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Domestic Emission Trading Systems in Developing Countries – State of Play and Future Prospects

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Summary

Designing a harmonised international carbon market is not only seen as a main strategy under the Kyoto Protocol, but also a key goal of the European Union. As plans for the establishment of emissions trading systems (ETS) emerge in various developing countries, prospects for creating a global market seem to finally get in reach.

Links among ETS of every type of country will have to deal with seven basic issues: coverage of the scheme, definition and recognition of trading units, type and stringency of emission targets, allocation methodology, temporal flexibility, MRV, and compliance systems. Each of these seven issues raises several challenges that policy makers have to solve in order to establish working systems.

Linking developed and developing country schemes raises another fundamental issue: Since developing countries do not dispose of Kyoto-valid trading units, new mechanisms or policy options need to be developed if trading units from developing countries are to be used by industrialised countries.

In this paper, six developing countries with possible domestic ETS are analysed: Brazil, China, India, Kazakhstan, Mexico, and South Korea. Brazil has set up a stock exchange for voluntary carbon units which may precede a domestic trading scheme. China has made concrete steps towards the creation of regional ETS in various cities and provinces. Newer announcements even envisage the creation of a national system by 2015. However, these plans are still in early stages, and differ widely in their institutional designs. India has not shown much propensity for a domestic ETS due both to political and institutional reasons. However, trading schemes for energy efficiency and renewable energy are already in place. Kazakhstan has very definite plans for an ETS and has in fact a draft law in parliament. Mexico has been one of the earliest proponents of a domestic ETS, but has not taken this plan much farther. South Korea had already come very far in the design of its ETS. However, due to opposition by domestic industry, targets have been weakened and the start date pushed back.

The paper concludes that even though South Korea seems to be firmly on track and Chinese announcements also give reason for optimism, developing countries' schemes are at the moment not far enough evolved to come to definite conclusions if links with e.g. the EU ETS are possible. It can also be assumed that for the time being climate policy in most developing countries will mainly revolve around non-ETS policies and measures. Therefore, while the moves towards emission trading should be supported, international climate cooperation should not neglect improving the CDM and supporting transformational policies and measures through fund-based instruments.

Zusammenfassung

Das Design eines international harmonisierten Kohlenstoffmarktes ist nicht nur eine wichtige Strategie im Kyoto-Protokoll, sondern auch ein Kernziel der Europäischen Union. Nun, da in verschiedenen Entwicklungsländern Pläne für die Einführung von Emissionshandelssystemen reifen, scheint die Schaffung eines globalen Marktes tatsächlich in greifbare Nähe zu rücken.

Verknüpfungen zwischen EHS aller Länder müssen sich mit sieben Designfragen auseinandersetzen: Regelungsweite, Definition und Anerkennung von handelbaren Zertifikaten, Art und Stringenz von Emissionszielen, Allokationsmethoden, zeitlicher Flexibilität, MRV sowie Compliance-Systeme. Jedes dieser Probleme weist wiederum mehrere Herausforderungen auf, die gelöst werden müssen, damit eine Koppelung funktionieren kann.

Die Verknüpfung von Industrie- und Entwicklungsländern ist aus einem zusätzlichen Grund problematisch: Da Entwicklungsländer nicht über Kyoto-Zertifikate verfügen, müssen spezielle Mechanismen oder politische Lösungen entwickelt werden, falls Zertifikate aus Entwicklungsländern auch von Industrieländern genutzt werden sollen.

In diesem Papier wurden sechs Entwicklungsländer betrachtet, die möglicherweise ein nationales EHS entwickeln. Brasilien hat eine Börse für freiwillige Kohlenstoffzertifikate eingerichtet. China hat konkrete Schritte unternommen, um auf regionaler Ebene EHS zu entwickeln. Neuere Ankündigungen sehen sogar die Schaffung eines nationalen Systems bis 2015 vor. Diese Pläne befinden sich jedoch noch in einem sehr frühen Stadium und unterscheiden sich stark in ihren geplanten Designs. Indien hat bisher nicht viel Interesse an der Entwicklung eines EHS gezeigt. Dies hat zum einen politische, zum anderen institutionelle Gründe. Allerdings gibt es bereits Handelssysteme für Energieeffizienz und erneuerbare Energie. Kasachstan hat weit fortgeschrittene Pläne für ein EHS, für das es bereits einen ausgearbeiteten Gesetzentwurf gibt. Mexiko war bereits früh an der Entwicklung eines EHS interessiert, hat seine Pläne jedoch nicht konkretisiert. Südkorea ist bei dem Design seines EHS bereits am weitesten fortgeschritten. Allerdings wurden durch starke Opposition der heimischen Industrie die Ziele geschwächt und das Anfangsdatum nach hinten verschoben.

