at a lower cost. South Korean companies with low abatement costs would lose out, as these net sellers would receive lower prices for the allowances they sell. However, several previous net sellers might find it cheaper to meet their compliance obligations through purchases of lower-price EUAs and would therefore benefit from linkage despite changing their status from net sellers to net buyers. In light of the expected high carbon price, the overall cost-efficiency gains South Korea could realize from linkage are likely to outweigh distributional concerns. The expected decrease of the South Korean carbon price in case of linkage with the EU ETS could further reduce the risk of carbon leakage for South Korea. With a lower carbon price in South Korea, emissions might be less likely to move to countries with lower or no carbon costs. However, the differences in scope and coverage of the two schemes may limit the potential for reducing the risk of carbon leakage. In addition, South Korean policymakers should consider the benefits of creating an institutional lock-in through linkage and the associated signalling effect, which is likely to encourage more investments into low-carbon technologies.

Considering compromises

Differences in scope and coverage might lead to concerns for some South Korean firms, who might fear reduced competitiveness vis-à-vis their non-covered EU counterparts. While this inequality in the way businesses are treated would also exist in the absence of linkage, South Korean firms might nevertheless use it as an argument against linkage. In line with the previous linkage cases, South Korea would likely have to make several amendments to its own ETS in order to facilitate linkage with the EU ETS. The preceding assessment shows that South Korea might have to restrict its flexibility to readjust allowance allocations and to intervene with market-stabilizing measures. Moreover, the EU may request that the penalty regime contain a requirement for non-compliant companies to surrender missing allowances in order to prevent the introduction of a price cap. South Korea would also most likely have to give up its quantity limit on the borrowing of allowances, since linkage would extend the EU's implicit, but unlimited borrowing rules to the South Korean scheme. Linkage may also require compromises with regard to the use of international offset credits. Under the current rules of the EU ETS, South Korea would have to indirectly accept Kyoto units as a result of linkage. At the same time, South Korea would have to impose some restrictions on the types of project credits accepted. In line with EU rules, this would most likely have to exclude credits generated from projects related to nuclear facilities, LULUCF, and the destruction of industrial gases. As mentioned, the situation may, however, change, since the EU's recent 2030 climate framework suggests that international offsets will no longer be accepted for compliance after 2020. Finally, the scope and coverage is another area where South Korea might have to accept concessions. Not only would the country have to agree to link to a scheme that is more limited, the EU might

also require the exclusion of indirect emissions and some of the additional three GHGs in order to commit to the linkage.

For South Korea, linkage would clearly involve several compromises. The concessions and loss of regulatory control over its own scheme have to be weighed against the potentially significant benefits the country could achieve through linkage to the EU ETS. Policymakers will have to carefully consider the potential gains, compromises, and risks that linkage would entail.

5.6 Trade-offs for the EU

For the EU, linkage with the South Korean ETS holds several advantages without requiring much compromise. It is similar to the previous linkage cases in that South Korea would mostly be the one having to make concessions by aligning key features with the EU ETS. The size of the South Korean carbon market implies that the country's influence on the carbon price in the joint market could be significant. The expectation for the high carbon price in South Korea could be a strong motivation for linkage for some in the EU, since it could offer part of the solution to boost the price of EUAs. In addition, linkage to the first national Asian-Pacific ETS would send an important signalling effect about the EU's commitment to international cooperation in the area of climate change and the EU's success in advancing international climate change action through ETSs. The size of the South Korean ETS does, however, also hold risks. As a relatively large carbon market, the EU is more exposed to developments in South Korea than in the case of linkage to smaller schemes. Nevertheless, the potentially significant gains would most likely outweigh the concerns about risk exposure.

Linkage negotiations with South Korea might, however, differ from the previous cases, where the EU was largely able to request harmonization from the other schemes. The differences between the EU and the other schemes were usually small, and the other schemes had a significant interest in linking to the world's largest carbon market, which made them willing to accept the necessary compromises. While South Korea is also likely to realize significant gains from linkage with the EU ETS, the country might be less willing to compromise on some elements of its scheme. Having learned from the EU's problem with price volatility and crashes, South Korea might not be easily convinced to give up its flexibility with regard to market stabilization measures, for example.

5.7 Implications for the South Korean Emissions Trading Scheme

The assessment shows that linkage with the EU ETS holds potentially significant benefits for South Korea, particularly with regard to cost-efficiency. South Korean policymakers should therefore seriously assess a possible future link with the EU ETS. Under the current plans for the South Korean ETS, certain elements of the scheme are already designed in a way that would facilitate linkage to the EU ETS.

Harmonization with the EU ETS

The analysis made clear that several elements of the South Korean ETS would pose significant barriers, which could prevent linkage between the two schemes. If South Korea has an interest in achieving the benefits linkage has to offer, then the country may have to be prepared to make several amendments to its scheme. South Korea should be particularly prepared for concessions with regard to its allocation readjustment provisions and market stabilization measures. Amendments could be made prior to the introduction of the ETS in 2015, over the course of the trial phases, or at a later stage.

Decisions on some design features have yet to be taken. If South Korea has a serious interest in linking its scheme with the EU ETS, it may be beneficial to choose designs that facilitate linkage without undermining its effectiveness and key priorities. Those responsible for the design of the South Korean ETS should particularly consider the following aspects. First, the introduction of a requirement for non-compliant companies to surrender missing allowances in addition to paying the fine in

order to remove the de facto price cap. Second, an imposition of quality requirements for the use of offset credits that exclude activities related to nuclear facilities, LULUCF, and the destruction of industrial gases.

Propagation of EU features into the South Korean ETS

In addition, South Korean policymakers should be aware of the potential propagation of certain elements of the EU ETS into their own ETS. First, linkage with the EU ETS would effectively remove South Korea's quantitative restrictions on the borrowing of allowances, as no such limits exist under the EU ETS. Second, since linkage creates a common pool of offset credits, South Korea would in fact indirectly accept Kyoto offsets since these can be used for compliance under the EU ETS — although this may change under the EU's 2030 framework.

Existing uncertainties

With regard to the scope and coverage, some amendments and compromises will most probably be required, but the extent of those changes is difficult to predict. Scope and coverage might further be an area where the EU could be willing to make concessions. The coverage of additional gases could involve compromises from both the EU and South Korea. The planned inclusion of methane under the Australian ETS implies that the EU might be willing to accept linkage with the South Korean scheme even under this extended coverage. For the other two gases – HFCs and SF_6 – and the inclusion of indirect emissions, the outcome is more difficult to predict. South Korean policymakers should be aware that the EU might request their exclusion or, at the very least, require the existence of accurate monitoring and accounting procedures. However, EU policymakers should also take into account the possibility that South Korea might not be willing to exclude the additional GHGs or indirect emissions from its ETS.

