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EXECUTIVE SUMMARY

An increasing number of countries and regions around the world are actively developing and implementing emissions trading schemes as a means to place a price on greenhouse gas (GHG) emissions. Trading schemes are now in place or being pursued in Europe, North America, and throughout the Asia-Pacific region. In addition to developments in OECD countries a vibrant dynamic is becoming apparent in rapidly developing and transition economies, with new trading systems under discussion or already evolving in China, India, Brazil, South Korea, or Vietnam.

This report provides an overview of existing and emerging GHG trading schemes, including those in Europe (EU ETS), North America (the WCI and RGGI), Australia, New Zealand, Japan (regional), China (regional) and South Korea. It discusses lessons learned across the systems and gives an outlook on the development of the future carbon market. The report illustrates that considerable diversity exists across cap-and-trade systems. Although unintentional, a potential benefit of this diversity is that it provides opportunities to compare different approaches and to facilitate transboundary learning. Individually, and in comparison, schemes may offer lessons that can be applied in the development or improvement of others. This report focuses on three large categories of lessons related to: the role of the political and economic process and context for establishing emissions trading systems; system design; and system implementation and oversight.

Political and Economic Process and Context

While often not the central focus of technical analyses of market mechanisms, it must not be forgotten that the underlying political and economic process and context of the jurisdiction(s) involved is a crucial factor in scheme development.

1. Jurisdictions’ decision to become involved will largely depend on their economic structure and relationships with lobby groups.
2. Believable energy and climate policy frameworks are crucial. Long-term signals are necessary, both for providing stability for investment decisions, and for communicating policy intents to other jurisdictions.
3. In multi-jurisdictional systems, the relationships among the involved players can either strengthen or weaken the association. Relationships are essential even for single-jurisdiction trading systems because no system is truly isolated.
4. Early and on-going stakeholder engagement is crucial for scheme development and can foster broader acceptance.

System Design

System design is clearly important, and several specific lessons and observations are noted in this report.

1. Decentralization of systems decision-making can reduce environmental effectiveness, but advocating for a strong centralized design in a multi-jurisdictional trading system may cause political difficulties.
2. It may be politically expedient to embrace free allocation in initial phases, but revenues generated through auctioning can provide significant benefits beyond improved efficiency of the market which contribute to acceptance.
3. A phased-in approach can reduce political resistance, generate adequate data and promote learning of both, industry and regulators. Ideally, learning generated through initial phases should be used to recalibrate the system.
4. Without addressing price uncertainty it may be more difficult for markets to incentivize the scale of emission reductions necessary. Mechanisms to stabilize price are used in several systems.

Market Oversight and Implementation

The importance of market oversight is becoming apparent as greater experience with emissions trading is gained. Emissions trading systems may be particularly vulnerable to criminal activities. Regulatory loopholes are essentially created through policy decisions. Several key issues regarding market oversight and implementation have emerged.
1. Adequate data is essential for market functioning and oversight. Neither industries nor regulators necessarily know how many emissions are being produced, how difficult these will be to reduce, or how these efforts compare with others. Without being able to assess the rigour of carbon accounting, it is difficult to properly evaluate the effectiveness of a market.

2. Having a sufficiently stringent cap is an important feature of a working trading system. The cap fixes the maximum abatement and no other polices for the same sector can achieve further reductions.

3. Markets need considerable bureaucratic and governance support in order to function effectively and efficiently. Similarly, the sheer quantity of data management and administrative expertise required to ensure adequate market oversight must not be underestimated.

4. A good understanding of impacts of an ETS on competitiveness is critical for the schemes’ acceptance.

**Implications for future Carbon Markets**

Several observations about possible future carbon markets emerge from this report. Although the EU ETS has been a vital source of empirical insights, new schemes may offer novel insights. Australia and California for instances, have actively sought to incorporate lessons from the EU ETS when designing their own systems, but these systems are not mere copies of the EU ETS. Instead, in each case the trading system has been designed to suit the domestic needs and circumstances of its respective jurisdiction. Yet already, lessons from North America, Australia or Japan are also gaining relevance for emerging schemes, such as in China.

The report illustrates that several emerging trading systems in Asia, including the Japanese and South Korean schemes, and some of the planned regional Chinese schemes do not focus on the power and heavy industry sectors, but involve smaller facilities, buildings, and indirect emissions from energy consumption. Such trading schemes require different design choices and involve different stakeholders than have been featured in previous schemes. They may present unique governance challenges as they develop, but may also provide future lessons for other schemes.

While an international framework could draw on the strengths of different systems, the sheer diversity among schemes may also hamper market convergence. This renders it particularly important to identify where differences pose real obstacles for future market harmonisation, and to agree early on a common international framework that may enable market integration at a later stage. In some cases, market integration has been explicitly anticipated, and some systems – such as the WCI – have tried to avoid certain design features, such as price caps, that may be barriers to market linkage.

While in the past it was assumed that the establishment of a federal US cap-and-trade system would be critical to the development of a global carbon market, this report draws attention to the long-term importance of rapid trading system development in the emerging economies. Given the current dynamic in Asia regarding the implementation of emissions trading schemes, the future of emissions trading will critically depend on the success of these efforts and, to a lesser degree, of other parts of the developing world. If this dynamic continues, the report concludes that emerging economies could eventually overtake the European Union and other OECD countries as centres for emissions trading, which in turn would significantly shift the style, nature and challenges of a future international emissions market.
1 INTRODUCTION

A number of countries around the world are actively developing emissions trading systems as part of their climate change abatement policies. Europe, in particular, has accumulated a rich body of experience with the design and implementation of emissions trading as a central instrument for greenhouse gas mitigation. Among the insights offered by the European Union Emissions Trading System (EU ETS) are hard-earned lessons on the allocation of allowances, price volatility, the role of market oversight, and competitiveness concerns.

While efforts to introduce domestic emissions trading systems in the United States have stalled or suffered critical setbacks at the national level, the political dynamic a couple of years ago has shifted to the subnational level. Regional systems such as the Regional Greenhouse Gas Initiative (RGGI) and the Western Climate Initiative (WCI) have gained attraction; while these also yield valuable policy insights, they are both smaller in scope and less mature than the EU ETS. Likewise, existing trading systems in Japan and New Zealand are beginning to reflect on best practices from their initial trading experiences.

Meanwhile, a vibrant dynamic is becoming apparent in rapidly developing and transition economies, with new trading systems under discussion or already evolving in China, India, Mexico, Brazil, South Korea, Thailand or Vietnam. While several schemes in emerging economies in Asia are already under implementation, in Central and Latin America the discussions on introducing Carbon Trading are only in initial stages.

While there is a continued trend towards inclusion of carbon trading in domestic climate policies, the international architecture of climate cooperation beyond 2012 may also feature market mechanisms as an important element. During the UN Climate Conference in Durban in December 2011 (COP17) UNFCCC Parties indicated an interest in creating a new market based mechanism and a framework for “various approaches, including opportunities for using markets” (UNFCCC, 2011). One of the aims of such a framework is to support linkages among domestic systems (de Sepibus et al, 2012). However no significant progress was made in the meantime and it remains still unclear if such a framework will emerge and how it will shape market integration or design.

As various systems emerge and develop, the countless policy choices taken will result in a number of material differences in their design and operation, for instance with a view to greenhouse gas coverage, trading entities, allowance allocation, the stringency and nature of reduction targets (the “cap”), and the use of offsets. Such differences will not only affect how each system performs when assessed against different assessment metrics, such as their environmental effectiveness and economic efficiency, but also have significant implications on how systems interact and potentially converge over time.

In an effort to contribute to this debate, this paper evaluates the current state of carbon trading around the world focusing on lessons learned from existing and emerging systems. It attempts to contrast different design features, draws lessons from the analysed schemes and discusses their relevance for evolving trading systems in the developed and developing world. The first sections in this report outline developments in trading systems in Europe (EU ETS), North America (the WCI and RGGI), Australia, New Zealand, Japan (regional), China (regional), and South Korea. The second major section identifies three main categories of lessons that become apparent through this comparison of the development and design of systems. These lessons focus on: the role of the political and economic context for establishing emissions trading systems; system design; and system implementation and oversight.
2 Comparing Existing and Emerging Systems

2.1 Overview of Schemes

Figure 1 shows the (planned) implementation date and the (possible) size of the analysed schemes. The size of the regional and a possible national Chinese scheme is still uncertain, as it will depend on the coverage. The figure illustrates the dynamically growing emissions trading markets in the Asian-Pacific region. One of the important implications of these developments is that the possible centre of an international carbon market could shift away from the European Union and the OECD to the Asia-Pacific region.

Figure 1. Emerging emissions trading schemes

importantly, not all of the new markets are copies of the more established ones. As described above, China is experimenting with multiple pilot designs, and even the North American and Australian systems are designed to meet domestic political and economic requirements and thus are different from each other and from the EU ETS. This pattern of development could cause challenges to the development of a future global carbon market. Instead of a single unified market, the increasingly likely reality is a network of regional and national markets. In some cases this has been explicitly anticipated and some systems, such as the WCI have tried to avoid certain design features, such as price caps, that may be barriers to potential linkages. Australia has modified its planned scheme design after deciding to link it to the EU-ETS. It dropped the initially planned price floor as well as modified international offset provisions. Table 1 compares design elements of existing and emerging trading schemes. As can be seen there is significant diversity across the trading systems currently implemented or under design in the regions covered in this paper.
<table>
<thead>
<tr>
<th>Price management</th>
<th>European Union</th>
<th>WCI</th>
<th>RGGI</th>
<th>Australia</th>
<th>New Zealand</th>
<th>Japanese regional (Tokyo)</th>
<th>South Korea</th>
<th>China regional (based on Beijing, Shanghai and Guangdong)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possibility to move forward auctions to address excessive price volatility</td>
<td>Downstream coverage of energy and industry sectors</td>
<td>Downstream electricity generation and industry, upstream residential, commercial and industrial fuel, transportation</td>
<td>Downstream coverage of power generation</td>
<td>Electricity and industry Also fugitive emissions and waste, and some transport fuels (rail, shipping)</td>
<td>Stepwise inclusion of all sectors of the economy</td>
<td>Commercial and institutional buildings and industrial facilities</td>
<td>Factories, buildings and livestock farms</td>
<td>Broad coverage (factories, buildings), including also indirect emissions reductions from energy savings</td>
</tr>
<tr>
<td>Stringency of targets</td>
<td>Coverage</td>
<td>Trading units and offsets</td>
<td>Allocation method</td>
<td>Penalties</td>
<td>Price management</td>
<td>Table 1. A comparison of the different design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporal flexibility</td>
<td>At least 21% below 2005 levels by 2020, may be further strengthened</td>
<td>15% reduction from 2005 level by 2020</td>
<td>1.3 times the shortfall, monetary fines</td>
<td>EUR 100 per excess tonne plus surrendering of missing allowances in the next calendar year</td>
<td>Limited use of interventions mechanisms</td>
<td>Downstream coverage of energy and industry sectors, upstream residential, commercial and industrial fuel, transportation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allocation method</td>
<td>At the beginning of the year</td>
<td>Allowed to increase the use of credits outside Tokyo and enable the use of Kyoto Credits</td>
<td>1% reduction up to 2020 compared to 2000</td>
<td>thrice the market value per excess tonne of emissions</td>
<td>Price cap originally until end of 2012, but in the meantime extended</td>
<td>Stepwise inclusion of all sectors of the economy</td>
<td>Commercial and institutional buildings and industrial facilities</td>
<td>Broad coverage (factories, buildings), including also indirect emissions reductions from energy savings</td>
</tr>
<tr>
<td>Trading units and offsets</td>
<td>CERs/ERUs</td>
<td>Allowances measured in short tons (907.18 kg); offset credits from RGGI states; limited EUAs, CERs, ERUs if price exceeds certain level. Sink credits allowed</td>
<td>During fixed price period no int'l permits, (ACCU) created by the Carbon Farming Initiative may be used to max 5%. During flexible price period int'l permits up to 50%; (however 12.5% limit on Kyoto units) and unlimited ACCUs</td>
<td>3 allowances for each tonne not covered</td>
<td>European Union, EUA, CER, ACCU, emissions allowance</td>
<td>Japanese regional (Tokyo)</td>
<td>Commercial and institutional buildings and industrial facilities</td>
<td>Broad coverage (factories, buildings), including also indirect emissions reductions from energy savings</td>
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<td>Limited use of interventions mechanisms</td>
<td>Access to offsets is increased if price exceeds certain level</td>
<td>Climate Change Authority; price cap, price floor was dropped in the meantime</td>
<td>Price cap originally until end of 2012, but in the meantime extended</td>
<td>Possibility to increase the use of credits outside Tokyo and enable the use of Kyoto Credits</td>
<td>Staging early auctions of allowances to increase the supply of credits when the price rises too high</td>
<td>Unclear</td>
<td>Unclear</td>
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<td>Temporal flexibility</td>
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<td>3 year compliance periods Banking possible</td>
<td>1 year compliance periods Unlimited banking possible</td>
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<td>Allocation method</td>
<td>In the second phase auctioning with exemptions for energy intensive industries</td>
<td>Auctioning with exemptions for Energy intensive industries</td>
<td>Auctioning, free allocation on an intensity basis for industries with leakage risk</td>
<td>Historical emissions and compliance factor</td>
<td>100% free allowances at the beginning (2015), 3% auctioning from 2018</td>
<td>Based on historical emissions, mostly free allocation</td>
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<td>Unclear</td>
<td>Unclear</td>
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</table>
The following chapters will give a more detailed overview of the schemes’ design features as well as experiences gained so far.