Das Papier kommt zu dem Schluss, dass zwar insbesondere Südkorea weit fortgeschritten ist und auch die neueren chinesischen Ankündigungen Grund für Optimismus bieten, die EHS der betrachteten Entwicklungsländer aber noch nicht weit genug entwickelt sind, um Schlüsse für Möglichkeiten des Linking z.B. mit dem EU-EHS zu ziehen. Auch kann davon ausgegangen werden, dass sich bis auf Weiteres die Klimapolitik in den meisten Entwicklungsländern um nicht-EHS Politiken und Maßnahmen drehen wird. Die Trends zum Emissionshandel sollten daher unterstützt werden, aber die internationale Zusammenarbeit sollte darüber nicht die Verbesserung der bestehenden Instrumente wie dem CDM vernachlässigen und auch eine Stärkung transformativer Bemühungen in den Entwicklungsländern durch fonds-basierte Instrumente weiter vorantreiben.

1 Introduction

Since the adoption of the Kyoto Protocol in 1997, the establishment of a harmonised international carbon market has been seen as one of the main strategies in international climate policy. So far, however, the market is far from being globally harmonised or systematically linked. Instead, a mosaic of national and sub-national markets has been under development, differing in timing, location, relationship to the Protocol and their levels of legal commitment.

Nevertheless, creating a global carbon market is a key goal of EU climate policy: "A well-functioning carbon market is essential for driving low-carbon investments and achieving global mitigation objectives in a cost-efficient manner. It can also generate important financial flows to developing countries." (European Commission 2010). The European Commission envisages to first establish an OECD-wide market which could then be extended step-by-step to developing countries.

Tentative discussions are in fact taking place in various developing countries. For example, South Korea introduced a voluntary pilot emission trading programme back in 2009 as well as a second one by a different ministry in May of this year. Korea is also initiating a "Greenhouse Gas & Energy Target Management Scheme" as a precursor to a planned full-scale emissions trading system. Kazakhstan has a draft emission trading law in Parliament. Brazil has established a largely private-driven carbon certificate exchange market. Other countries, like Chile, Turkey and South Africa, have expressed a general interest in designing a domestic ETS and have in some cases taken early steps in designing such systems. Most recently, the first recipients of initial grants under the World Bank's Partnership for Market Readiness have been announced. Chile, China, Columbia, Costa Rica, Indonesia, Mexico, Thailand and Turkey have received 350.000 USD each for capacity building in domestic carbon markets. The Partnership for Market Readiness was announced at the Cancún Climate Summit in 2010 and acts as a trust fund of the World Bank for the provision of grants for capacity building and technical assistance in the development of market-based instruments for GHG abatement.

This paper aims to give an overview of the current status in key developing countries. First, the paper gives a theoretical overview of what design factors need to be taken into account when establishing national emission trading systems. This chapter also looks at what economic and environmental impact different design choices may have and how different designs may impact the chances of creating linked markets. The following elaborates the status of emissions trading discussion in various countries in the framework of the countries' general climate legislation if information could be obtained. If not otherwise indicated, information on current legislation is derived from the recent GLOBE Climate Legislation Study (Townshend et al. 2011). The paper is limited to countries where a minimum of specific information on emission trading discussions was available. These are Brazil, China, India, Kazakhstan, Mexico, and South Korea. Tentative discussions are also taking place in other countries such as the other countries that have received grants under the Partnership for Market Readiness. However, these appear to be at an even more general level than the discussions in the countries that are covered in this paper. Also, many proposals submitted to the Partnership on Market Readiness relate to developing (credited) NAMAs in the form of national regulations or local projects rather than domestic ETS.