Recommendations for policymakers

It is recommended that policymakers in South Korea clearly assess a potential link with the EU ETS now. This can provide clarity about their interest in such a link and the potential benefits. Policymakers should then carefully evaluate how this compares to the compromises and risks the country would face as a result of linkage. Many compromises would result from the differences in the design of the two schemes. South Korea should therefore consider whether certain changes to its current plans could be beneficial in the long run. Enhancing harmonization through the alignment of relevant features prior to the start of the ETS in 2015 could prevent difficulties related to the implementation of changes in the future. Alternatively, certain elements that have the potential to prevent linkage, such as allocation readjustments or market stabilization measures, could be implemented as temporary measures with a phase-out date. This would give South Korea additional flexibilities during the trial periods of its ETS, while facilitating linkage in the future.

Policymakers in the EU and South Korea should enter a transparent dialogue early on to openly discuss ambitions, priorities, and barriers. This would provide both parties with a better understanding of the opportunities and limits of linkage and facilitate future negotiations. Such a dialogue can already start prior to the introduction of the South Korean ETS. The Australian case shows, for example, that negotiations can begin and an agreement can be reached even before the start of an ETS.

Should South Korea not be ready to face significant trade-offs at the beginning of its ETS, it could consider initially establishing a unilateral link to the EU ETS. Norway put into place a one-way link to the EU ETS before the full bilateral link came into force, and Australia plans to do the same. A unilateral link can be implemented more easily – both legally

and practically – offering more flexibility while still providing key benefits. Firms covered by the South Korean ETS would gain access to a larger carbon market and face lower compliance costs. At the same time, South Korea would not be required to immediately harmonize its system with the EU ETS, allowing the country to preserve its flexibilities and differences. The bilateral link could then be negotiated at a later date once the South Korean ETS has been in place long enough to facilitate amendments.

6. CONCLUSION AND POLICY RECOMMENDATIONS

Emissions trading schemes offer a cost-effective solution for countries to curb their GHG emissions. Linkage between such schemes can further enhance overall cost-efficiency and provide additional benefits. However, linkage also involves disadvantages and trade-offs and requires a certain degree of harmonization between schemes. As a result, policymakers may have to make some adjustments to their domestic ETSs. Linkage does not, however, require complete harmonization, and certain differences can exist between linked schemes.

To date, direct linkages have been established or are being negotiated between the EU, on the one hand, and Norway, Switzerland, and Australia, on the other hand. The analysis of these case studies provided interesting insights. Despite their differences, the Norwegian, Swiss, and Australian cases supported the argument that linkage does not require complete harmonization, but that a sufficient alignment of key elements is a precondition for linkage. The case studies illustrated that the EU requires largely harmonized penalty regimes and rules for the use of international offset credits, as well as a removal of cost containment measures. In order to facilitate linkage with the EU ETS, Norway, Switzerland, and Australia had to align some elements of their schemes with the EU scheme. The willingness of these countries to implement the necessary changes shows the high value they attach to linkage with the EU ETS. Nevertheless, differences still exist between the EU ETS and the above schemes, for example with regard to MRV arrangements, allocation methods, and even the scope and coverage, proving that ETSs do not need to be perfectly harmonized in order to be linked.

The emergence of cases of linkage and the benefits it can offer make it worthwhile to consider linkage at an early stage when designing domestic ETSs. South Korea, where the introduction of the ETS is scheduled for January 2015, provides an interesting case in point. With the South Korean carbon price expected to reach high levels, linkage with the EU ETS would provide an opportunity to lower the compliance costs for covered entities. In addition to this and the general linkage benefits, South Korea would particularly profit from the signalling effect of linkage for South Korean firms, which could help encourage investments into low-carbon technologies.

With a relatively large carbon market, South Korea not only stands to gain from linkage, but also has much to offer to the EU. South Korea would likely exert a non-negligible influence on the allowance price in the linked carbon market. Given the prediction of a relatively high carbon price in South Korea, linkage could therefore provide a much-needed boost to the EU's carbon price. Linkage with the first Asian-Pacific ETS would further strengthen the EU's signalling effect with regard to its commitment to international cooperation on climate change mitigation and the role ETSs can play in this regard.

For South Korea, the potential linkage with the EU ETS would, however, also involve trade-offs. In line with the previous linkage cases, it can be expected that a sufficient degree of harmonization of scheme elements would be a precondition for linkage. Under the current plans for the South Korean ETS, several elements could pose significant barriers to linkage and may therefore require adjustments. This particularly concerns the provisions for market stabilization measures and the readjustment of allocations. In addition, the EU might ask South Korea to exclude indirect emissions and the three additional GHGs – CH_4, HFCs, and SF_6 – from the scope of the ETS. Decisions on several elements of the South Korean ETS remain to be taken and could – depending on the choices – create barriers or facilitators. They concern the penalty regime and eligibility criteria for international offset credits. In addition to possible adjustments in these areas, South Korea could face further compromises as a result of the propagation of EU features into its own scheme, such as unlimited borrowing of allowances. While linkage to the EU ETS would

involve trade-offs for South Korea, the country could realize substantial gains from linking to the world's largest carbon market. Moreover, as illustrated by the previous cases, South Korea would not need to fully align its scheme with the EU ETS. Some differences could prevail, for example with regard to the treatment of new entrants or allowance allocations.

Compared to the previous cases, linkage negotiations between the EU and South Korea could take on a different dynamic. South Korea might be less likely to agree to adjustments for elements it considers essential, for example the extended scope and coverage or its provisions for market stabilization measures. As a result, the EU might have to accept some compromises itself.

In light of the significant gains linkage could provide to both the EU and South Korea, policymakers in both entities would benefit from establishing an open and transparent dialogue to discuss the potential for linkage of their respective schemes early on. South Korean policymakers should, in particular, assess the country's interest in linking with the EU ETS, taking into account the advantages and disadvantages. This could help inform them in their final design choices for the ETS and identify the best way and timeline to implement the necessary changes.

The establishment of linkages between domestic ETSs is an interesting and pertinent development to follow over the next few years. In addition to the final stages in the creation of the Swiss-EU link, the Australian case should be watched with particular attention. If Australia does not go ahead with the planned ETS, this could have negative effects for the EU, which stands to gain much from this planned first intercontinental linkage. Conversely, should the linkage between the EU ETS and the Australian scheme take place as agreed, this could prove to be an important stepping stone for further intercontinental linkages with emerging schemes, including South Korea.

Linkage between domestic ETSs offers an interesting opportunity for international cooperation in climate policy, while allowing countries to maintain some national autonomy. However, its potential depends on the willingness of a growing number of countries to implement ETSs and to sufficiently align them in order to enable linkages. If linkage turns into a growing climate policy trend, it could offer an opportunity to complement international cooperation on climate change mitigation through a bottom-up approach. With the growing number of countries implementing or considering ETSs and the increasing interest in linkage, the development of linkages should be watched carefully by policymakers in the years to come.

In the context of growing unilateral climate change action and the associated competitiveness and carbon leakage concerns, linkage between domestic ETSs can offer an alternative to border carbon adjustments (BCAs) – a unilateral measure proposed by some governments, aimed at equalizing the carbon cost by taxing imports from countries with lower or no carbon cost. Linking ETSs can help address concerns about distortions in competitiveness and the risk of carbon leakage in a cooperative way, rather than implementing BCAs.