2.2 European Union

In operation since 2005, the European Union Emissions Trading System (EU ETS) has faced a number of challenges and undergone dramatic development, and has resulted in the creation of the largest market for an environmental commodity in history. Its evolution and design offer important insights for decision makers in other jurisdictions considering the implementation of an emissions trading system.

Currently, the EU ETS operates in 30 countries – all 27 EU Member States as well as Iceland, Liechtenstein and Norway – and covers CO₂ emissions from emitters in the power sector, combustion plants, oil refineries and iron and steel works, as well as installations producing cement, glass, lime, bricks, ceramics, pulp, paper, and board. More than 10,000 covered entities account for around 2 Gigatons or 40% of EU greenhouse gas emissions, a figure that is set to expand further as additional sectors – notably petrochemicals, ammonia and aluminum – and additional gases are included in the trading system in its third trading phase starting in 2013 and continuing until 2020.

No endeavour of this scope can be carried out without obstacles, and the EU ETS has encountered a number of expected and unexpected difficulties. More visible challenges have included a dramatic collapse of allowance prices in the early phase of trading and more recent scandals involving security breaches and criminal activity. Somewhat less exposed to public scrutiny, yet still of great relevance for the success of the EU ETS, have been concerns about its impact on the competitiveness of industry as well as interactions with other policy instruments.

Central lessons from the first EU ETS trading period have included the importance of accurate data when defining the “cap”, or aggregate amount of allowances in the system, especially when these are allocated free of cost; and the risk of devolving decisions about allowance quantities and allocation to entities other than the central administrator (in this case the governments of Member States). With its latest reform, the EU ETS has seen a clear trend towards greater centralization to counteract understandable, yet detrimental incentives of the Member States to favour domestic industries when allocating allowances. Likewise, free allocation is being successively replaced by auctioning as the default allocation method, responding to expert recommendations from since the outset of the European carbon market, yet opposed by a significant number of covered entities. For policy makers, these recommendations can result in a need to balance environmentally optimal and politically feasible design options; perhaps the ultimate lesson from the first trading period, therefore, was the value of a learning phase: as the shortcomings of the trading system became evident in the initial trading period, governments were able to better justify amendments to the system. In addition, through the EU ETS a great deal of insight has been generated into distinguishing genuine competitiveness risks. Prior to the introduction of the EU ETS, there was widespread fear among industry representatives that the trading system would substantially undermine their ability to compete with foreign industries exempt from a comparable price on carbon. In essence, they feared that the EU ETS would force European manufacturers to either relocate their production or lower their output, shifting industrial activities and associated emissions abroad. As a result of such “carbon leakage”, the emission reductions achieved in Europe through the EU ETS would be more than offset by emission increases elsewhere. Several empirical studies have looked into the issue and concluded that, while leakage can occur, it is not nearly as large a threat as it has expected to be, with most sectors far more exposed to cost differentials in labour and other inputs (Grubb et al., 2009). Still, for those sectors considered most at risk of leakage, the EU ETS has chosen to mitigate any detrimental impacts through more favourable allocation terms, and additional policy options remain at the disposal of decision makers.

Finally, another major challenge under the EU ETS arises from the fact that less than half of European greenhouse gas emissions are included in the carbon market. Activities not currently covered by the trading system have been governed by a wide range of regulatory and flexible instruments, some of
which predate the EU ETS by far. Although the EU ETS is part of a complex policy environment that may influence the carbon price, to date no intervention mechanisms have been introduced to manage price levels as are being introduced in other countries. Proponents of the current framework argue that market intervention should be limited to an absolute minimum, with any interference in price discovery a distortion of existing forces of supply and demand, and a threat to confidence in the stable parameters of the European carbon market. Still, recent price fluctuations and volatility have given rise to a renewed discussion of mechanisms to stabilize or manage carbon prices, for instance through creation of a floor price.

2.3 North America: WCI and RGGI

As was occurring in the late 1990s and early 2000s, North American climate policy continues to be pursued primarily at the state and provincial levels (Rabe 2008). Within the broader category of market mechanisms, the two most established regional efforts in North America remain the Western Climate Initiative (WCI) and the Regional Greenhouse Gas Initiative (RGGI), two initiatives that are conducted in the absence of federal policy. Developing and implementing climate policy remains a contentious and slow process in North America. During the last several years the political context for climate policy development has become increasingly difficult both in the United States and Canada. US attempts to implement a federal cap-and-trade system died in the Senate in 2010 and midterm elections in 2010 resulted in a solid victory of the Republican Party, which successfully captured a majority in the House of Representatives and eroded the majority of the Democratic Party in the Senate. Within the United States the primary federal activities continue to revolve around disputes about the extent to which the federal government can regulate CO₂ through the Environmental Protection Agency (EPA).

Meanwhile, in Canada a government led by the Conservative party has been unwilling to explore climate policy efforts independently from progress in its southern neighbour. When the US administration under President Barack Obama was promoting a federal cap-and-trade scheme the Canadian federal government appeared inclined to proceed in the same direction, but with the failure of the American initiative, Canada too has backed away from carbon trading as a mainstay of its domestic climate policy. Currently the central focus at the Canadian federal level is the implementation of fuel efficiency standards in conjunction with similar policy developments in the United States. Canada made international headlines in late 2011 when it was the first country to officially withdraw from the Kyoto Protocol due to its unabated growth in emissions after 1990.

With the following sections this paper traces the current status of both systems and summarizes the key lessons that emerge from their establishment and operation.

### Table 2. Emerging WCI emissions trading schemes

<table>
<thead>
<tr>
<th>Schemes operational</th>
<th>Expressed interest but no regulations</th>
<th>Will not be implementing cap-and-trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>Ontario</td>
<td>Montana</td>
</tr>
<tr>
<td>Quebec</td>
<td>British Columbia</td>
<td>Utah</td>
</tr>
<tr>
<td></td>
<td>Manitoba</td>
<td>Oregon</td>
</tr>
<tr>
<td></td>
<td>Washington</td>
<td>New Mexico</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arizona</td>
</tr>
</tbody>
</table>
2.3.1 **Western Climate Initiative (WCI)**

The WCI is comprised of Western US states and Canadian provinces that have developed a comprehensive strategy for reducing global warming pollution 15 per cent below 2005 levels by 2020, including a regional carbon market. Cap-and-trade is the central policy instrument for mitigation in the WCI, complemented by additional policies for specific sectors and activities.

The WCI regional cap-and-trade program will be composed of individual jurisdictions’ cap-and-trade programs which would be linked once they were established in each jurisdiction. Trading throughout the WCI was supposed to start in 2012, but as most jurisdictions do not have the required regulations in place or have withdrawn from the cap-and-trade portion of the WCI, this date has been postponed. Initially, the WCI involved seven American states and four Canadian provinces. However, only California and Quebec have passed cap-and-trade regulations. The Californian and Quebec schemes started on January 1, 2013. In December 2012 the Quebec Cabinet adopted a regulatory amendment to its cap-and-trade program, proposing to link its emissions trading system with the California AB32 program.¹

British Columbia, Ontario and Manitoba have continued to express interest, but formal regulations have not been passed in these jurisdictions. New Mexico passed regulations in late 2010, but these were immediately halted by the newly elected Republican governor in early 2011.

**Basic Structure**

The basic structure of the WCI is a decentralized cap-and-trade program in which jurisdictions cooperate to design individual systems that can be linked to create a single market. Each jurisdiction is responsible for setting its own cap in light of the regional aim of a 15% reduction of 2005 GHG levels by 2020. While some general guidelines for establishing jurisdiction-specific caps were agreed upon, these guidelines were extremely broad in the hopes that flexibility in this regard would facilitate greater participation. However, prior to linking one jurisdiction’s system to another, each would have the opportunity to review the others jurisdiction’s program to assess its consistency with the program design.

Within the jurisdiction in which it is adopted, the coverage of the cap and trade scheme is very high. In the initial phase of development the majority of large-emitting installations in all industrial and power sectors would be included, and transportation and commercial sectors are due for inclusion in the second phase. Between 85 and 90% of total GHG emissions in the participating sectors would be covered in the second phase which, in theory, would start in 2015. In participating jurisdictions all installations emitting over 25,000 t CO₂e per year would be included in the scheme.

The basic guidelines of the WCI allow for some cost containment measures, including allowance reserves, limited borrowing, and auction floor prices, but exclude hard price caps and unlimited borrowing as contained in some of the earlier proposals for a federal US cap-and-trade system². Both California and Quebec have declared a price floor of 10$ a tonne (Canadian and American dollars respectively) for 2012-2013 allowances, which is set to increase by 5% plus the annual rate of inflation thereafter.³ Initial modeling of the WCI suggested that overall prices might go to 33$ US a ton⁴ but these models are now considerably out of date as the new WCI is much smaller than the original design. No price ceilings have been included in the design either of the WCI as a whole or within

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¹ [http://www.mddep.gouv.qc.ca/communiques_en/2012/c20121213-carbone.htm](http://www.mddep.gouv.qc.ca/communiques_en/2012/c20121213-carbone.htm)
individual jurisdictions’ regulations – instead the focus has been on the use of reserve allowances. Both California and Quebec set aside 4% of allowances for this purpose.\(^5\)

Auctions were initially recommended by the WCI but as jurisdictions got closer to implementation the extent of auctioning eroded. In the final WCI design auctions were to account for at least 10% of allowance allocation.\(^7\) This amount is maintained in the California regulations, but all other allowances are distributed for free. A unique feature of the California design is the allocation of free allowances to electricity providers, who are then required to sell them in order to avoid passing costs on to consumers. In line with the WCI design in Quebec heating and transportation fuels will be covered from 2015, and will be subject to 100% auctioning. All other covered sectors, except oil and gas which are not apparently eligible for free allocations\(^8\) are given the majority of their allowances for free – ~ 80% in 2013.\(^9\) At this point no modelling of the Quebec context is publicly available, making any consideration of windfall profits or other economic implications of this allowances structure impossible to identify.

One of the central activities of the WCI has been to approve a standard set of protocols for offsets. Offsets must account for less than 50% of total emission reductions and any installation can, at a maximum, use offsets for up to 8% of its total emissions. Unlike in the EU-ETS, international credits, such as CERs from CDM projects, are not permitted into the scheme. The decision to limit international offsets was initially caused by concerns about the rigour of MRV in overseas projects but it should be noted that several WCI jurisdictions have large forestry and agricultural sectors. Under the current design offsets are almost entirely to be sourced domestically from the sole large sectors excluded from the system.\(^10\) These sectors include agriculture (largely manure management), forestry, and landfill gases. Energy efficiency measures would in principle be included but would have to flow from installations smaller than the threshold for inclusion in the WCI. In practice, offsets generated from such small installations are often too small to be economically viable when faced with the costs of verification and development. California’s regulations have left the door open for the possibility of international credits, including REDD credits at some point in the future but this is not set to start immediately.

Aligning the design with the EU-ETS

Throughout the process of designing the WCI considerable efforts were taken to reflect the EU ETS as much as possible and the basic structure is similar enough that linking would be unlikely to pose insurmountable difficulties. The range of offsets included in the two schemes are different, but each system is committed to strong MRV which would facilitate market integration.