2 Design Issues in Linking Domestic Emission Trading Schemes

Conceptually, links between emission trading systems can be either indirect via acceptance of a common offset credit, or direct based on an explicit decision by at least one of the linked jurisdictions. Moreover, direct links can be distinguished by whether they allow trading in one or more directions. Under a unilateral link, entities in one system can purchase and use trading units from another system for compliance, but not vice versa. Administrators of a system can establish such a unilateral link by agreeing to accept allowances or credits issued by another system for compliance purposes. For example, the EU ETS has a uni-directional link to the CDM and JI. In a full bilateral link, by contrast, units can be freely traded between both systems, and units from each system are equally valid for compliance in both systems.

Several authors have addressed the institutional and systemic requirements of linking different types of emissions trading schemes from a general perspective. The issues that will need to be considered in linking processes are considered in detail below (see e.g. Haites and Mullins 2001; Blyth and Bosi 2004; Sterk et al. 2006; Tuerk et al. 2009):

- The sector and GHG coverage of the scheme;
- The definition and recognition of trading units;
- The type and stringency of the emission target;
- The allocation methodology;
- Provisions for temporal flexibility, i.e. the compliance period, allowance validity, banking and borrowing;
- Provisions for monitoring, reporting and verification;
- The compliance framework and penalties.

2.1 Sector and GHG coverage of the scheme

Differing **sector or gas coverage** is not a matter of institutional compatibility, nor does it affect the environmental effectiveness of a linked trading scheme. A constellation where one or more gases or categories of sources are included in one scheme but not in the other first and foremost raises questions regarding competitiveness and gaining the necessary political support for linking under these circumstances. However, competitive disadvantages and possible discrimination due to diverging treatment of sectors in two trading regimes are not caused by linking and would also occur in its absence. Possible economic discrimination against certain sources can also be mitigated by economically efficient cap-setting: In the optimal case of sharing out reduction efforts according to each sector's abatement costs, which is admittedly difficult to do, the economic impact would be the same as in an economy-wide emission trading system covering all emitters. Thus, if opposition by stakeholders regarding competitiveness concerns due to unequal treatment of comparable emissions sources can be overcome, differences in the sources covered by two system's coverage should not impede linkages.

2.2 Definition and recognition of trading units

Trading systems should ideally have the same **quantitative unit of trading** based on the Kyoto Protocol, namely metric tonnes of CO_2-eq. The **recognition of trading units** is likely to be at the centre of linking negotiations. For example, if a particular type of unit, such as credits from carbon sinks, is not recognised in one scheme, companies in another scheme, which accepts this unit, could use them for domestic compliance purposes and then sell their 'regular' domestic allowances to companies in the first scheme. The political decision in the first scheme about which trading units are recognised would thus be bypassed.

While a scheme with a more narrow recognition of units may take adjustment measures such as the introduction of exchange rates, these would increase transaction costs while producing only limited effects. The question would therefore probably rather be to which extent the negotiators from both countries would want to maintain their rules for the recognition of units instead of harmonising them for the purpose of linking. If the inclusion of certain units is considered to be intolerable by a country, the only option to really keep them out would be not to link to schemes which include them.

2.3 Type and stringency of the emission target

The **kind of target** adopted by individual schemes also poses a problem. Two types of targets are conceivable: absolute caps, which limit the total emissions during a specified period; and relative targets, which are defined as emissions per unit of output or activity, such as gross domestic product (GDP) or energy consumption, or per unit of input. Thus, under a system with relative targets, GHG emissions will be allowed to increase in line with the increase of production.

Linking two schemes that differ in the way the target is determined may actually impair rather than enhance the liquidity of the combined scheme. Relative targets require that allocation takes place in two steps, an initial allocation based on projected production levels and adjustment ex post when the actual production levels are known. This is likely to lead to spikes in liquidity at the moment of adjustment. In the case of linkage, these liquidity shocks will also affect the scheme with absolute targets.