Ultimately, linkage can contribute to sustainable development. Not only does linkage enhance the cost-effectiveness of ETSs, it also has the potential to reduce possible distortions in competitiveness as well as the risk of carbon leakage that can arise through the unilateral implementation of ETSs. Linkage can further support important investments into low-carbon technologies. Consequently, emissions reductions can be undertaken without adversely affecting economic development. On the contrary, through increasing investments into low-carbon technologies, linkage between ETSs can contribute to sustainable economic growth, while reducing GHG emissions.

ENDNOTES

1 Robert Baldwin. 2008. "Regulation lite: The rise of emissions trading." *Regulation & Governance*. 2 (2): 194.

2 Ibid. at 195.

3 Directive 2003/87/EC, preamble (4), Art. 1, Art. 4.

4 European Commission. 2009. "Climate change: Commission sets out proposals for global pact on climate change at Copenhagen." European Commission Press Release, 28 January 2009. http://europa.eu/rapid/press-release_IP-09-141_en.htm (accessed 24 September 2013).

5 Wolfgang Sterk et al. 2006. "Ready to Link up? Implications of Design Differences for Linking Domestic Emissions Trading Schemes." *German Federal Ministry of Education and Research (BMBF)*, Jet-Set Cross-Section Project 4: 38.

6 European Commission. *n.d.a.* "The EU Emissions Trading System (EU ETS)." http://ec.europa.eu/clima/policies/ets/ (accessed 24 September 2013).

7 FOEN. 2013c. "Fifth Round of Swiss-EU Negotiations on Linking their Emissions Trading Systems." FOEN Press Release, 12 December 2013. http://www.bafu.admin.ch/emissionshandel/05576/12688/index.html?lang=en&msg-id=51350 (accessed 28 January 2014).

8 European Commission. 2012b. "Australia and European Commission agree on pathway towards fully linking Emissions Trading Systems." Joint Press Release – European Commission and The Honourable Greg Combet AM MP, 28 August 2012. http://europa.eu/rapid/press-release_IP-12-916_en.htm (accessed 11 October 2013).

9 Christian Flachsland, Robert Marschinski, and Ottmar Edenhofer. 2009. "To link or not to link: benefits and disadvantages of linking cap-and-trade systems," *Potsdam Institute for Climate Impact Research:* 5–10.

10 James Wilde, Michael Grubb, and Tom Brewer. 2009. "Linking emission trading systems: Prospects and issues for business," *Carbon Trust*: 26.

11 Eunjung Kim et al. 2012. *A Study on Legislation regarding the linking of the international carbon market* (Korea Legislation Research Institute): 29.

12 See Baldwin, above n 1, at 194.

13 Michael Grubb. 2007. "The European Emissions Trading Scheme: An Overview of Operations and Lessons," *Ifo DICE*, 5 (4): 18.

14 Ingrid Jegou and Luca Rubini. 2011. "The Allocation of Emission Allowances Free of Charge: Legal and Economic Considerations." *ICTSD Programme on Competitiveness and Sustainable Development*, Transition to a Low Carbon Future Series, Issue Paper No. 18: 1–2.

15 A.M. Gielen, P.R. Koutstaal, and Herman R.J. Vollebergh. 2002. "Comparing Emission Trading with Absolute and Relative Targets," Paper presented at the 2nd CATEP Workshop on the Design and Integration of National Tradable Permit Schemes for Environmental Protection, hosted by University College London, 25–26 March 2002: 2.

16 See Jegou and Rubini, above n 14, at 1–2.

17 Ibid. at 3.

18 European Commission. 2013b. "The EU Emissions Trading System (EU ETS) - Factsheet," http://ec.europa.eu/clima/publications/docs/factsheet_ets_en.pdf (accessed 25 September 2013).

19 Peter Heindl and Adreas Löschel. 2012. "Designing Emissions Trading in Practice: General Considerations and Experiences from the EU Emissions Trading Scheme (EU ETS)." *Centre for European Economic Research,* Discussion Paper No. 12-009: 2–3.

20 Richard Baron and Stephen Bygrave. 2002. "Towards International Emissions Trading: Design Implications for Linkages." *OECD*, Information Paper: 29–30.

21 William Blyth and Martina Bosi. 2004. "Linking non-EU Domestic Emissions Trading Schemes with the EU Emissions Trading Scheme." *OECD/IEA*: 28.

22 See Heindl and Löschel, above n 19, at 3.

23 See European Commission, above n 6.

24 European Environment Agency. 2013. "European Union Emissions Trading System (EU ETS) data from CITL." http://www.eea.europa.eu/data-and-maps/data/european-union-emissions-trading-scheme-eu-ets-data-from-citl-5 (accessed 30 October 2013).

25 EFTA. 2013. "EEA EFTA States will continue to participate fully in EU ETS," EFTA Press Release, 3 January, 2013. http://www.efta.int/eea/eea-news/2013-01-03-jc-ets (accessed 25 September 2013).

26 Directive 2003/87/EC, Art. 1.

27 European Commission. *n.d.b.* "EU greenhouse gas emissions and targets." http://ec.europa.eu/clima/policies/g-gas/ (accessed 25 September 2013).

28 UNFCCC. 2012. "Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol." FCCC/KP/CMP/2012/L.9. http://unfccc.int/resource/docs/2012/cmp8/eng/l09.pdf (accessed 25 September 2013).

29 See European Commission, above n 27.

30 See European Environment Agency, above n 24.

31 See European Commission, above n 18.

32 ICTSD. 2013a. "Suspension of EU Aviation Emissions Rule Planned for April, Officials Say." *ICTSD Bridges Trade BioRes*, 13 (4), 20 March 2013. http://ictsd.org/i/news/biores/159939/ (accessed 25 September 2013).

33 ICAO. 2013. "Dramatic MBM Agreement and Solid Global Plan Endorsements Help Deliver Landmark ICAO 38th Assembly," *ICAO Press Release*, 4 October 2013. http://www.icao.int/Newsroom/Pages/mbm-agreement-solid-global-plan-endoresements.aspx (accessed 9 October 2013).

34 Valerie Volcovici and Barbara Lewis. 2013. "U.N. aviation body agrees on emissions deal," *Reuters*, 4 October 2013. http://www.reuters.com/article/2013/10/04/us-aviation-climate-idUSBRE99302A20131004 (accessed 9 October 2013).

35 ICTSD. 2014b. "European Parliament Prepares for Aviation Emissions Clash." *ICTSD Bridges Trade BioRes*, 14 (1), 3 February 2014. http://ictsd.org/i/news/biores/183234/ (accessed 4 February 2014).

36 See European Commission, above n 18.

37 See Jegou and Rubini, above n 14, at 4.

38 See European Commission, above n 18.

39 Directive 2003/87/EC, Art. 9.

40 Lucas Merrill Brown, Alex Hanafi, and Annie Petsonk. 2012. "The EU Emissions Trading System: Results and Lessons Learned." *EDF*: 2.

41 Ibid. at 2.

42 Peter Sopher and Anthony Mansell. 2013a. "European Union – The World's Carbon Markets: A Case Study Guide to Emissions Trading." *EDF/IETA*: 2–3.