Political Challenges

By 2009 it looked like the WCI was well on its way to becoming the second largest GHG emission trading system in the world and a structure that provided an initial skeleton to a federal American policy. At this point the WCI was important either as a trial system until the federal scheme was up and running, or as a trading system on its own merits. The situation by the end of 2012 looks entirely different. As described, only California and Quebec have succeeded in passing the required regulations, and while the remaining provinces have maintained interest in principle and are still at the table, it is unclear when, if ever, and in what way, they will join. Simultaneously, in the six states other than California cap-and-trade, and in some situations climate policy in general, is off the agenda entirely.

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\(^5\) California, *California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms*.  
\(^6\) Quebec, *Regulation respecting a cap-and-trade system for greenhouse gas emissions allowances*.  
\(^8\) Quebec, *Regulation respecting a cap-and-trade system for greenhouse gas emissions allowances*.  
It is important to note that both of these initiatives were conducted in the absence of federal policy. In both countries, the US and Canada, large scale carbon taxes were not seen to be politically feasible. Some of this may be due to ongoing tensions in the United States about the desirability of taxation in general, and the particular dislike of taxation expressed through the Republican party. Canada has repeatedly tied its climate policy to the US positions and significantly, the party promoting a carbon tax during the 2008 federal elections was forced to renounce this position after resounding resistance by voters. An exception to this has been the development of a carbon tax in British Columbia – a carbon tax that was in part introduced along with the Western Climate Initiative. In this specific case industries were exempt from the tax if they were to be regulated under the WCI, offering a potentially less expensive option and eroding political resistance to the provincial tax.

Montana exports about 40% of the electricity it produces, almost all of it from coal. In contrast, none of the jurisdictions that have continued to express interest in emissions trading, including California, have particularly large fossil fuel industries. British Columbia, Quebec and Manitoba are largely reliant on hydroelectricity, California is an energy importer, and Ontario was already in the process of phasing out coal power plants due to air pollution concerns. These background economic conditions fed into political differences in opinion about the desirability and costs of an emission trading scheme. Besides economic arguments, the effectiveness of emissions trading was increasingly questioned. Economic costs in the context of the economic crisis and publicized observations about fraud and market manipulation in the EU ETS for example contributed to the decision of Oregon and Washington to stop cap and trade developments, and focus instead on domestic planning and transportation policies.

Also the consistently low prices in the EU ETS contributed to speculation about the effectiveness of the policy in supporting long term investment and emission reductions.

The actual structure of the WCI is characterized by a diversity of energy systems and decentralization shaped some of its problems. The diversity across jurisdictions in energy systems and size of covered emissions created imbalances, especially in the smaller sub-set of jurisdictions left after 2010. California accounts for over half of the greenhouse gas emissions in the market. For relatively small provinces, such as British Columbia, the possibility of having a market dominated by California raises questions about their strategic interests in pursuing a linked market. This is accentuated in this case because BC, Quebec and Manitoba are all dominated by hydroelectric power, and have all pursued multiple climate policies including a carbon tax in BC. The concern is that emission reductions in these provinces could be relatively expensive, resulting in mass purchase of credits from California and an internal erosion in financing for domestic long-term transitions to a low-carbon economy.

2.3.2 The Regional Greenhouse Gas Initiative (RGGI)

In operation since 1 January 2009, the Regional Greenhouse Gas Initiative (RGGI) is a joint effort by a group of states in the U.S. Northeast and Mid-Atlantic to implement a regional cap-and-trade system including Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. Although it represents the first mandatory emissions trading system for greenhouse gases and has been mostly received with approval, RGGI has lately been beset by a number of challenges, including weak allowance prices, a drop in trading activity, and political setbacks. Following the conservative surge in the 2010 midterm elections, several participating states threatened to abandon RGGI, and the governor of New Jersey formally withdrew his state effective

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11 Hardisty, Johnson, & Weber, A Dirty Word or a Dirty World?: Attribute Framing, Political Affiliation, and Query Theory, Psychological Science. 2009
12 CBC news, “Carbon tax plan ‘good for the wallet,’ Dion pledges - Canada - CBC News” June 2008
While this has reduced the overall scope and impact of the system, an independent analysis of the system recently still considered it a success, and a review process that has started this year is addressing major features currently undermining its environmental effectiveness.

**Basic Structure**

Under this system, emissions from fossil-fuel electricity generators larger than 25 MW are covered, with the aim of stabilizing these at 188 million short tons of CO\textsubscript{2} per year between 2009 and 2014, and subsequently reducing them by 10 percent until 2019 for the ten-state region. From 2012-2014, the cap is 165 million short tons of CO\textsubscript{2} per year for the nine-state region. Beginning in 2015, the cap will decrease by 2.5 percent per year, for a total reduction of 10 percent by 2018.\footnote{\text{http://www.rggi.org/design/overview/cap}}

Each participating state receives an emissions budget and is free to determine how to allocate 75 percent of the corresponding allowances among covered participants. At least 25 percent of the allocated allowances must be assigned to consumer benefit or strategic energy purposes, such as advanced energy technologies, yet in practice most of the allowances are auctioned (RGGI, 2008). Five types of offsets are eligible for compliance, including carbon sequestration from afforestation projects, with limits on the percentage that covered entities may use to meet their compliance obligations. Specifically, if the 12-month rolling average price for RGGI allowances exceeds 7 USD per short ton, entities may use offset credits to meet up to 5 percent of their obligation; if the 12-month rolling average exceeds 10 USD, entities may offset up to 10 percent of emissions. In the latter case, participants may also use credits from any “governmental mandatory carbon constraining program that places a specific tonnage limit on greenhouse gas emissions” – which would include the EU ETS – as well as certified emission reduction credits issued under the UNFCCC or any subsequent protocol, such as the Kyoto Protocol.\footnote{\text{See Section XX.10.3(b)(1) of the Regional Greenhouse Gas Initiative Model Rule, 15 August 2006, revised on 31 December 2008, available on the Internet at: \url{http://rggi.org/docs/Model%20Rule%20Revised%202008.pdf}.}}

**Review and Outlook**

Because of the modest initial target, reduced electricity demand due to the recession and a significant shift from coal to natural gas for electricity generation, the market has been oversupplied with allowances and the price has fallen to near the minimum clearing price allowed at auction (Point Carbon, 2012).\footnote{RGGI allowances traded at an average of $1.90 per short ton during most of 2011, only a few cents above or below the auction reserve price – the minimum clearing price allowed under the system – of $1.89, see Point Carbon (2012).} Despite these low price levels, however, a recent analysis of the economic impacts of RGGI commissioned by a group of nonprofit foundations and conducted by an independent research organization concluded that RGGI has had a positive macroeconomic impact while helping reduce emissions in participating states, mainly through investments in energy efficiency measures and renewable energy deployment which were financed through a share of the 912 million USD generated from allowance auctioning in the same period.\footnote{\text{See Hibbard et al., 2011; in terms of emissions reductions, one of the study’s authors, Susan F. Tierney, estimates that these fell by 6 percent more than would have been possible without RGGI, see Navarro, 2011: A22; it bears noting, however, that there were differences in how individual states applied the proceeds, with New York and Massachusetts mostly investing these in energy efficiency measures, while New Jersey used much of the revenue to offset a shortfall in the state budget.}} These results highlight some of the benefits of substantial auctioning even when prices are low. Specifically, the analysis suggests that the first three-year control period added 1.6 billion USD in net present value (NPV) to the region, with capital flows into economic goods and services as well as ratepayer savings from energy efficiency improvements clearly outweighing net revenue losses in the energy sector.\footnote{Hibbard et al., 2011: 33. This outcome is notable in that it lends further support to auctioning as a method of allowance allocation, demonstrating that even an}
excessively generous cap can result in emission reductions if the auctioning revenue is invested in greenhouse gas abatement measures.\textsuperscript{23}

Several states participating in RGGI recently agreed to retire a majority of unsold allowances and auction only allowances from the current control period, that is, to offer no allowances from future control periods.\textsuperscript{24} Aside from an immediate dampening effect on the supply of allowances, this decision also suggests that participants expect to tighten the overall cap going forward, and this is one of the main issues under discussion in a comprehensive review of the RGGI program required under the establishing Memorandum of Understanding (MOU). As specified therein, the program review started in 2012 and includes, among other things, an evaluation of program success, program impacts, additional reductions, leakage effects, and offsets.\textsuperscript{25} Recommendations ensuing from the review are expected early 2013.

\subsection*{2.4 Australia}

In November 2011 the Australian Parliament adopted the Clean Energy Future Package including an Australian emissions trading scheme. The package is made up of 18 bills that aim to cut pollution and drive investment. It assigned a price to carbon starting July 1, 2012 cutting Australia’s emissions 5\% below 2000 levels by 2020 (though the target can be strengthened based on science or international action). In addition to the ETS’ unconditional target of reducing 5\% by 2020 from 2000 baseline the bill includes a Renewable Energy Target (20\% renewable electricity supply by 2020) and energy efficiency measures.

\textbf{Basic Structure}

Around 60\% per cent of Australia’s carbon pollution is covered by the carbon price, including pollution from electricity generation, stationary energy, some business transport, waste, industrial processes, and fugitive emissions. Emitters of more than 25,000 tonnes of CO\textsubscript{2}e per year need to acquire permits. There will be approximately 500 entities directly liable for their emissions under the carbon pricing mechanism. Australia introduced a Carbon tax from July 2012, as an initial three-year fixed price period. The tax amounts at A$23 and rises by 2.5\% in real terms for the following two years. During the first three years after the switch to a floating carbon price (beginning with 2015), a price collar was planned to keep the carbon price above a floor of A$15 rising annually by 4 per cent in real terms and below a ceiling of A$ 20 above the international carbon price for 2015-16.

In August 2012 the Australian government and the European Commission announced their plans to link to the two schemes no later than 1 July 2018 (European Commission, 2012). To enable linking the Australian government abandoned the minimum price for carbon permits and made also changes regarding the use of international credits. Entities under the scheme will still be able to meet up to 50\% of their liabilities through purchasing eligible international units during the flexible price period, however only 12.5\% of their liabilities will be able to be met by Kyoto units (European Commission, 2012). During the fixed price period Australian Carbon Credit Units (ACCUs) created by the Carbon Farming Initiative (CFI) may be used to max 5\% of party’s liability. During the flexible price unlimited ACCUs can be used. The Carbon Farming Initiative (CFI) is a carbon offsets scheme that will provide

\textsuperscript{23} An additional impact are the benefits for generators of renewable and other low-carbon electricity sources as a result of price increases in the broader electricity market under the trading system. Because generators do not need to purchase the same number of allowances as more carbon-intensive generators, the price increase translates into net profits. Greater availability of renewable generation in the electricity system, moreover, tends to alter the merit order of electricity sources by counteracting the effects of peak demand, thereby lowering the average price per unit of electricity.

\textsuperscript{24} See Regional Greenhouse Gas Initiative 2012 Auctions Updates, 17 January 2012, available on the Internet at: http://rggi.org/docs/Auctions/011712_Announcement-2012-Auctions.pdf. The states of New York, Connecticut, Delaware, Massachusetts, Rhode Island, and Vermont announced that they were permanently retiring unsold carbon allowances from previous auctions, amounting to a total of roughly 67 million allowances; additionally, Maryland has stated its intention to retire unsold allowances, which would raise the percentage of retired allowances to 93 percent.

\textsuperscript{25} See Section 6.D. of the RGGI MoU
new economic opportunities for farmers, forest growers and land managers while also helping the environment by reducing carbon pollution. Carbon offset credits created through the CFI represent reductions in greenhouse gases in the atmosphere through increasing the amount of carbon stored in soil or trees, or reducing or avoiding landfill or livestock manure emissions.

The Clean Energy Bill provides for limited borrowing (up to 5% of compliance requirement) and unlimited banking of permits. The penalty rate under the Australian ETS is twice the annual average market price.

Generally a large share of permits will be auctioned from the beginning of the scheme. The revenues will be used to act in non-covered sectors or to assist business to cut emission. To reduce the risk of industrial production moving from Australia to countries where carbon is not priced, the authorities plan to allocate a large share of allowances at no cost to producers of trade-exposed outputs such as cement, steel, aluminium, coal and LNG. For many emissions-intensive trade exposed businesses the impacts on their bottom line will therefore be small (Jotzo, 2012). Allocations will be made using an industry emissions benchmark that is set on a unit-of-production basis.