Linking a scheme with relative targets to a system with absolute targets also raises equity concerns since companies under the system with relative targets in effect receive a subsidy for increasing their output. This incentive may also compromise the environmental effectiveness of a combined regime because output increases will inflate the number of trading units available.

In fact, linking as such will have an impact on emissions, the direction of which depends on the allowance prices in the two schemes: If the price in the system with relative targets is lowered by linking, production and energy use will be stimulated, which will lead to rising emissions. That is, the environmental effectiveness of emissions trading would be impaired. If the price is raised by linking, the reverse effect will take place.

There are several options to address the problem of different types of targets, such as introducing exchange rates whereby trading units from the scheme with relative targets would be discounted against units from the scheme with absolute caps. However, all these options would render the system more complex and increase transaction costs.

As for the **stringency of targets**, a perfect balance of efforts is very unlikely to be achieved. However, while

competitiveness issues would not arise as a result of linking – they would also arise if the two schemes operated separately – it is probably a political precondition for linking that all sides demonstrate efforts to establish comparable targets.

Moreover, here as well linking itself changes the rules of the game: Countries will have an incentive to relax their target in order to become net sellers. To guard against this effect, countries should have a comparably ambitious climate policy strategy and a joint vision of where medium- and long-term emission trends should be headed. It would also be helpful to jointly agree on the targets in all linked systems in order to reassure all stakeholders that no country is trying to take advantage of the others. In the EU ETS, this role is played by the European Commission.

2.4 Allocation methodology and provisions for temporal flexibility

Differences in **allowances distribution** usually have no impact on the system's environmental effectiveness since this is solely determined by the overall cap. Moreover, after the initial distribution the carbon price will be independent of the method of distribution and be determined by market supply and demand. However, while competitiveness, defined as a company's ability to make a profit from its normal business operations, will not be affected, there will be an equity problem if allowances are allocated for free in one system and auctioned in another. Since the creation of allowances means creation of new economic value, companies in the first system would in effect receive a lump sum subsidy while the latter would not. Once again, this distortion would take place irrespective of linking, but companies in the system with auctioning can probably be expected to demand harmonisation prior to linking.

Banking allowances from one trading period to the next provides emitters with an incentive to overachieve their targets if they can expect that future allowance prices will be higher. It also gives them additional flexibility to deal with uncertainties such as future production levels. If a scheme which prohibits banking was linked to a scheme which allows banking, the latter would effectively provide a banking option for all the companies on the combined market. Since banking effectively means that more emissions have been reduced than required by the cap, this should in principle not pose any environmental problems. However, if a scheme is over-allocated, banking makes it harder to correct such over-allocation in later trading periods.

Borrowing allowances from future trading periods and thus delaying reduction measures into the future where they might be achieved more cost-effectively is not seen favourably from an environmental perspective. First, borrowing entails the risk that mitigation measures may not be taken in future periods either, for example due to lack of enforcement or if a company goes bankrupt. Second, companies may have an incentive to rely heavily on borrowing to artificially raise their future compliance cost curve and then argue that they need softer targets because otherwise the costs would be prohibitive. Similar to banking, linking a system without borrowing to a system with borrowing would open the borrowing option also to the companies in the system without borrowing.

Thus, linking a system without borrowing to a regime that allows borrowing may require restrictive provisions to be taken so as to maintain the environmental effectiveness of the linked trading scheme. One option would be to allow purchases from the scheme with borrowing only after its compliance period has been completed and only from companies that did not borrow, i.e. to allow only ex-post purchases of surplus al-

lowances.

2.5 MRV provisions and compliance framework

Monitoring, reporting and verification (MRV) provisions are crucial for achieving a credible ETS since they are the key to determining whether each trading unit corresponds to one tonne of emissions. Slight differences in MRV do not necessarily impact on the effectiveness of a combined trading scheme, but only as long as confidence in the trading units is not undermined by suspicions of under-reporting of emissions.

From the environmental perspective, the financial **penalties** for non-compliance should be significantly higher than the cost of allowances, as is the case in the EU ETS. In the EU ETS, companies have to pay a penalty of EUR 100 per tonne of emissions for which they did not submit allowances and paying the penalty does not free companies from the obligation to submit allowances.