43 Richard N. Cooper. 2010. "Europe's Emissions Trading System." *Cambridge, Mass.: Harvard Project on International Climate Agreements*, Discussion Paper 2010-40: 3.

44 See Heindl and Löschel, above n 19, at 6.

45 See European Commission, above n 18.

46 European Commission. *n.d.*d. "Carbon leakage." http://ec.europa.eu/clima/policies/ets/cap/leakage/index_en.htm (accessed 30 September 2013).

47 See European Commission, above n 18.

48 See Heindl and Löschel, above n 19, at 10.

49 Tom Delay and Michael Grubb. 2008. "Cutting Carbon in Europe: The 2020 plans and the future of the EU ETS." *Carbon Trust*: 12–3.

50 See Jegou and Rubini, above n 14, at 7.

51 Christina Hood. 2010. "Reviewing Existing and Proposed Emissions Trading Systems." *OECD/IEA*, Information Paper: 53.

52 See Heindl and Löschel, above n 19, at 7.

53 Richard G. Newell, William A. Pizer, and Daniel Raimi. 2013. "Carbon Markets 15 Years after Kyoto: Lessons Learned, New Challenges." *Journal of Economic Perspectives*, 27 (1): 128.

54 Directive 2004/101/EC, preamble (2).

55 UNFCCC. *n.d.a.* "Clean Development Mechanism." http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php (accessed 23 October 2013).

56 Matthew Ranson and Robert N. Stavins. 2012. "Post-Durban Climate Policy Architecture Based on Linkage of Cap-and-Trade Systems." *Fondazione ENI Enrico Mattei Working Papers, Paper* 694: 6.

57 See UNFCCC, above n 55.

58 UNFCCC. *n.d.*b. "Joint Implementation (JI)." http://unfccc.int/kyoto_protocol/mechanisms/joint_implementation/items/1674.php (accessed 23 October 2013).

59 Directive 2004/101/EC, preamble (5).

60 See Sopher and Mansell, above n 42, at 4.

61 See Brown, Hanafi and Petsonk, above n 40, at 24.

62 See Sopher and Mansell, above n 42, at 3.

63 See Ranson and Stavins, above n 56, at 8.

64 Ibid. at 7.

65 European Commission. 2014. "A policy framework for climate and energy in the period from 2020 to 2030." http://ec.europa.eu/clima/policies/2030/docs/com_2014_15_en.pdf (accessed 4 February 2014).

66 European Commission. *n.d.*e. "Monitoring, reporting and verification of EU ETS emissions." http://ec.europa.eu/clima/policies/ets/monitoring/index_en.htm (accessed 4 February 2014).

67 See Heindl and Löschel, above n 19, at 7.

68 See Grubb, above n 13, at 18.

69 Regina Betz and Misato Sato. 2006. "Emissions trading: lessons learnt from the 1st phase of the EU ETS and prospects for the 2nd phase." Editorial, *Climate Policy*, 6 (4): 352.

70 See Grubb, above n 13, at 18.

71 See Heindl and Löschel, above n 19, at 9.

72 See for example Denny Ellerman and Barbara Buchner. 2006. "Over-Allocation or Abatement? A Preliminary Analysis of the EU-ETS based on the 2005 Emissions Data." *Fondazione ENI Enrico Mattei Working Papers*, 139.06.

73 See Jegou and Rubini, above n 14, at 16.

74 European Energy Exchange AG. *n.d.* "Market Data." http://www.eex.com (accessed 24 October 2013).

75 Arthur Neslen. 2013. "Backloading amendment to return for 'second round'." *EurActiv,* 23 April 2013. http://www.euractiv.com/climate-environment/backloading-amendment-return-sec-news-519285 (accessed 27 September 2013).

76 European Commission. *n.d.*c. "Structural reform of the European carbon market." http://ec.europa.eu/clima/policies/ets/reform/ (accessed 27 September 2013).

77 Anita Talberg and Kai Swoboda. 2013. "Emissions trading schemes around the world," *Parliament of Australia/Department of Parliamentary Services*, Background Note: 5–7.

78 See European Commission, above n 76.

79 See European Energy Exchange AG, above n 74.

80 See European Commission, above n 76.

81 ICTSD. 2014a. "European Commission Announces 2030 Climate, Energy Goals." ICTSD Bridges Trade BioRes, 14 (1), 23 January 2014, http://ictsd.org/i/news/biores/182639/ (accessed 4 February 2014).

82 See Brown, Hanafi and Petsonk, above n 40.

83 See Cooper, above n 43, at 18.

84 See Grubb, above n 13, at 22.

85 See Brown, Hanafi and Petsonk, above n 40, at 19–23.

86 See for example Sander de Bruyn, Agnieszka Markowska and Dagmar Nelissen. 2010). "Will the energy-intensive industry profit from EU ETS under Phase 3? Impacts of EU ETS on profits, competitiveness and innovation." *CE Delft*.

87 Hans Bolscher et al. 2013. "Carbon Leakage Evidence Project – Factsheets for selected sectors." *Ecorys in consortium with Öko-Institut e.V., Cambridge Econometrics and TNO*: 11–4.

88 See European Commission, above n 27.

89 See Brown, Hanafi and Petsonk, above n 40, at vi.

90 Ibid. at v.

91 Ibid. at 14–7.

92 Tim Laing et al. 2013. "Assessing the effectiveness of the EU Emissions Trading System." *Centre for Climate Change Economics and Policy,* Working Paper No. 126/*Grantham Research Institute on Climate Change and the Environment*, Working Paper No. 106.

93 Peter Sopher and Anthony Mansell. 2013b. "South Korea – The World's Carbon Markets: A Case Study Guide to Emissions Trading." *EDF/IETA*: 1.

94 Bloomberg New Energy Finance/Ernst & Young. 2013. "South Korea's Emissions Trading Scheme." *Bloomberg New Energy Finance*, White Paper: 3.

95 See Sopher and Mansell, above n 93, at 1.

96 See Bloomberg New Energy Finance/Ernst & Young, above n 94, at 3.

97 Ibid. at 3.

98 See Eunjung Kim et al., above n 11, at 30–34.

99 See Bloomberg New Energy Finance/Ernst & Young, above n 94, at 5–8.

100 See Eunjung Kim et al., above n 11, at 35.

101 See Eunjung Kim et al., above n 11, translated chapter "Economic analysis of the status of carbon markets and the possibilities offered by the linkage of international carbon markets".