More than half of the money raised from auctions will be used to assist households. Household transport fuel consumption will not be subject to a carbon price. The majority of households will receive tax cuts, increased assistance payments or both. The carbon pricing package is flanked by a range of other new policy initiatives to support investment in renewable energy (including a A$10 billion financing facility), energy efficiency, and land-based carbon sequestration. As part of the Clean Energy Future package, a series of measures have been established to maintain energy security and market stability through targeted support for emissions-intensive electricity generators.

The Australian government will create an independent body, the Climate Change Authority, which will oversee the scheme, track Australia’s pollution levels and provide independent advice to the Government on the performance of the carbon price and other initiatives. In addition it will set up a regulator authority, the Clean Energy Regulator that will administer the carbon pricing mechanism.

2.5 New Zealand

The New Zealand Emissions Trading Scheme (NZ ETS) scheme brings in all sectors of the economy over a period of several years. Forestry was the first sector to enter the scheme (on 1 January 2008). The New Zealand emissions trading scheme thereby is the first worldwide to include emissions from deforestation under the cap, rather than via offsets. Three other sectors joined in July 2010 (liquid fossil fuels, stationary energy and industrial processes). Waste and synthetic greenhouse gas sectors entered the scheme in January 2013, when the agriculture sector will enter is unclear. The NZ ETS has no specific cap and so far operates within the national 2012 Kyoto Protocol target (ie. the country has agreed to bring net emissions down to 1990 levels over the period 2008-2012).

A New Zealand Unit (NZU) is the primary domestic unit of trade, which is issued by free allocation to emitters, with no auctions intended in the short term. The scheme also allows unlimited use of international Kyoto credits, including RMUs, with the exception of forestry CERs (ICERs and tCERs). The scheme provides several transitional measures: Stationary energy, liquid fossil fuels and industrial processes will have to surrender a one tonne unit for every two tonnes of emissions. Furthermore the scheme includes a fixed price option of $25/tonne allowing sectors facing obligations to pay rather than purchase units to limit costs and enhance stability in the start-up phase until 2013. To protect emissions-intensive and trade-exposed businesses against a loss of competitiveness and carbon leakage, the free allocation of NZUs is provided on an intensity basis, which means allocation will vary depending on a participant’s level of output. For agriculture, all activities are presumed to be emissions intensive and trade exposed, and will therefore initially receive a level of assistance covering 90 per cent of an emissions baseline. For industry, only those activities that meet emissions intensity and trade-exposure criteria are eligible for allocation. These eligible industrial activities initially receive
a level of assistance covering either 60 per cent or 90 per cent of an emissions baseline depending on whether the activity is moderately or highly emissions intensive.

**Review and legislative changes**

A review of the New Zealand Emissions Trading Scheme in 2011 showed that impacts of the ETS for the majority of businesses and households are currently low even if there are also businesses for which the impacts of the ETS seem to be significantly greater than average. The review recommended the government to make a strong statement about its long-term commitment to the ETS in order to achieve long term certainty to business (NZ ETS Review 2011).

- The review stressed the importance of transitional measures in the beginning of the scheme, but recommended the current obligation for businesses to surrender one emissions unit for every two tonnes of emissions be phased out over three years so that in 2015 businesses will have to surrender one emissions unit for each tonne of emissions. Under current legislation, the one-for-two obligation and price cap are currently due to end completely in 2012. In the amendment to the New Zealand ETS in November 2012 the New Zealand government extended it beyond 2012 without specifying an end date in legislation (New Zealand government, 2012a).

- The review emphasised that any further short-term moderation of the carbon price should not create additional uncertainty that medium- to long-term investments need to factor in a full price of carbon. Within the legislative changes the New Zealand government decided that participants will also in future have the choice to meet their obligations by paying the Government $25 per tonne of emission (New Zealand government, 2012a).

In 2011 the majority of credits used in the New Zealand ETS were international credits caused by the low level of international Carbon prices (New Zealand government, 2012b). The New Zealand government therefore introduced a power to allow the Government to sell NZUs by auction, within an overall cap on the number of NZUs auctioned and allocated reducing the need for NZ ETS participants to purchase international units. Furthermore the New Zealand government removed the start date (planned to be 2015) for surrender obligations for biological emissions from agriculture and has indicated biological emissions from agriculture will only incur surrender obligations if there are technologies available to reduce these emissions and also international competitors are taking sufficient action on their emissions (New Zealand government, 2012a).

### 2.6 Japan

Japan has been discussing the introduction of a national mandatory ETS for ten years but no decision to introduce it has been taken so far. Plans by Japan to implement a comprehensive mandatory federal carbon emissions trading scheme by 2013 have been put on hold at least until 2014. Over the last years different proposals for such a national emissions trading scheme were discussed without finding common ground. On the national level Japan has a voluntary trading scheme in place (JVETS). At the regional level trading schemes emerged in Tokyo, Saitama and Kyoto.

#### 2.6.1 The Tokyo ETS

Tokyo started from 2011 with an emissions trading scheme targeting energy related CO₂ emissions and requiring 1,300 of Tokyo's most energy and carbon intensive organisations to meet legally binding emission targets.

The covered entities are 1,100 Commercial and institutional buildings and 200 industrial facilities with annual energy consumption of 1,500 kl or more (crude oil equivalent) representing 40% of commercial and industrial sectors’ emissions (Chiba, 2011). The ETS forms the main pillar of the Tokyo Metropolitan Governments (TMG) comprehensive effort to achieve emissions reductions of 25% between 2000-2020. During the first phase of the scheme, which runs up to 2014, participating organisations will have to cut their carbon emissions by six per cent and in the second period from 2015 to 2019 by 14% (Chiba, 2011). Allowances are allocated based on historic emissions. If entities
don’t meet their reduction targets they have to reduce 1.3 times the shortfall and, in addition, if they do not pay the monetary fines they face public announcements of their failure to meet their obligations (Chiba, 2011). Banking is allowed in the Tokyo scheme but borrowing is not (Ishinabe, 2010).

The covered entities can use offsets within several limitations (Rudolph et al, 2012):

- Emission Reduction Credits from energy savings in small or midsize facilities in Tokyo not covered by the TMG ETS (unlimited)
- Renewable Energy Credits from electricity production by solar (heat, electricity), wind, geothermal, hydro (under 1,000 kW), biomass (biomass rate ≥ 95%) etc.; due their positive effects, renewable energy credits are counted 1.5 times the value of regular credits.
- Emission Reductions Credits from outside Tokyo but within Japan; credit sellers must be large facilities with less than 150,000 tons of base year emissions; the company has to be regulated under the TMG ETS; credits are only accepted for one third of facilities.

Kyoto credits are not allowed in the beginning of the program.

To prevent price surges measures may be taken such as expanding the supply of credits for small and medium-sized enterprises in Tokyo, or increasing the use of credits outside Tokyo and enabling the use of Kyoto Credits on condition that credits for small and medium-sized enterprises in Tokyo are also used.

The Tokyo Metropolitan Government (TMG) joined the International Carbon Action Partnership (ICAP) as an official member in 2008 in an effort to show support for emission trading as a climate mitigation strategy.

The development of the Tokyo system started in 2004 and has yielded a number of important lessons – many of which speak directly to the administrative and governance requirements of establishing a cap-and-trade system capable of achieving emission reductions and, perhaps more importantly, spurring long-term investment in low carbon technologies and business models. The initial stage of policy development in Tokyo featured a voluntary program which resulted in a minimal emission reduction of only 2% (Chiba, 2011). However, the data collected through this process and ongoing stakeholder engagement facilitated the creation of a mandatory programme with a more aggressive emission reduction target. Having robust data collected over a number of years allowed regulators to demonstrate the technical opportunities for ongoing emission reductions which was important in gaining the support and confidence of stakeholders and investors. In addition, the long-term political message calling for emission reductions throughout this period, from 2004 to the present, may have contributed to a political context in which it became accepted by diverse stakeholders that some form of emission regulation was inevitable.

Simultaneously, it may be important to note that while regulators were signalling the inevitability of emission reduction regulations, the Tokyo system was also designed to highlight the business opportunities emerging from the transition to green buildings, low carbon technology and renewable energy. The system includes recognition of renewable energy certificates and energy efficiency offsets from small and medium-size enterprises otherwise excluded from the market. This strategy aims to maximize the opportunities created through the scheme and to leverage private sector investment. First, data from the fiscal year 2010 show that covered entities could reduce emissions by 13% already, half of the reduction required by 2020. The Tokyo metropolitan government emphasizes that the reductions were the result of active reduction measures and not mainly caused by electricity shortages after the earthquake (TMG, 2012).

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Tokyo’s approach highlights the importance of the underlying political economy of establishing the markets and of designing systems in which key stakeholders can find pathways to transform market constraints into opportunities.

2.6.2 The Saitama and Kyoto’s trading schemes

Japan has two other regional emissions trading schemes, the Saitama cap-and-trade program and Kyoto’s ETS that started in 2011.

The Saitama ETS

The Saitama ETS targets owners of large facilities (office buildings and factories) whose consumption of fuels, heat and electricity in the previous fiscal year is 1,500kl or larger (crude oil equivalent) (Yasuharu, 2010). The number of covered facilities is about 600. The entities face an absolute emissions cap with grandfathering as allocation method. The allocated allowances are the base year emissions (average emission of consecutive 3 years between FY2002 and FY2007) x Compliance factor (6% or 8%) x Compliance period (Yasuharu 2010).

The tradable allowances include reduction surplus certified by the Prefecture (Emissions reduction exceeding the yearly obligation by covered facilities), emissions reduction credits from small and midsize facilities in Saitama (Emissions reduction by energy-saving measures) and forest sink credits (equivalent to amount of CO₂ reduction by forest sinks) (Yasuharu, 2010).

The Kyoto ETS

The scheme is part of the local government’s strategy to cut its greenhouse gas emissions, currently at 12.3 million tonnes of CO₂ equivalent, to 25 percent below 1990 levels in 2020 and 40 percent by 2030 (Masaki, 2011). Around 280 businesses have to submit three-year emission reduction plans, although participation in the ETS is voluntary. Companies that struggle to meet their targets can fund emission reductions at small- and medium-sized facilities in the prefecture, for which they will be given Kyo-VERs, which they can use for compliance. They can also earn Kyo-VERs by participating in forest conservation projects (Masaki, 2011). The has ruled out the use of U.N.-issued credits because they don’t contribute to local emission cuts (Masaki, 2011).

2.7 China

China is now the world’s second largest economy, and is expected to continue its rapid economic expansion in coming decades. Largely based on the strength of its manufacturing sector, however, China’s economic growth has been accompanied by a heavy environmental footprint. Soaring industrial activity, rising demand for consumer goods, and rapid deployment of new housing, transport and commercial infrastructure have rendered China the largest emitter of heat-trapping greenhouse gases, contributing 25% of global annual emissions. Chinese leadership has recognized the need to decouple further economic growth from greenhouse gas emissions, pledging improvements in energy efficiency and an increase in the share of alternative energy sources. Within the Copenhagen Accord, for instance, China has pledged to reduce its carbon intensity by 40-45% by 2020 relative to the 2005 level. A reduction of carbon intensity by 17% by 2015 relative to 2010 level has been set as mandatory target. But as more readily available abatement options are exhausted – in the past five years alone, energy consumption per unit of GDP has fallen by nearly 20%, mostly due to decommissioning of inefficient power plants – it will become increasingly challenging to achieve similar improvements in the carbon intensity of China’s economy.

In the logic of cost-effectiveness, market-based instruments have progressively drawn the attention of Chinese leaders. CO₂ emission trading was firstly concretized within the 5-province and 8-city low carbon region program. In 2010 the National Development and Reform Commission (NDRC), the leading ministry in charge of climate change in China, selected five provinces – Guangdong, Hubei, Liaoning, Shaanxi and Yunnan – as well as eight cities – Tianjin, Chongqing (the first two cities are
administratively equivalent to provinces in China), Hangzhou, Xiamen, Shenzhen, Guiyang, Nanchang and Baoding\(^{28}\) as low carbon pilot regions. Local leaders are voluntary and willing to conduct low carbon pilot regions due to the national political environment which favours low carbon development in China. The choice of these provinces and cities has taken into account both the economic development and (social) balances among regions in China.