102 See Sopher and Mansell, above n 93, at 2.

103 See Eunjung Kim et al., above n 11, at 32–33.

104 See Bloomberg New Energy Finance/Ernst & Young, above n 94, at 10.

105 See Sopher and Mansell, above n 93, at 2–3.

106 See Eunjung Kim et al., above n 11, at 37–8.

107 See Sopher and Mansell, above n 93, at 3.

108 See Eunjung Kim et al., above n 11, at 41.

109 Ibid. at 41–2.

110 Ibid. at 44.

111 See Bloomberg New Energy Finance/Ernst & Young, above n 94, at 7.

112 See Sopher and Mansell, above n 93, at 3.

113 See Eunjung Kim et al., above n 11, at 46.

114 See Bloomberg New Energy Finance/Ernst & Young, above n 94, at 2, 7.

115 See Eunjung Kim et al., above n 11, at 43–4.

116 See Sopher and Mansell, above n 42, at 2.

117 See Bloomberg New Energy Finance/Ernst & Young, above n 94, at 8.

118 Ibid. at 24.

119 See Sopher and Mansell, above n 93, at 3; See European Commission, above n 46.

120 Point Carbon. 2013. "Backloading given green light from Parliament." *Point Carbon*, 3 July 2013. http://www.pointcarbon.com/aboutus/pressroom/pressreleases/1.2445845 (accessed 30 September 2013).

121 See European Commission, above n 76.

122 Judson Jaffe and Robert Stavins. 2007. "Linking Tradeable Permit Systems for Greenhouse Gas Emissions: Opportunities, Implications and Challenges." IETA: 11–2.

123 Ibid. at 12.

124 Ibid. at 12–3.

125 Ibid. at 13–4.

126 Ibid. at 14.

127 Judson Jaffe and Robert Stavins. 2008. "Linkage of Tradeable Permit Systems in International Climate Policy Architecture." *Cambridge, Mass.: Harvard Project on International Climate Agreements,* Discussion Paper 2008-07: 13–4.

128 Ibid. at 1.

129 See Wilde, Grubb, and Brewer, above n 10, at 13.

130 See Jaffe and Stavins, above n 127, at 10.

131 Andreas Tuerk et al. 2009. "Linking Emissions Trading Schemes: Synthesis Report." *Climate Strategies*: 4–5.

132 See Flachsland, Marschinski, and Edenhofer, above n 9, at 4–5.

133 Ibid. at 7.

134 See Jaffe and Stavins, above n 127, at 15–7.

135 See Flachsland, Marschinski, and Edenhofer, above n 9, at 7.

136 See Tuerk et al., above n 131, at 5.

137 See Jaffe and Stavins, above n 122, at 19–20.

138 Ibid. at 20.

139 See Tuerk et al., above n 131, at 5.

140 See Jaffe and Stavins, above n 127, at 12–3.

141 See Tuerk et al., above n 131, at 2.

142 See Jaffe and Stavins, above n 127, at 12–3.

143 See Tuerk et al., above n 131, at 4–5.

144 See Jaffe and Stavins, above n 127, at 11.

145 Ibid. at 12.

146 See Flachsland, Marschinski, and Edenhofer, above n 9, at 6–7.

147 See Jaffe and Stavins, above n 127, at 11.

148 See Eunjung Kim et al., above n 11, translated chapter "Economic analysis of the status of carbon markets and the possibilities offered by the linkage of international carbon markets".

149 See Flachsland, Marschinski, and Edenhofer, above n 9, at 5.

150 Ibid. at 7.

151 See Tuerk et al., above n 131, at 25.

152 Ibid. at 26.

153 See Blyth and Bosi, above n 21, at 26–7.

154 See Sterk et al., above n 5, at 21.

155 Ibid. at 20.

156 See Wilde, Grubb, and Brewer, above n 10, at 2.

157 Ibid. at 16.

158 Ibid. at 16.

159 See Sterk et al., above n 5, at 20.

160 See Blyth and Bosi, above n 21, at 29.

161 See Wilde, Grubb, and Brewer, above n 10, at 16–7.

162 Ibid. at 16–7.

163 See Tuerk et al., above n 131, at 28.

164 Jane Ellis and Dennis Tirpak. 2006. "Linking GHG Emission Trading Schemes and Markets." *OECD/IEA*: 26.

165 See Sterk et al., above n 5, at 5.

166 See Ellis and Tirpak, above n 164, at 23–4.

167 See Blyth and Bosi, above n 21, at 17.

168 See Ellis and Tirpak, above n 164, at 22.

169 See Jaffe and Stavins, above n 122, at 32.

170 See Blyth and Bosi, above n 21, at 18.

171 See Tuerk et al., above n 131, at 36.

172 Ibid. at 36.

173 European Commission. 2008. "Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community." Art. 25 (1a).

174 Peter Sopher and Anthony Mansell. 2013c. "Norway – The World's Carbon Markets: A Case Study Guide to Emissions Trading," *EDF/IETA*: 1.

175 Ibid. at 1.

176 See Sterk et al., above n 5, at 38.

177 See Sopher and Mansell, above n 174, at 3.

178 Ibid. at 3.

179 Ibid. at 1–2.

180 Ibid. at 2–3.

181 Norwegian Ministry of Environment. 2004. "Act of 17 December 2004 No.99 Relating to Greenhouse Gas Emission Allowance Trading and the Duty to Surrender Emission Allowances." Chapter 2 (9), Chapter 3 (13). http://www.regjeringen.no/en/doc/laws/Acts/greenhouse-gas-emission-trading-act.html?id=172242 (accessed 7 October 2013).

182 See Sopher and Mansell, above n 174, at 3.

183 See Norwegian Ministry of Environment, above n 181, at Chapter 3 (13).

184 See Sopher and Mansell, above n 174, at 4.

185 Ibid. at 2.

186 See Norwegian Ministry of Environment, above n 181, at Chapter 1 (3).

187 See Sopher and Mansell, above n 174, at 2.

188 See Hood, above n 51, at 22.

189 Norwegian Ministry of Environment. 2008. "Norwegian National Allocation Plan for the emissions trading system in 2008–2012." http://www.regjeringen.no/upload/MD/Vedlegg/Planer/NAP_FINAL_ESA_260308.pdf (accessed 7 October 2013): 7.

190 See Sopher and Mansell, above n 174, at 2.

191 Ibid. at 3.

192 Ibid. at 4.

193 See Norwegian Ministry of Environment, above n 181, at Chapter 4 (16–8).

194 See Hood, above n 51, at 21–2.

195 World Trade Organization. 2013a. "Trade Profiles: Norway." http://stat.wto.org/CountryProfile/WSDBCountryPFView.aspx?Language=E&Country=NO (accessed 22 October 2013).

196 See FOEN, above n 7.

197 Peter Sopher and Anthony Mansell. 2013d. "Switzerland – The World's Carbon Markets: A Case Study Guide to Emissions Trading." *EDF/IETA*: 2–3.

198 Ibid. at 1.

199 Schweizerische Eidgenossenschaft. 2013a. "Bundesgesetz über die Reduktion von CO_2-Emissionen (CO_2-Gesetz) vom 23. Dezember 2011 (Stand am 1. Januar 2013)." Art. 3 (1–2). http://www.admin.ch/opc/de/classified-compilation/20091310/index.html (accessed 9 October 2013).

200 See Sopher and Mansell, above n 197, at 1.

201 Ibid. at 2.

202 Ibid. at 2–3.

203 Ibid. at 3.

204 Ibid. at 4.

205 FOEN. 2011. "First formal round of negotiations held with EU for linking of emissions trading systems." FOEN Press Release, 9 March 2011. http://www.bafu.admin.ch/emissionshandel/05576/12688/index.html?lang=en&msg-id=38021 (accessed 9 October 2013).