**Figure 2. Pilot Carbon Trading Schemes in China** (Source Climate Connect)

The NDRC is requiring these pilot regions to include low-carbon development models in their regional 12th Five-year plans. The regions are encouraged to experiment with different incentive mechanisms, including CO\(_2\) trading. The bottom-up approach to low-carbon development in this pilot program complements the top-down approach of 12th Five Year Plan. The pilot program attempts to provide practical experiences and identify appropriate strategies and tactics for localized low carbon development.

Emission trading is put forward by the 12th Five Year Plan, endorsed by the National People’s Congress on 14 March 2011. The Plan anticipates the “step by step establishment of carbon emission trading markets” to ensure further greenhouse gas reductions throughout the economy. Concrete policies follow this step. Two types of emissions trading markets are clarified: first, voluntary emissions trading will be established\(^{29}\) based on previous pilot programs conducted at local level. Second, pilot emissions trading schemes are set to be rolled out in four municipalities (Beijing, Chongqing, Shanghai and Tianjin), two provinces (Guangdong and Hubei) and one local level city Shenzhen (in Guangdong province), by 2013\(^{30}\). A national emissions trading system may follow from 2015, however there is no clear date yet for such a scheme to start. Although no official definition on the nature of pilot ETS is available so far, it could be considered a mandatory nature.

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A clarification on the relations between cities and provinces selected for conducting pilot ETS is necessary for a comprehensive review of this section. Four cities (municipalities) have equal administrative power as provinces in China, they are: Beijing, Tianjin, Shanghai and Chongqing. Leaders of these cities sometimes have higher chance to promotion to higher administrative level to the central government than leaders of provinces. Other cities mentioned in this paper are local cities which belong to provinces. In general, cities have rural administrative areas in China.

The part below provides a review of current actions taken place at these provinces and cities conducting pilot emission trading program. We first look at the ongoing actions on voluntary emissions trading and second on pilot ETS.

2.7.1 Pilot trading schemes in China- an overview

Voluntary emission trading in provinces conducting pilot ETS

Voluntary emission trading on CO\textsubscript{2} has taken place during the 11th FYP (2006-2010) period in China. A few standards have been published in order to formalize the voluntary emission reduction exchange (Panda standard, Chinaver, etc.). Other provinces and cities not chosen for pilot ETS have also implemented certain voluntary emission trading. In general, the lack of infrastructures and the savoir-faire and incentives of firms are major reasons of a poor market performance currently. Provinces and cities are now developing further voluntary emissions trading. For example, in Shenzhen city, most of the voluntary emission exchanges have taken place during the 2011 Shenzhen University Games. Shenzhen is now conducting a project which can generate verified emission reductions (VERs) based on new energy vehicles deployed in public transport sector in the city.\textsuperscript{31} In Hubei province, a first exchange has taken place in early 2012 where 20.000 tons of CO\textsubscript{2} were purchased by two firm.\textsuperscript{32}

In the hope of providing a general guideline to establish a voluntary emission trading market at the national level and boosting liquidity, the NDRC published the Provisional Regulation Plan of Voluntary Emission Trading in China on 13 June, 2012\textsuperscript{33}. According to this plan, projects which can generate additional emission reductions of six GHGs (CO\textsubscript{2}, CH\textsubscript{4}, N\textsubscript{2}O, HFCs, PFCs, SF\textsubscript{6}) can participate in voluntary emission trading where NDRC will be the charging national authority. Eligible projects include:

- projects applicable to approved methodologies by the national authority;
- CDM projects approved by the NDRC while not (yet) registered at the EB of the UNFCCC;
- CDM projects rejected by the the CDM Executive Board (EB). The trading unit is named as Chinese Certificated Emission Reduction (CCER) and measured in CO\textsubscript{2} eq.

So far, it seems that those voluntary emission exchange markets which are mostly project-based are still at the provincial level and no clear linkage to a national wide voluntary emission trading scheme is established. Further observations following the publication of the Plan mentioned above on first, how to link the local voluntary market at national level and second, how to boost voluntary emissions exchange could be important areas.

The Pilot ETS: a bottom up approach at local level

In this section, we provide a review on the ongoing establishment of pilot ETS in China. In general, the five cities and two provinces conducting pilot ETS account for 18% of China’s population and 28% of its national GDP, while their energy and carbon intensity are below China’s national average (Guerin and Wang, 2012). The capacity to pay is therefore the dominant reason of why these regions are selected to run pilot ETS programs. Given that ETS is usually a learning-by-doing process and that learning costs during the initial phases might be high in China under high economic growth and

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\textsuperscript{32} Internet source: http://roll.sohu.com/20120115/n332209020.shtml
development uncertainty, it could be an optimal social-economic choice to first let richer regions to conduct pilot ETS in order to minimise national wide learning costs in the long-term when other (poorer) regions start running ETS.

2.7.2 Beijing, Shanghai and Guangdong: first design choices

Beijing, Shanghai and Guangdong have already published their local ETS implementation guidelines which give (different levels of) details on components of ETS.

Policy horizon

Most of the pilot regions have defined 2013 as kick-off year and 2015 as the end of pilot period. There is so far no definition on post-2015 phase which is considered a transition phase from pilot to national wide ETS. Guangdong has additional a 2020 objective which aims to have a mature inner-provincial ETS as a solid basis for an inter-provincial ETS and defined clearly three phases I (2012-2015), II (2016-2020), III (after 2020). However, how the post-2015 phases can be compatible with a national wide ETS remains unclear as there is so far no official information on a national wide ETS.

Boundary

The boundary can be summarized by the following:

Beijing: Firms with annual CO\textsubscript{2} emissions (direct and indirect from CO\textsubscript{2} emissions of electricity consumed) during 2009-2011 above 10,000 tons will be included into the ETS. Other firms can participate in the ETS in a voluntary manner. Such a definition indicates that all sectors can be included into Beijing’s ETS if their annual CO\textsubscript{2} emissions go beyond 10,000 tons. Tradable quotas at ETS are direct and indirect (CO\textsubscript{2} emissions from electricity) CO\textsubscript{2} emissions and CCERs. There are no further precisions on whether quotas of direct and indirect CO\textsubscript{2} emissions can be mixed and exchanged freely. There is no precision on the limit of the use of CCERs.

Shanghai: A clear sectoral boundary is given: iron&steel, petrochemical, chemical, non-ferrous metal, electricity, building materials, textiles, pulp&paper, rubber and chemical fiber firms with annual CO\textsubscript{2} emissions during 2010-2011 higher than 20,000 tons (both direct and indirect emissions) will be included into the ETS. Aviation, port (ship), airport, railway, commercial sectors, hotel and finance sectors with annual CO\textsubscript{2} emissions during 2010-2011 higher than 10,000 tons will also be included into the ETS. CCERs and other project-based credits authorized by Shanghai local government can be traded as a complementary measure. However, no precisions on the level of CCERs are given.

Guangdong: Electricity, cement, iron&steel, ceramic, petrochemical, textile, non ferrous metal, plastic and pulp&paper sectors’ firms with annual CO\textsubscript{2} emissions during 2011-2014 higher than 20,000 tons (or total comprehensive energy consumption higher than 10,000 tsc) will be included into the ETS. By the end of 2015, transport and building sectors are supposed to be included into the Guangdong’s ETS. Such a choice of year indicates that new firms which are not included initially before the implementation of the ETS by early 2013 can be included into the ETS later until 2014 as its CO\textsubscript{2} emissions overpass the threshold. CCERs and other project-based credits authorised by the Guangdong province can be used in the ETS. No precisions on the limit of these credits are given.

Cap setting

No quantitative cap is set so far for the three regions. The guidelines only indicate the fact to have an absolute cap during the pilot period. Further precisions are expected to accomplish by the end of this year as pilot ETS are expected to function from early 2013 in all seven regions.

Allocation

Local Development and Reform Commissions are the designated authority which allocates CO\textsubscript{2} emission quotas to firms (both initial allocation and for new entrances). Allocation methods are described in a general way and they differ among pilot regions. Further precisions on concrete allocation methods are expected to follow.
Beijing: The initial allocation for 2013 is based on historical emissions of 2009-2011 and a sectoral approach. Quotas are allocated freely to firms. The initial allocation for 2014 and 2015 will be based on CO\textsubscript{2} emissions of the previous year. Local government will reserve a small amount of quotas which will be auctioned during the pilot phase. However, no explicit definition of the use of the reserve is given although it may be considered generally as reserve for new entrances.

Shanghai: based on historical CO\textsubscript{2} emissions during 2009-2011, the quotas for 2013-2015 are allocated at once at sectoral level (not explicit if sector benchmarks will be used). A baseline approach may be adopted for quota allocation if feasible. Initial allocation of quotas is free during the pilot period. Auctions of quotas will be implemented progressively (without a clear definition of timing).

Guangdong: Based on firms’ historical CO\textsubscript{2} emissions during 2010-2012, local DRC will allocate in one time each year’s quotas to firms for the period 2013-2015, at sectoral level based on sectoral benchmark(s) (no further precisions are given on the contents of benchmarks). Most of the quotas will be free while a certain percentage of quotas will be auctioned (or paid by firms after government arranged quotas initial allocation). Local DRC will estimate the CO\textsubscript{2} emissions for new installations with annual total energy consumption above 10ktcs and allocate quotas for totally or partially for free. There is however no explicit definition on the total amount of quotas reserve for new entrance.

Banking and borrowing of quotas
In general, borrowing is prohibited during the pilot phase while banking is allowed.

Beijing: no quotas valid after 2015. No borrowing. No explicit definition of banking.
Shanghai: no explicit definition on the use of quota after 2015. No borrowing. Banking is allowed.
Guangdong: no quotas valid after 2015. Banking is allowed within the pilot phase.

Monitoring, Reporting, Verification (MRV)
All three pilot regions’ governments planned to assign designated third party to conduct MRV works. Apparently, local firms are usually prioritized.

Beijing: third-party verifier is planned to be established. Firms will have to report their energy consumption and emission factors data and submit to local DRC their verified annual CO\textsubscript{2} emissions of year t by March of year t+1. This will serve as the basis for the new allocation of quotas of year t+1 (in May of year t+1).

Shanghai: MRV is required by the plan while no precisions are given at the current stage. Firms with annual CO\textsubscript{2} emissions higher than 10,000 tons which are not included into the ETS will have to report their CO\textsubscript{2} emissions as a preparation step for next phases ETS.

Guangdong: Third-party verifiers are required. Industrial sectors’ firms with annual CO\textsubscript{2} emissions during 2011-2014 higher than 10,000 tons (or with annual total energy consumption higher than 5,000 tcs) which are not included into the ETS will be required to conduct reporting activities. Transport and key building sectors are also required to reporting their CO\textsubscript{2} emissions. Southern United Assets and Equity Exchange center is assigned to establish the CO\textsubscript{2} emissions trading platform. The former has already created green assets exchange platform at local level (Foshan city) in Guangdong province. Firms in this city will conduct emissions trading within a unique MRV standard. This provides a good basis for provincial wide emissions trading\textsuperscript{34}.

Trading platform and registry
Local trading centers are preferable and sometimes clearly designated as trading platform. Only Guangdong has written a sentence of a clear tentative to test inter-provincial trading although no

\textsuperscript{34} Internet source: http://ep.chinaluxus.com/Ste/20111020/66246.html
further precisions are given. Registry as well as supporting mechanisms is clearly demanded by local ETS guidelines.

**Competitiveness and carbon leakage**

No plans have specific and explicit terms on such issues. This could be explained by two major reasons: first, local governments are rather motivated than reluctant to conduct pilot ETS in a hope that first movers may gain additional advantages (both for government and firms) once national wide ETS is implemented. Second, as there is strong signal that national wide ETS may be implemented by 2016, inter-provincial competitiveness and leakage problems would be minimized as no firm can escape from ETS by 2016.

### 2.7.3 Other pilot ETS having not published official guidelines

In this sub-section, all information are gathered from internet media sources which may differ to final contents once the local ETS implementation guidelines will be published officially.