206 Schweizerische Eidgenossenschaft. 2013b. "Verordnung über die Reduktion von CO_2-Emissionen (CO_2-Verordnung) vom 30. November (Stand am 1. Juni 2013)." Anhang 6 (art 40 abs 1). http://www.admin.ch/opc/de/classified-compilation/20120090/index.html (accessed 9 October, 2013).

207 FOEN. 2013d. "The inclusion of aviation in emissions trading." http://www.bafu.admin.ch/emissionshandel/12448/index.html?lang=en (accessed 10 October 2013).

208 See Schweizerische Eidgenossenschaft, above n 199, at Art. 15 (1).

209 Ibid, at Art. 21 (1–2).

210 FOEN. 2014a. "Emission allowances issued for free (benchmark approach)." http://www.bafu.admin.ch/emissionshandel/05545/12434/index.html?lang=en (accessed 10 October 2013).

211 See Schweizerische Eidgenossenschaft, above n 199, at Art. 19 (3).

212 FOEN. 2014b. "Emissionsobergrenze (Cap) im Emissionshandelssystem und Absenkpfad." http://www.bafu.admin.ch/emissionshandel/05545/12433/index.html?lang=de (accessed 10 October 2013).

213 FOEN. 2013a. "Fact Sheet: Emission Reductions Achieved Abroad: Quality, Quantity and Carry-Over." http://www.bafu.admin.ch/emissionshandel/05545/12456/index.html?lang=en (accessed 10 October 2013).

214 Ibid.

215 FOEN. 2014c. "Monitoring companies that participate in emissions trading." http://www.bafu.admin.ch/emissionshandel/05545/12436/index.html?lang=en, (accessed 10 October 2013).

216 See Schweizerische Eidgenossenschaft, above n 199, at Art. 48 (1).

217 See FOEN, above n 212.

218 FOEN. 2013b. "Fourth Round of Swiss-EU Negotiations on Linking of Emissions Trading Systems." FOEN Press Release, 9 July 2013. http://www.bafu.admin.ch/emissionshandel/05576/12688/index.html?lang=en&msg-id=49632 (accessed 9 October 2013).

219 See Sopher and Mansell, above n 197, at 6.

220 Ecoplan. 2010. *Schweizer Emissionshandelssystem: Wie weiter nach 2012? Analyse mit einem Mehrländer-Gleichgewichtsmodell* (Bern: Bundesamt für Umwelt), 3–4.

221 Ibid. at 3–4.

222 World Trade Organization. 2013b. "Trade Profiles: Switzerland." http://stat.wto.org/CountryProfile/WSDBCountryPFView.aspx?Language=E&Country=CH (accessed 22 October 2013).

223 Peter Sopher and Anthony Mansell. 2013e. "Australia – The World's Carbon Markets: A Case Study Guide to Emissions Trading." *EDF/IETA*: 2.

224 ICTSD. 2013b. "New Australia PM: Carbon Tax Repeal Tops Agenda." *ICTSD Bridges Trade Bio Res*, 13 (7), 12 September 2013. http://ictsd.org/i/news/biores/176738/ (accessed 11 October 2013).

225 See Sopher and Mansell, above n 223, at 2.

226 Ibid. at 7.

227 See European Commission, above n 8.

228 Australian Government, Clean Energy Regulator. 2013. "Eligible emissions units." http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/About-the-Mechanism/Emissions-units/Pages/default.aspx (accessed 11 October 2013).

229 See Sopher and Mansell, above n 223, at 5–6.

230 Ibid. at 6.

231 Ibid. at 7.

232 Australian Parliament. 2012. "Securing a clean Energy Future: Implementing the Australian Government's Climate Change Plan." Statement by the Honourable Greg Combet AM MP: 7.

233 See Sopher and Mansell, above n 223, at 4.

234 See Talberg and Swoboda, above n 77, at 12.

235 European Commission. 2012a. "FAQ: Linking the Australian and European Union emissions trading systems." http://europa.eu/rapid/press-release_MEMO-12-631_en.htm (accessed 11 October 2013).

236 Ros Donald. 2012. "The Carbon Briefing: Australia's punt on the EU ETS – how does it work?" *The Carbon Brief*, Blog, 5 September 2012. http://www.carbonbrief.org/blog/2012/09/the-carbon-briefing-australias-punt-on-the-eu-ets (accessed 11 October 2013).

237 Australian Government, Department of Climate Change and Energy Efficiency. 2012. "12th IEA-IETA-EPRI Annual Workshop on Greenhouse Gas Emission Trading, 15–16 October 2012." http://www.iea.org/media/workshops/2012/ghg/1_Wilkinson_IEAIETAEPRIWorkshop2012.pdf (accessed 11 October 2013).

238 See European Commission, above n 8.

239 See Bloomberg New Energy Finance/Ernst & Young, above n 94, at 2.

240 Ibid. at 24.

241 Ibid. at 6.

REFERENCES

Australian Government, Clean Energy Regulator. 2013. "Eligible emissions units." http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/About-the-Mechanism/Emissions-units/Pages/default.aspx. Last accessed 11 October 2013.

Australian Government, Department of Climate Change and Energy Efficiency. 2012. "12th IEA-IETA-EPRI Annual Workshop on Greenhouse Gas Emission Trading, 15–16 October 2012." http://www.iea.org/media/workshops/2012/ghg/1_Wilkinson_IEAIETAEPRIWorkshop2012.pdf. Last accessed 11 October 2013.

Australian Parliament. 2012. "Securing a clean Energy Future: Implementing the Australian Government's Climate Change Plan." Statement by the Honourable Greg Combet AM MP.

Baldwin, Robert. 2008. "Regulation lite: The rise of emissions trading." *Regulation & Governance*. 2 (2): 193–215.

Baron, Richard and Stephen Bygrave. 2002. "Towards International Emissions Trading: Design Implications for Linkages." *OECD*, Information Paper.

Betz, Regina and Misato Sato. 2006. "Emissions trading: lessons learnt from the 1st phase of the EU ETS and prospects for the 2nd phase." Editorial. *Climate Policy*, 6 (4): 351–9.

Bloomberg New Energy Finance/Ernst & Young. 2013. "South Korea's Emissions Trading Scheme." *Bloomberg New Energy Finance*, White Paper.

Blyth, William and Martina Bosi. 2004. "Linking non-EU Domestic Emissions Trading Schemes with the EU Emissions Trading Scheme." *OECD/IEA*.

Bolscher, Hans et al. 2013. "Carbon Leakage Evidence Project – Factsheets for selected sectors." *Ecorys in consortium with Öko-Institut e.V., Cambridge Econometrics, and TNO*.

Brown, Lucas Merrill, Alex Hanafi, and Annie Petsonk. 2012. "The EU Emissions Trading System: Results and Lessons Learned." *EDF*.

Cooper, Richard N. 2010. "Europe's Emissions Trading System." *Cambridge, Mass.: Harvard Project on International Climate Agreements,* Discussion Paper 2010–40.

de Bruyn, Sander, Agnieszka Markowska, and Dagmar Nelissen. 2010. "Will the energy-intensive industry profit from EU ETS under Phase 3? Impacts of EU ETS on profits, competitiveness and innovation." *CE Delft*.

Delay, Tom and Michael Grubb. 2008. "Cutting Carbon in Europe: The 2020 plans and the future of the EU ETS." *Carbon Trust*.

Donald, Ros. 2012. "The Carbon Briefing: Australia's punt on the EU ETS – how does it work?" *The Carbon Brief,* Blog, 5 September 2012. http://www.carbonbrief.org/blog/2012/09/the-carbon-briefing-australias-punt-on-the-eu-ets. Last accessed 11 October 2013.

Ecoplan. 2010. "Schweizer Emissionshandelssystem: Wie weiter nach 2012? Analyse mit einem Mehrländer-Gleichgewichtsmodell." Bern: Bundesamt für Umwelt.

EFTA. 2013. "EEA EFTA States will continue to participate fully in EU ETS." *EFTA Press Release*, 3 January 2013. http://www.efta.int/eea/eea-news/2013-01-03-jc-ets. Last accessed 25 September 2013.

Ellerman, Denny and Barbara Buchner. 2006. "Over-Allocation or Abatement? A Preliminary Analysis of the EU-ETS based on the 2005 Emissions Data." *Fondazione ENI Enrico Mattei Working Paper* No. 139.06.

Ellis, Jane and Denis Tirpak. 2006. "Linking GHG Emission Trading Schemes and Markets." *OECD/IEA*.

European Commission. 2008. "Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community."

———. 2009. "Climate change: Commission sets out proposals for global pact on climate change at Copenhagen." *European Commission Press Release*, 28 January 2009. http://europa.eu/rapid/press-release_IP-09-141_en.htm. Last accessed 24 September 2013.

———. 2012a. "FAQ: Linking the Australian and European Union emissions trading systems." http://europa.eu/rapid/press-release_MEMO-12-631_en.htm. Last accessed 11 October 2013.

———. 2012b. "Australia and European Commission agree on pathway towards fully linking Emissions Trading Systems." *Joint Press Release – European Commission and The Honourable Greg Combet AM MP*, 28 August 2012, http://europa.eu/rapid/press-release_IP-12-916_en.htm. Last accessed 11 October 2013.

———. 2013. "The EU Emissions Trading System (EU ETS)." http://ec.europa.eu/clima/publications/docs/factsheet_ets_en.pdf. Last accessed 25 September 2013.

———. 2014. "A policy framework for climate and energy in the period from 2020 to 2030." http://ec.europa.eu/clima/policies/2030/docs/com_2014_15_en.pdf. Last accessed 4 February 2014.

———. *n.d.*a. "The EU Emissions Trading System (EU ETS)." http://ec.europa.eu/clima/policies/ets/. Last accessed 24 September 2013.

———. *n.d.*b. "EU greenhouse gas emissions and targets." http://ec.europa.eu/clima/policies/g-gas/. Last accessed 25 September 2013.

———. *n.d.*c. "Structural reform of the European carbon market." http://ec.europa.eu/clima/policies/ets/reform/. Last accessed 30 September 2013.

———. *n.d.*d. "Carbon leakage." http://ec.europa.eu/clima/policies/ets/cap/leakage/index_en.htm. Last accessed 30 September 2013.

———. *n.d.*e. "Monitoring, reporting and verification of EU ETS emissions." http://ec.europa.eu/clima/policies/ets/monitoring/index_en.htm. Last accessed 4 February 2014

European Environment Agency. 2013. "European Union Emissions Trading System (EU ETS) data from CITL." http://www.eea.europa.eu/data-and-maps/data/european-union-emissions-trading-scheme-eu-ets-data-from-citl-5. Last accessed 30 October 2013.

European Energy Exchange AG. *n.d.* "Market Data." http://www.eex.com. Last accessed 24 October 2013.

European Union. 2003. "Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC." *Official Journal of the European Union*, L 275/32.

———. 2004. "Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms." *Official Journal of the European Union*, L 338/18.

Flachsland, Christian, Robert Marschinski and Ottmar Edenhofer. 2009. "To link or not to link: benefits and disadvantages of linking cap-and-trade systems." *Potsdam Institute for Climate Impact Research*.

FOEN. 2011. "First formal round of negotiations held with EU for linking of emissions trading systems." *FOEN Press Release*, 9 March 2011. http://www.bafu.admin.ch/emissionshandel/05576/12688/index.html?lang=en&msg-id=38021. Last accessed 9 October 2013.

———. 2013a. "Fact Sheet: Emission Reductions Achieved Abroad: Quality, Quantity and Carry-Over." http://www.bafu.admin.ch/emissionshandel/05545/12456/index.html?lang=en. Last accessed 10 October 2013.

———. 2013b. "Fourth Round of Swiss-EU Negotiations on Linking of Emissions Trading Systems." *FOEN Press Release*, 9 July 2013. http://www.bafu.admin.ch/emissionshandel/05576/12688/index.html?lang=en&msg-id=49632 . Last accessed 9 October 2013.

———. 2013c. "Fifth Round of Swiss-EU Negotiations on Linking their Emissions Trading Systems." *FOEN Press Release,* 12 December 2013. http://www.bafu.admin.ch/emissionshandel/05576/12688/index.html?lang=en&msg-id=51350. Last accessed 28 January 2014.

———. 2013d. "The inclusion of aviation in emissions trading." http://www.bafu.admin.ch/emissionshandel/12448/index.html?lang=en. Last accessed 10 October 2013.

———. 2014a. "Emission allowances issued for free (benchmark approach)." http://www.bafu.admin.ch/emissionshandel/05545/12434/index.html?lang=en. Last accessed 21 February 2014.

———. 2014b. "Emissionsobergrenze (Cap) im Emissionshandelssystem und Absenkpfad." http://www.bafu.admin.ch/emissionshandel/05545/12433/index.html?lang=de. Last accessed 21 February 2014.

———. 2014c. "Monitoring companies that participate in emissions trading." http://www.bafu.admin.ch/emissionshandel/05545/12436/index.html?lang=en. Last accessed 21 February 2014.

Gielen, A.M., P.R. Koutstaal and Herman R.J. Vollebergh. 2002). "Comparing Emission Trading with Absolute and Relative Targets." Paper presented at the 2nd CATEP Workshop on the Design and Integration of National Tradable Permit Schemes for Environmental Protection, hosted by University College London, 25–26 March 2002.

Grubb, Michael. 2007. "The European Emissions Trading Scheme: An Overview of Operations and Lessons." *Ifo* DICE, 5 (4): 17-25.

Heindl, Peter and Andreas Löschel. 2012. "Designing Emissions Trading in Practice: General Considerations and Experiences from the EU Emissions Trading Scheme (EU ETS)." *Centre for European Economic Research,* Discussion Paper No. 12-009.

Hood, Christina. 2010. "Reviewing Existing and Proposed Emissions Trading Systems." *OECD/IEA*, Information Paper.