**Shenzhen**

Shenzhen city is a local city, a special economic zone and it is part of the Guangdong province. Being not initially selected for conducting individual pilot emission trading program, Shenzhen is now conducting its own pilot emission trading program which could differ to Guangdong province. Shenzhen local government has held a press conference on 19 September 2012 and released the following details of ETS design. Industrial firms with annual CO\textsubscript{2} emissions higher than 20,000 tons will be included into the ETS. This will engage around 800 firms in 26 sectors which account for 54% of total CO\textsubscript{2} emissions of Shenzhen in 2010. Most of the quotas will be allocated for free with progressive auctioning. Shenzhen government has assigned designated third parties to conduct verification works. The Shenzhen Emission Rights Exchange established in September 2010 is the CO\textsubscript{2} emissions exchange platform.

**Hubei (province)**

The advance of Hubei’s ETS plan is summarized as follows. It could include iron & steel, chemical, cement, vehicle manufacturing, electricity, non-ferrous metal, glass, pulp & paper sectors which may represent 35% of total CO\textsubscript{2} emissions. In terms of quota allocation for existing installations and firms, 80% would be based on historical emissions and 20% will be based on sectoral benchmarks. Quotas would be given for free during the pilot phase. Reserves for new entrances will be less than 15% of total annual quotas allocation. In terms of the use of CCER, the maximum level would be 15% and 10% respectively for existing and new firms.

A first CO\textsubscript{2} emissions trading association was created by November 2010 which gathered major industrial sectors of this city conducting (voluntary) CO\textsubscript{2} emission reduction activities. This association also pioneered in terms of CO\textsubscript{2} emissions measuring, reporting and verification (MRV) by publishing the Guideline for GHG MRV in September 2011, which could effectively ensure the emissions trading in Hubei province.

At city level, Wuhan, the capital city of Hubei province is the first city that solicited for conducting pilot CO\textsubscript{2} emission trading in early 2010 in China. In terms of exchange platform, the Environment and Resource Exchange Center of Hubei which is established in early 2009 has already achieved a dozen of exchanges on SO\textsubscript{2} and COD (chemical oxygen demand) during 2009 and 2011. It can be considered

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36 Internet source: [http://finance.qq.com/a/20120918/001032.htm](http://finance.qq.com/a/20120918/001032.htm)
37 Internet source: [http://news.dzfl.net/dt/Details_24_20511.html](http://news.dzfl.net/dt/Details_24_20511.html)
39 Details can be found at [http://www.ovupre.com/sewage/Tab.do?method=getList&l_id=2](http://www.ovupre.com/sewage/Tab.do?method=getList&l_id=2)
a relevant exchange center for CO$_2$ emissions trading under both voluntary and pilot emissions trading programs in Hubei province.

**Tianjin (municipality)**

Several policies are implemented in order to pave the way for emissions trading. The General Plan for the Development of Pollutants Trading Market of Tianjin$^{40}$ is published in August, 2011. This plan gives the pathway of building an integrated emission trading system, including major pollutants (SO$_2$, COD, etc.) and CO$_2$. Concrete action is also introduced in order to put the CO$_2$ emission trading on track: Energy Efficiency Trading Plan for Civil Building of Tianjin$^{41}$ was implemented in May 2011. According to this Plan, buildings with energy efficiency lower than the benchmark can convert the energy saving into tradable CO$_2$ emissions while less energy efficient buildings will have to buy CO$_2$ quotas in order to compensate their over consumption. In particular, the heat supply sector and public buildings are obliged to engage emissions trading.

An ETS pilot guideline is still under development in Tianjin. There is so far no information on the relation between emission trading in the building sector mentioned above and the current ETS pilot program. The former could be probably considered as a subset of the latter. According to the current plan, firms with annual energy consumption above 10,000 tcs would be included and more than 100 firms accounting roughly 60% of total emissions of Tianjin would participate in emission trading.

**Chongqing (municipality)**

Chongqing is preparing to establish an emissions exchange center early this year and to finish related plans in order to implement a pilot emissions trading by 2013. Further guidelines and policies are expected to be soon published. Aluminum, iron alloy, calcium carbide, caustic soda, cement, iron&steel sectors would participate in the pilot ETS with the credits generated from forest carbon sinks$^{42}$.

### 2.7.4 Outlook on Carbon Trading in China

The first regional ETS have published several design choice other are to follow soon. It is unclear whether a national emissions trading system may follow already from 2015-2016.

However, based on the review of existing actions taken place at local level, it can be found that local governments are now on track of preparing their own emissions trading plans and related trading services and infrastructures. Most of them have a fixed implementation horizon by 2013. The pilot CO$_2$ emission trading is thus conducted under a nation-wide bottom-up approach.

However, it is not clear whether inter-provincial CO$_2$ exchange will be conducted. Pilot emissions trading schemes will vary across cities and regions, in terms of caps and targeted sectors in order to gather sufficient information, thus providing a solid basis for implementing a unique and national wide emission trading scheme. At province or city level, further articulation must be made on whether a unique ETS or a bottom-up approach will be adopted for conducting pilot ETS program in a given province.

As these systems are elaborated and implemented, policy makers will face substantial challenges due to lacking experience with market-based instruments and the sophisticated requirements in terms of emissions data, administrative capacity, and solid regulatory structures needed for a robust trading system. Active engagement of local stakeholders to build capacity and transfer best practices will be critical to ensure that the emerging Chinese carbon market achieves its environmental objectives and meets international standards.

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$^{41}$ Original Chinese: 天津市民用建筑能效交易实施方案

$^{42}$ Media source: http://gcontent.oeeee.com/8/15/8155cf9d25c763ee/Blog/34e/13b79a.html
Finally, there is so far no clear definition on the précised agenda of how these pilot ETS will merge with a forthcoming national wide ETS from 2015 or later. It is not clear whether the national wide ETS will be a unique trading system or it just include different local ETS. The nature of the national wide ETS, for example whether there is also a pilot phase of the national ETS, whether it is mandatory, etc. may need further clarification. The short experience learning period of pilot ETS in the seven regions between 2013 and 2015 is also a challenge for accumulating sufficient information. These issues need to be progressively addressed by the Chinese government in the coming periods.

2.8 South Korea

In May 2012 the Korean parliament adopted an emissions trading scheme, in November 2012 the government published details regarding the schemes design. The government originally planned to introduce emissions trading starting in 2013 but delayed it to 2015 due to strong resistance from corporations. South Korea’s scheme would cover about 60 per cent of the nation’s greenhouse gas emissions including about 450 polluters (Noh, 2012). Companies that emit 125,000 metric tons or more of carbon dioxide a year along with buildings and livestock farms that produce at least 25,000 tonnes of carbon dioxide a year will be covered under the scheme as well as companies voluntarily participating in the scheme in order to avoid emission and energy reduction requirements under the Green Growth Act (Noh, 2012).

Covering about 450 million tonnes of annual CO₂ emissions the Korean ETS would have a similar size as the Californian ETS (Point Carbon, 2012c). The schemes’ first phases would be from 2015-2017 and 2018-2020. The cap would decline to 350 Mt in 2020 (Point Carbon, 2012b). Emitters will be given all the permits they are projected to need in the first three years of the ETS, and will only have to buy allowances if they exceed those emission levels. From 2018 companies will have to pay for 3 percent of their emissions, rising to 10 percent from 2021 (Point Carbon, 2012b).

Any Korean company that fails to meet its ETS target must pay three times the market price for each tonne of CO₂, with an upward limit of 100,000 won (86 USD)\(^{43}\).

The adopted legislation would allow banking and borrowing of allowances and participants can buy permits from each other\(^{44}\). Companies will have access to domestic offsets from the outset, but will not be allowed to use international carbon credits to meet their targets until 2021 (Point Carbon, 2012b). It also includes measures that allow the government to stabilize the price by staging early auctions of allowances to increase the supply of credits when the price rises too high. The trading will be managed by Korea Power Exchange, Korea Exchange or a new commodities exchange. Korea Exchange has been promoting emissions trading and possible derivative products and is looking at cross-listing emissions products traded.

\(^{44}\) http://www.reuters.com/article/2011/02/07/us-carbon-korea-idUSTRE71611120110207
LESSONS FROM EXISTING AND EMERGING SCHEMES

As the previous chapters showed considerable diversity exists across cap-and-trade systems; each has its own design and each is at a unique point in its implementation process. A benefit of this diversity is that each scheme may offer lessons that can be applied in the development or improvement of others. The WCI or Australia for instances, have actively sought to incorporate lessons from the EU ETS and RGGI when designing their own systems. At the same time, diversity also offers better opportunities to test different approaches and compare their relative merits in terms of environmental effectiveness, or cost efficiency; such insights may eventually help inform the design of an international framework or common standards that draw on the strengths of different systems while facilitating their convergence in an integrated market. Precisely this latter aspiration, however, may also be hampered by the current diversity across systems, rendering it particularly important to identify where differences pose real obstacles for future market harmonisation.

The following section draws on the lessons alluded to in the previous sections, consolidating them for better analysis and discussion in a comparative context. Lessons have been grouped into three large categories:

- Process and context
- System design, and
- System implementation.

At this point there are only few concrete lessons from the youngest schemes – such as those planned in China and South Korea). Given their relative maturity and size, older systems such as the EU ETS and RGGI provide much of the material highlighted in this section. However although some of the younger or emerging markets, such as the WCI are still too immature to yield many concrete lessons about market design, they provide many useful insights about the political and governance requirements for trading system development.

3.1 Process and context

Several core lessons regarding the process and context emerge from the overviews of trading systems provided in previous sections. These lessons relate to the political and economic context, the political commitment regarding long-term emissions reductions, and the relationships within and among jurisdictions. Each is briefly discussed below.

3.1.1 Political and economic context

It is perhaps obvious, but the underlying political and economic context of the jurisdiction(s) involved is a crucial factor in facilitating the development of cap-and-trade systems. The power of large lobbies to pressure regulators to either abandon mandatory targets or to significantly loosen caps was amply demonstrated through the initial phase of the EU ETS. However, continued tensions about the possibility of strengthening the EU ETS are largely split along political economic lines; Poland has played a particularly strong political role in opposition to a stronger EU ETS and maintains a large coal and fossil energy industry.

The importance of underlying economic interests was also clearly observed through the differential progress of cap-and-trade regulations through the jurisdictions involved in RGGI and in the WCI. The majority of RGGI members are not energy producers, and energy efficiency overall has resulted in economic benefits to the partner jurisdictions. Within the WCI only a few jurisdictions (namely Utah and Montana) are significant fossil energy producers. Despite initial involvement both of these two jurisdictions decided against involvement in cap and trade, reversed their interest in any climate change policy and took actions to prevent any federal level regulation. In contrast, British Columbia, Quebec and Manitoba have rich hydroelectricity resources and may have seen the proliferation of
carbon constraints across North America as a significant economic opportunity and so were supportive of efforts to strengthen North American wide emission regulations.

There are some notable exceptions. Australia has just managed to get its legislation through, but in the industrialized country most afflicted by climate related disasters, it was still only a narrow victory over the opposition of coal and some heavy industry interests (Grubb, 2012).

3.1.2 Political Commitment regarding long-term energy and climate policy frameworks

One of the clear lessons that have emerged from several trading systems is the importance of long-term, believable energy and climate policy frameworks. Such long-term signals are of great importance for today’s investment decisions, and recent developments in the international carbon market, in particular, have shown how sensitive investor interest is to policy and political uncertainty.

For example, in the EU ETS, commitment to a long-term phased approach clearly sent a signal to industry groups and other jurisdictions that the EU was serious about climate policy, and that some carbon constraints would be imposed regardless of any remaining uncertainties about the detailed technical design. Similarly, lessons from the Tokyo ETS suggest that long-term political commitment was important in finally facilitating the switch from a voluntary to a mandatory system – a shift that was essential for supporting investment. The importance of a long-term commitment has also been stressed in the recent review of emissions trading in New Zealand, and Australia has clearly signalled a commitment for 2050 to cut pollution to 80 per cent below 2000 levels. Within the EU there is some degree of uncertainty, for instance on the future targets including the 2020 or 2030 horizon, but the EU does have a sectoral reduction roadmap up to 2050.

Juxtaposing the experience in Tokyo and the EU with that under the WCI shows just how important a robust, long-term political signal can be. In the WCI, several jurisdictions (such as Montana or Utah) had no history of political commitment to climate policy, and it was comparatively easy for industry to push for the abolition of any climate policy when the first questions about regional policy appeared. Not only did these jurisdictions withdraw their involvement in the cap-and-trade system, but they also halted the development of other climate-related policy options.