ICAO. 2013. "Dramatic MBM Agreement and Solid Global Plan Endorsements Help Deliver Landmark ICAO 38th Assembly." *ICAO Press Release*, 4 October 2013. http://www.icao.int/Newsroom/Pages/mbm-agreement-solid-global-plan-endoresements.aspx. Last accessed 9 October 2013.

ICTSD. 2013a. "Suspension of EU Aviation Emissions Rule Planned for April, Officials Say." *ICTSD Bridges Trade BioRes*, 13 (4), 20 March2013. http://ictsd.org/i/news/biores/159939/. Last accessed 25 September 2013.

———. 2013b. "New Australia PM: Carbon Tax Repeal Tops Agenda." *ICTSD Bridges Trade Bio Res*, 13 (7), 12 September 2013. http://ictsd.org/i/news/biores/176738/. Last accessed 11 October 2013.

———. 2014a. "European Commission Announces 2030 Climate, Energy Goals." *ICTSD Bridges Trade BioRes*, 14 (1), 23 January 2014. http://ictsd.org/i/news/biores/182639/. Last accessed 4 February 2014.

———. 2014b. "European Parliament Prepares for Aviation Emissions Clash." I*CTSD Bridges Trade BioRes*, 14 (1), 3 February 2014. http://ictsd.org/i/news/biores/183234/. Last accessed 4 February 2014.

Jaffe, Judson and Robert Stavins. 2007. "Linking Tradeable Permit Systems for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges." IETA.

———. 2008. "Linkage of Tradeable Permit Systems in International Climate Policy Architecture." *Cambridge, Mass.: Harvard Project on International Climate Agreements,* Discussion Paper 2008-07.

Jegou, Ingrid and Luca Rubini. 2011. "The Allocation of Emission Allowances Free of Charge: Legal and Economic Considerations." *ICTSD Programme on Competitiveness and Sustainable Development*, Transition to a Low Carbon Future Series, Issue Paper No 18.

Kim, Eunjung et al. 2012. *A Study on Legislation regarding the linking of the international carbon market*. Korea Legislation Research Institute.

Laing, Tim et al. 2013. "Assessing the effectiveness of the EU Emissions Trading System." *Centre for Climate Change Economics and Policy,* Working Paper No. 126/*Grantham Research Institute on Climate Change and the Environment*, Working Paper No. 106.

Neslen, Arthur. 2013. "Backloading amendment to return for 'second round'." *EurActiv,* 23 April 2013. http://www.euractiv.com/climate-environment/backloading-amendment-return-sec-news-519285. Last accessed 27 September 2013.

Newell, Richard G., William A. Pizer and Daniel Raimi. 2013. "Carbon Markets 15 Years after Kyoto: Lessons Learned, New Challenges." *Journal of Economic Perspectives*. 27 (1): 123–46.

Norwegian Ministry of Environment. 2004. "Act of 17 December 2004 No.99 Relating to Greenhouse Gas Emission Allowance Trading and the Duty to Surrender Emission Allowances." Chapter 2 (9), Chapter 3 (13). http://www.regjeringen.no/en/doc/laws/Acts/greenhouse-gas-emission-trading-act.html?id=172242. Last accessed 7 October 2013.

———. 2008. "Norwegian National Allocation Plan for the emissions trading system in 2008–2012." http://www.regjeringen.no/upload/MD/Vedlegg/Planer/NAP_FINAL_ESA_260308.pdf. Last accessed 7 October 2013.

Point Carbon. 2013. "Backloading given green light from Parliament." *Point Carbon,* 3 July 2013. http://www.pointcarbon.com/aboutus/pressroom/pressreleases/1.2445845. Last accessed 30 September 2013.

Ranson, Matthew and Robert N. Stavins. 2012. "Post-Durban Climate Policy Architecture Based on Linkage of Cap-and-Trade System." *Fondazione ENI Enrico Mattei Working Papers*, Paper 694.

Schweizerische Eidgenossenschaft. 2013a. "Bundesgesetz über die Reduktion von CO_2-Emissionen (CO_2-Gesetz) vom 23. Dezember 2011 (Stand am 1. Januar 2013)" http://www.admin.ch/opc/de/classified-compilation/20091310/index.html. Last accessed 9 October 2013.

———. 2013b. "Verordnung über die Reduktion von CO_2-Emissionen (CO_2-Verordnung) vom 30. November (Stand am 1. Juni 2013)" http://www.admin.ch/opc/de/classified-compilation/20120090/index.html. Last accessed 9 October 2013.

Sopher, Peter and Anthony Mansell. 2013a. "European Union – The World's Carbon Markets: A Case Study Guide to Emissions Trading." *EDF/IETA*.

———. 2013b. "South Korea – The World's Carbon Markets: A Case Study Guide to Emissions Trading." *EDF/IETA*.

———. 2013c. "Norway – The World's Carbon Markets: A Case Study Guide to Emissions Trading." *EDF/IETA*.

———. 2013d. "Switzerland – The World's Carbon Markets: A Case Study Guide to Emissions Trading." *EDF/IETA*.

———. 2013e. "Australia – The World's Carbon Markets: A Case Study Guide to Emissions Trading." *EDF/IETA*.

Sterk, Wolfgang et al. 2006. "Ready to Link up? Implications of Design Differences for Linking Domestic Emissions Trading Schemes." *German Federal Ministry of Education and Research (BMBF)*, Jet-Set Cross-Section Project 4.

Talberg, Anita and Kai Swoboda. 2013. "Emissions trading schemes around the world." *Parliament of Australia/Department of Parliamentary Services,* Background Note.

Tuerk, Andreas et al. et al. 2009. "Linking Emissions Trading Schemes: Synthesis Report." *Climate Strategies*.

UNFCCC. 2012. "Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol" FCCC/KP/CMP/2012/L.9. http://unfccc.int/resource/docs/2012/cmp8/eng/l09.pdf. Last accessed 25 September 2013.

———. *n.d.*a "Clean Development Mechanism." http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php. Last accessed 23 October 2013.

———. n.d.b "Joint Implementation (JI)" http://unfccc.int/kyoto_protocol/mechanisms/joint_implementation/items/1674.php. Last accessed 23 October 2013.

Volcovici, Valerie and Barbara Lewis. 2013. "U.N. aviation body agrees on emissions deal." *Reuters*, 4 October 2013, http://www.reuters.com/article/2013/10/04/us-aviation-climate-idUSBRE99302A20131004. Last accessed 9 October 2013.

Wilde, James, Michael Grubb and Tom Brewer. 2009. "Linking emission trading systems: Prospects and issues for business." *Carbon Trust*.

World Trade Organization. 2013a. "Trade Profiles: Norway." http://stat.wto.org/CountryProfile/WSDBCountryPFView.aspx?Language=E&Country=NO. Last accessed 22 October 2013.

———.2013b. "Trade Profiles: Switzerland." http://stat.wto.org/CountryProfile/WSDBCountryPFView.aspx?Language=E&Country=CH. Last accessed 22 October 2013.

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