Establishing a believable long-term policy stance changes the political bargaining process, as it shifts the context from one in which industry is aiming to avoid any regulation, to one in which it is negotiating what the price and form of regulation will be. Moreover, any market for a commodity based purely on a policy decision, namely the creation of tradable greenhouse gas emission allowances in a system geared towards gradually tightened supply, will see the confidence and expectations of market participants be particularly susceptible to the stability of political choices.

3.1.3 Relationships within/among trading jurisdictions

For several trading systems, such as those in Australia or New Zealand, the basic framework for trading is national. In contrast, the EU ETS, RGGI and the WCI are multi-jurisdictional trading systems which means that tensions within the trading system can make political negotiations more difficult. The potential power of tensions among the group is illustrated by comparing the EU ETS and the WCI. The EU ETS is embedded in the extensive network of interactions and interdependencies cemented through the creation of the EU itself; in other words, the EU ETS is part of the acquis communautaire which forms a mandatory condition for accession to the Union, and violation of any of its requirements can be sanctioned by a powerful EU judiciary and enforced through substantial penalties. Also the EU’s balancing mechanisms helped to accommodate economies in transition with vastly different socioeconomic realities – for example with the help of the EU’s structural funds that helped alleviate economic hardship, redistribute the burden of compliance, and promote disadvantaged regions.

By contrast, the sub-national jurisdictions involved in the WCI are not embedded in a similar community. Some of them share membership in the same federal states, but they are negotiating a regional trading scheme at the state and provincial level, and as such have limited ties to each other
outside of the WCI itself which has made building a sufficient core of involved states more difficult. It is therefore unclear how the WCI will be able to accommodate the massive asymmetry in size and power between California and the smaller hydroelectric provinces of Quebec or British Columbia. Interestingly, RGGI offers a glimpse of a moderately strong informal multi-jurisdictional community. Unlike the EU ETS there is not official overarching institutional structures linking these states together, but these states have a long history of environmental and economic co-operation that is deeper than that experienced by the WCI. For instance, many RGGI states had already experienced ongoing cooperation on acid rain and mercury regulations and were accustomed to cooperation.

The logic of “collective action” of countries is crucial to the development of a functioning market system at multiple levels. Relationships are essential even for single-jurisdiction trading systems because no system is truly isolated. In multi-jurisdictional systems, such as the WCI, the relationships among the involved players can either strengthen or weaken the association. Having ties beyond a mere trading alliance gives jurisdictions a wider range of diplomatic and economic tools that can be used to convince others to join a collective effort. Second, no trading system exists in isolation. The review of the New Zealand ETS states that alignment to Australia is an important consideration, especially in the context of the Australia New Zealand Closer Economic Relations Trade Agreement. From 2015 both countries plan to link their schemes. At this point it is unclear how the Chinese systems will develop, but the federal state may need to play a role similar to the EU-Commission if disparities across provinces make unification of their multiple pilots difficult.

Similarly, China is carefully watching the establishment of trading schemes in other regions and testing different approaches in different regions. China is not only looking at the traditional approaches, such as Australia, but also at the Tokyo program, which bills itself as the “World’s First Urban Cap-and-Trade,” to see whether it should copy Tokyo’s end-user cap on building and facility owners. Opportunities for future cooperation among systems are considerations – albeit typically not priorities – that influence the design of systems, and active engagement e.g. between representatives from different system administrators may have more or less subtle impacts on technical design choices in each system.

3.1.4 Stakeholder Engagement

Stakeholder engagement is essential in crafting a market. In the EU ETS, RGGI, the Tokyo ETS and the Australian scheme, early and ongoing stakeholder engagement helped foster acceptance among a sceptical public and private sector. An initial Green Paper soliciting stakeholder comments in the EU, for instance, was issued by the European Commission nearly five years before the actual trading began, kicking off a continuous process of stakeholder consultations both at the European and the Member State level. Similarly, when the fate of cap-and-trade is compared across the jurisdictions involved in the WCI, it becomes apparent that stakeholder buy-in was prevalent in those jurisdictions in which it was able to progress through the initial stages of development (Klinsky, 2011). In the Tokyo ETS, initial motions towards a voluntary system resulted in few emission reductions but started a process of engagement with stakeholders which may have facilitated the eventual formalization of a trading system. Early signalling to and involvement of industry and other stakeholders may help to establish a negotiating environment in which some form of emission constraint is accepted as an inevitability, helping change the conversation from avoidance to proactive engagement. While covered entities such as industry and the electricity sector tend to be the most active and vocal stakeholders in the policy process, they are not the only ones. One of the important lessons emerging from the WCI was the importance of non-industry stakeholders. In California, environmental justice communities successfully slowed development of cap-and-trade regulations through arguments that alternatives to this policy instrument had been insufficiently taken into account during the decision making process. These communities were particularly concerned about the regulations because they had hoped that state greenhouse gas emission policies would result in local reductions of associated pollutants. This case demonstrated that stakeholders may have diverse reasons both for supporting and opposing trading policies, and that non-industrial stakeholders must be considered. The importance of non-industrial
stakeholders is also illustrated by Australia’s final attempt to get cap-and-trade legislation passed. After several failed attempts, regulation was finally adopted, and it is notable that this was largely explained to both industrial and household level stakeholders in terms of its benefits. While large-scale or aggregate economic savings may be a motivator for cap-and-trade systems for some stakeholders, focusing on aggregate benefits is insufficient for building the required political support. Individual and relatively immediate benefits must be demonstrated in order for the scheme to be politically feasible. The importance of stakeholder engagement is also highlighted by the political difficulties that some other policies – such as carbon taxes – have experienced in some jurisdictions. As discussed, in both the WCI and RGGI carbon taxes were not perceived to be politically feasible, ultimately an indication that insufficient stakeholder engagement could be assured to develop and implement the policy. Similarly, the political structure of the EU and the inability of all states to agree on a carbon tax, in part due to pressure from stakeholders within these states, suggests that stakeholder perspectives may be one contribution to the development of trading systems despite interest in carbon taxes. The same effect was visible in Australia and New Zealand.

3.2 System Design

System design is largely within the mandate of policy makers, and can significantly shape market functionality. Arguably, most previous analysis of trading systems has focused on the system design. Five main lessons related to system design are focused upon in this report: the role of the decision-making level, allocation methods, policy interactions, the value of learning phases, and uncertainty management strategies.

3.2.1 Decision-Making Level

A central design element of any trading system is the level at which decisions related to the amount, issuance, and distribution of allowances are made. A striking example of the importance of this design element can be found in the EU ETS. In the first and second trading phases, decisions about the number of allowances and their allocation were left almost entirely to the Member States, resulting in efforts to favour and protect domestic industries, which in turn contributed to an excessive supply of allowances in the system. Individual states may have less bargaining power against strong interest groups, and may be less willing to commit to significant caps because of internal political pressure.

One of the key changes to the EU ETS in phase three has therefore been significant centralization of authority in the administration of the trading system, including allowance allocation. From 2013 onwards, the aggregate number of allowances in the system is set at the European level, reducing the role of Member States to domestic auctioning and, where permissible, allocation. Several of the newer markets apply a similarly centralized approach, in part because they are national systems (for instance in Australia, and New Zealand) and this may provide future comparative insights about the role of centralization. Yet it is also worth noting that the WCI is equally, if not more, decentralized in terms of decision making about allocation and cap-setting as the EU-ETS was up to 2013, which suggests it to may run the risk of overly generous caps and of bending too easily to specific internal lobbying in each jurisdiction.

Advocating for a strong centralized design in a multi-jurisdictional trading system does present political difficulties. As so often, policy makers will need to balance environmentally optimal and politically feasible design options. In RGGI, for instance, decision making on the implementation of the trading system rests with each individual state, yet the aggregate number of allowances and the reduction pathways have been agreed from the outset in a Memorandum of Understanding. By settling this problematic issue in the very beginning, covered entities had fewer incentives to pressure their respective state agencies for more favourable conditions. That way, some of the benefits of centralization – in terms of improved incentive dynamics – were achieved even without a formal surrender of sovereignty.
3.2.2 Allocation Method

The importance of allocation method designs can be seen throughout debate about all emission trading systems. The extent to which auctioning is the primary mode of allocation has been a central issue in many trading systems.

For example, although auctioning was initially envisioned as the preferred distribution method for allowances under the EU ETS, political pressure from covered sectors resulted in the vast majority of allowances being allocated for free during the first and second phase. Weak emissions data, early mitigation success in some sectors, and generous allocation rules contributed to a substantial surplus of allowances and accompanying price collapse. This highlights the drawbacks associated with free allocation. In Member States with unregulated electricity prices, where a small number of large electricity generators were able to pass through the value of free allowances as an opportunity cost to ratepayers, the resulting windfall profits eroded support for the EU ETS in some segments of the public. Responding to these challenges, auctioning has been defined as the default allocation method from 2013 onwards, with limited exceptions being phased out over time. A similar pattern as has been the case in the EU is being repeated during the design process of the WCI and the South Korean scheme, where after pressure from covered businesses most of the allowance will be given out for free.

As experience with auctioning grows in Europe and other systems such as RGGI, valuable insights can be drawn for questions such as auction design. For instance, while it may be politically more expedient to embrace free allocation in the initial design of a trading system, the revenue generated through auctioning can provide benefits beyond overall improved efficiency of the market and can lead to acceptance of a high share of auctioning. An important lesson garnered from the operation of the RGGI trading system have been the surprising economic and environmental benefits realized through prudent use of auctioning proceeds, despite the overallocation in the system undermining its environmental effectiveness. Also the Australian scheme has a high share of auctioning from the beginning. Most of the auctioning revenues are redistributed to households and business including ambitious initiatives for business to increase energy efficiency and cut emissions. The use of revenue is an issue that was initially overlooked in the EU ETS but is now become more central – and may be an important consideration for emerging schemes. Using revenues to reduce key costs can be an important mechanism (as was seen in Australia) for building support across many stakeholders for the scheme. Particularly at a time where constrained public budgets prevent necessary investments in infrastructure, research and development, as well as the promotion of alternative energy technologies, this experience highlights the importance of revenue generation as a feature of emission trading systems. The other major tension within allocation debates is the extent to which specific sectors receive free allowances. The challenges in these discussions is that all sectors will attempt to pressure government for greater numbers of free allowances. Thus far the standard approach to such pressure has been to develop baselines or sectoral categories which are then used to determine allocation. This strategy has two risks. First there is a risk of getting too many claims based on concerns about competitiveness as may be the case in the EU ETS. Second, the sheer information burden assessing entities across multiple baselines can be significant. Perceived lack of fairness in allocating allowances can provide space for industry groups to lobby for greater emissions (which can undermine the cap).

3.2.3 Transition or “Learning” Phases

A central lesson from the first EU ETS trading period is the importance of a learning phase. A phased approach allowed accurate data to be acquired during the initial period (during which allowances were freely allocated), which could then be used to recalibrate the system. Governments were better able to justify amendments to the system as the shortcomings of the trading system became evident in the initial trading period. By setting out emission limitation and reduction pathways for 10 years from the outset, implementing changes under RGGI has been made somewhat more difficult; and while the clear evidence of substantial overallocation in the system may lead to an agreement on a tighter cap as result of the comprehensive review mandated for this year, policy makers will have to weigh the
impacts on market confidence of such a market intervention. Allowing an initial learning phase might have facilitated necessary changes, as their possibility would have been factored into market expectations. Other systems have also opted for a phased approach. In New Zealand, for example, all sectors of the economy are included in the cap, but over a several-year timeline, with several transitional provisions in place. Stationary energy, liquid fossil fuels and industrial processes, for example, will have to surrender one unit for every 2 tonnes of emissions. Furthermore, the system includes a fixed price option of $25 per tonne, allowing sectors facing obligations to pay this fee rather than purchase units to limit costs and enhance stability during the start-up phase up to 2013. The review of the New Zealand ETS emphasises the importance of these transition measures for the long-term stability of the scheme and calls to extend them for a few years. The Australian ETS has a fixed price in the first three years, preventing price volatility that was a significant problem in the first phase of the EU ETS. In the WCI, a phased approach was used to postpone politically and technically difficult decisions required for reductions of transportation or commercial emissions, without also slowing coverage of large industrial sectors. Starting with slightly more straightforward sectors allowed stakeholders and regulators time to discover how best to integrate sectors less typically covered under emission trading schemes. Using a phased approach can also reduce initial political resistance. For instance, in Europe, grandfathering was used extensively in the initial phases of the EU ETS, although with time free allocation is giving way to auctioning as the default distribution method. A transitional regime can help pave the way for a more economically efficient trading system. China’s strategy has been to mandate the creation of several pilot trading systems, allowing it to compare experiences prior to deciding on an approach for a future nationwide system. Yet the economic and social conditions as well as the energy mix in the cities and regions currently implementing pilot trading systems are quite different. Success of one ETS in a particular city or region does not necessarily guarantee a similar performance if the same approach is extended to the national level. The pilot programs can thus only be partial guidance as the country prepares a nationwide trading system.

3.2.4 Uncertainty Management

Price uncertainty is an on-going concern for large industries contemplating expensive investments or business strategy shifts. If markets are going to be able to incentivize the scope and scale of transitions needed to achieve significant emission reductions, taking uncertainty seriously is essential. Some of this uncertainty relates to the lessons about political context and commitment. Without believable long-term commitments to climate policy, it may be more difficult for industry to have the confidence to make the scale of investment needed. However, several schemes have also tried to manage price uncertainty. Based on observations about the extremely low prices in the EU ETS, the New Zealand, and Californian systems include a price floor. This was planned also by Australia, however Australia may give up it price floor to enable linking to the EU-ETS. In addition, the Australian system complements this minimum price with a price ceiling. The New Zealand system even provides for regular increases in this price. Australia, by contrast, has imposed a fixed price for the

3.3 System Implementation

One of the benefits of having systems that have been running for several years is that lessons can be drawn from their actual implementation. Five central lessons emerge from consideration of existing systems: the need for robust market oversight; the importance of data; the role of cap stringency; governance support; and the real impacts of emissions trading on competitiveness.

3.3.1 Market Oversight

One of the most well publicized lessons emerging from the EU ETS have been a number of criminal activities and efforts to exploit regulatory loopholes, highlighting the need for adequate market oversight and governance in emissions trading systems, which are rendered particularly vulnerable due to the fact that the traded commodity and hence the entire market are essentially based on policy
decisions. Adding to value-added tax (VAT) fraud in 2009, the last two years have seen a series of scandals involving the sale of recycled CERs, phishing attempts on the German national registry, and a series of subsequent cyber-thefts. This has undermined confidence in the European carbon market, highlighting security shortcomings and increasing the urgency of stakeholder requests to strengthen the regulatory and governance infrastructure (World Bank, 2011). In total, some 3.36 million EUAs are thought to have been stolen in various Member States during this period (Point Carbon, 2012a). Understandably, such events have eroded the legitimacy of the system and prompted a surge in political discussions within other systems about the desirability of market mechanisms. The importance of this lesson was reflected by the care that the WCI took to establish a sufficiently integrated trading platform in its initial design. This platform is not yet finalised, but the need for systematic market oversight has been a key part of these negotiations from the beginning. The Australian government will create an independent body, the Climate Change Authority, which will oversee the scheme.

3.3.2 Availability of Data

Adequate access to date is an essential component of a functioning market. Neither industries nor governments necessarily know how many emissions are being produced, how difficult these will be to reduce, or how these efforts compare with others. Without being able to assess the rigour of carbon accounting, it is difficult to properly evaluate the effectiveness of a market. One of the rationales for a learning phase is the necessity of collecting and generating the data required to have an efficient market. In the EU ETS, it was clearly observed that the lack of data about emissions in most Member States prompted overly cautious definitions of caps, and hence over-allocation. A viable, efficient market in emission permits can only exist where that market is well-informed. To some extent, an auction could have helped compensate for the lack of data, but it is possible that the caps would still have been set too high. Solid baseline data that is based on the same monitoring methods is essential in order to evaluate the stringency of caps and to understand the likely policy impacts on different stakeholders. The Tokyo government has emphasized that one reason of Tokyo’s success with its trading system was a robust approach to data collection, which served as a good communication tool with stakeholders for the purposes of negotiation. By contrast, one of the lessons from emerging systems in China is that data availability can be a particular challenge in emerging markets. In the face of significant diversity of energy efficiency within and across sectors, it was necessary to create installation-specific baselines. This highlights the resources it can take to develop the essentials required for a functioning market.

3.3.3 Stringency of Cap

Having a sufficiently stringent cap is an important feature of a working trading system. The cap fixes the maximum abatement and no other polices for the same sector can achieve further reductions. This lesson has been confirmed by both the tumultuous price history in the EU ETS as well as the price collapse in RGGI. Within the EU ETS, weak data, political negotiations and strong initial decentralization (that included inflated projections by companies and sectors) have prevented the cap from being sufficiently robust. This meant that changes in the macroeconomic context quickly resulted in over-allocation, leading to prices that are considered too low to incentivize long-term investment changes. Similarly, the weak cap in RGGI has made the allowance price susceptible to even small variations in weather in addition to macroeconomic conditions. For decision makers in emerging trading systems, this translates into an admonition to be bold in the definition of the cap, or at the very least ensure adequate opportunities for subsequent tightening.

3.3.4 Governance Support and Capacity Building

Markets need considerable bureaucratic and governance support in order to achieve many of the previously mentioned requirements for a functioning and effective market. For instance, when highly decentralized, the EU ETS was unable to negotiate a sufficiently stringent cap to function effectively.
Centralizing decision-making has helped ensure a tighter cap, yet this centralization itself requires resources and governance support. Similarly, the sheer quantity of data management and administrative expertise required to ensure adequate market oversight must not be underestimated. Sourcing these requirements may be particularly difficult in multi-jurisdictional trading contexts, which add a layer of negotiation and jurisdictions may have different pre-existing requirements for issues like market oversight. Various multilateral initiatives, such as the International Carbon Action Partnership (ICAP) and the World Bank Partnership for Market Readiness (PMR), and active bilateral cooperation between different countries are seeking to improve administrative and technical capacities in these regions. Going forward, this may prove a critical factor in any attempt to promote market convergence or future integration.

3.3.5 Addressing Competitiveness Concerns

Improved understanding of the EU ETS and its impacts has helped dispel some of the more extreme concerns about leakage and industrial relocation, notably fears that the EU ETS might promote a “deindustrialization” of Europe, by showing that cost differentials from labour and other inputs typically outweigh those induced by international differences in the cost of carbon; as a result, most sectors can accommodate carbon costs without significant impacts to their profits, sales, or competitiveness (Grubb et al., 2009). Still, some sectors have been affected by the imposition of a carbon price, especially primary resource sectors which face a high cost increase due to the EU ETS and trade on international markets, where competition prevents them from passing the production cost increase on to customers. In many sectors, constraints on international trade, for instance transport restrictions on industrial gases or high transport cost for flat glass, allow at least partial cost pass-through by manufacturers; in other sectors, such as oil refining, high volatility in raw material prices and different taxation structures outweigh the cost impact from introducing an emissions trading system. In the end, therefore, only steel and aluminium, cement, pulp and paper, as well as parts of the chemicals and fertilizer industry are to some extent affected by leakage. But policy makers also have tools at their disposal to alleviate or minimize the risk of leakage. In Europe, the approach chosen to address this risk has been continued allocation free of cost to sectors that are considered vulnerable to carbon leakage. Free allocation can help alleviate firms’ concerns about their competitiveness, but companies still have to comply with reduction obligations. Technical difficulties and political pressure accompany the definition of vulnerable sectors: under the EU ETS, the criteria for said assessment have been framed very generously, with nearly 80% of industrial installations covered by the EU ETS currently deemed at risk and hence entitled to free allowances in the third trading period. Over time, this share is set to decline, although particularly exposed industries will continue to receive free allowances until the rules are amended. On the one hand, giving free allowances to firms is more efficient than excluding them from the trading system altogether. On the other hand, free allocation will only avoid incentives to relocate if it is combined with an effective closure rule, which forces installations to return unused allowances. Also, free allocation based on historical emissions or a benchmark may still incentivize production decreases as a way to sell surplus allowances; conversely, linking free allocation to production output blurs the price signals of the carbon market, undermining its behavioural effect and overall efficiency. Whenever firms can pass on their incremental cost increase to customers, free allocation may lead to windfall profits. While free allocation may therefore not be the perfect solution to address carbon leakage, other available options also have drawbacks. In particular, border adjustment or levelling measures – such as carbon tariffs or allowance purchasing requirements – have been put forward as a way of offsetting any competitive disadvantages arising for European exporters under the EU ETS. In theory, such approaches may offer an effective way to address carbon leakage; but it is unclear whether they would be fully compatible with international rules on free trade, and they are likely to be perceived as “green protectionism” by affected countries and therefore create significant diplomatic tensions. For that reason, the legislation setting up the EU ETS contains no direct mandate to implement such measures, and the focus has instead rested on achieving a level playing field – in which no major exporting country is entirely exempt from carbon constraints – through multilateral cooperation on climate change.
4 CONCLUSIONS

The report illustrates that considerable diversity exists across cap-and-trade systems; with each having its own design features, and each being at a different stage in its implementation process. A benefit of this diversity is that each scheme may offer lessons that can be applied in the development or improvement of others; it also offers an opportunity to test and compare the relative merits of different approaches and enable transboundary learning. Australia and California for instances, have actively sought to incorporate lessons from the EU ETS when designing its own system, but these systems are not mere copies of the EU ETS. Instead, in each case the trading system has been designed to suit the domestic needs and circumstance of its respective jurisdiction, sometimes even at the expense of effectiveness and efficiency of the schemes. Clearly, the EU ETS has been a vital source of empirical insights for other developing carbon markets; yet already, lessons from North America, Australia or Japan are also gaining relevance for emerging schemes, such as China, that can benefit from the experiences made in the EU ETS and the WCI with establishing multi-jurisdictional trading systems.

The report illustrates that several of the emerging trading systems in particular in Asia, including the Japanese and South Korean schemes, and several of the emerging regional Chinese schemes do not focus on the traditional sectors of power and heavy industry but involve smaller facilities, buildings, and include indirect emissions from energy consumption. Such trading schemes require different design choices and involve different stakeholders than have been featured in traditional schemes such as the EU ETS and may therefore present unique governance challenges as they develop. Several key lessons emerge from this review: First, it highlights the importance of the political and economic context for successful implementation of cap-and-trade schemes. Long-term energy and climate policy frameworks are essential, but the state of relationships within/among trading jurisdictions is also an important factor. No system is truly isolated but embedded in a broader set of political and economic ties. For example, New Zealand considers the alignment of its scheme with Australia an important consideration, similarly, China is carefully watching the establishment or trading schemes in other regions. Second, the report also highlights the role of system design (including allocation method and other design options) for the acceptance and function of schemes. Such design elements have been a major focus of analysis and differ across systems. For instance, contrary to the EU-ETS, both RGGI and the Australian scheme use a high level of auctioning from the beginning. Most of the auctioning revenues in these two schemes are redistributed to households and business including ambitious initiatives for business to increase energy efficiency and cut emissions thus increasing the acceptance for the scheme. Third, lessons are also drawn regarding the implementation of schemes, including aspects of market oversight. A number of criminal activities and efforts to exploit regulatory loopholes observed in the EU-ETS prompted a surge in discussions within other systems about the desirability and management of market mechanisms. The importance of this lesson was reflected for example by the care that the WCI took to establish a sufficiently integrated trading platform in its initial design or the Australian plan to create an independent body which will oversee the scheme.

Several observations about possible future carbon markets emerge from this report. While an international framework could draw on the strengths of different systems, the sheer diversity among schemes may also hamper market convergence. This renders it particularly important to identify where differences pose real obstacles for future market harmonisation, and to agree early on a common international framework that may enable market integration at a later stage. While in the past it was assumed that the establishment of a federal US cap-and-trade system would be critical to the development of a global carbon market, this report draws attention to the long-term importance of rapid trading system development in the emerging economies. Given the current dynamic in Asia regarding the implementation of emissions trading schemes, the future of emissions trading will critically depend on the success of these efforts and, to a lesser degree, of other parts of the developing world. If this dynamic continues, the report concludes that emerging economies could eventually overtake the European Union and other OECD countries as centres for emissions trading, which in turn would significantly shift the style, nature and challenges of a future international emissions market.
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