A different philosophy is that of the 'price cap' where paying the penalty exempts companies from submitting allowances. Yet another option for regulators is to establish a 'safety valve'. With this mechanism, the regulator commits to selling allowances at a pre-determined price in whatever quantity is demanded once the market price for allowances rises above a certain level. This mechanism limits the cost of the market participants to the safety-valve level but at the cost of missing the environmental target. One of the main advantages of cap-and-trade emission trading is the ability to precisely define the environmental outcome. Price caps and safety valves crack the cap. They also stifle innovation since the incentive for developing low-emission technology rises with the price for allowances.

Moreover, if a system with strict penalties was linked to a system with a safety valve or where paying the penalty exempts companies from submitting allowances, the safety valve or penalty rate in this system would effectively act as a price cap for the combined system. As long as the market price was higher than the price cap or safety valve level, companies in the price cap/safety valve system would have an incentive to sell their allowances to companies in the other system until prices were equalised at the price cap or safety valve level. The government in the price cap/safety valve-system would thus effectively subsidise its emitters and the environmental effectiveness of the combined scheme would suffer since total emissions would be higher than if the two schemes were kept separate. Stakeholders in a scheme with strict non-compliance provisions might also object to linking to a scheme with less stringent provisions.

To conclude, the need for harmonisation varies widely with regard to different design elements. Some design options such as the systems' coverage may raise equity issues and stir opposition from concerned stakeholders. However, they are unlikely to adversely affect the overall effectiveness of the linked regimes. Other aspects have important implications for the equity, the economic and the environmental effectiveness in a combined scheme. The definition and recognition of trading units, the nature and the stringency of the targets, the provisions for banking and borrowing, monitoring, reporting and verification and the compliance regime fall into this category.

It bears noting that all of these issues fundamentally depend upon countries' levels of ambition as regards climate protection. If environmental effectiveness is the main priority, the route leads clearly to stringent absolute targets with reliable MRV and strict penalties. Such a system will also be careful to allow only high-quality offsets to count towards compliance. By contrast, features such as relative targets, weak emission

caps, price caps or safety valves and a generous recognition of offsets sacrifice environmental effectiveness for the sake of containing costs.

Through linking, these cost-containment measures will also impact all other linked systems. Linking should therefore only be sought between countries which have a comparably ambitious climate policy outlook.

In addition to domestic design issues, purchasing trading units from emission trading systems in non-Annex I countries also raises international accounting issues. Under the Kyoto Protocol, industrialised countries have to submit one Kyoto-valid trading unit (AAUs, CERs, ERUs or RMUs) for each tonne of CO_2-eq. they emit. Within the EU ETS, transfers of EU allowances are hence shadowed by transfers of AAUs. Thus, even if a country is a net buyer of allowances, it is still able to comply with its obligations under the Protocol. The situation would be different, however, when envisaging to purchase trading units from domestic emission trading systems in non-Annex I countries. As non-Annex I countries do not have legally binding caps, they also do not dispose of Kyoto-valid trading units which they could use to back up the trading units in their emission trading systems. The EU has therefore proposed to develop non-Annex I emission trading systems top-down under the UNFCCC through mechanisms for sectoral crediting and trading. Such new UNFCCC mechanisms would generate Kyoto-valid trading units which could be used by industrialised countries for their Kyoto compliance. However, the current initiatives in developing countries do not take place under the UNFCCC framework. To allow industrialised countries to purchase and use trading units from these systems, it would therefore be necessary to implement some form of certification of these systems under the UNFCCC. Obviously this point only applies if a second commitment period under the Kyoto Protocol is agreed or a new treaty retains the Kyoto Protocol's emission accounting system. But if there is an interest in trading internationally, developing countries with plans for domestic ETS, as the ones outlined below, will have to resolve this potentially ambiguous situation.

3 Overview of Emerging Domestic Emissions Trading Systems

3.1 Brazil

Brazil adopted a National Climate Change Law (PNMC) in December 2009, which includes a GHG reduction commitment of 36.1 – 38.9% against BAU projections. In order to reach this target, the law envisages, among others,

> *financial and economic mechanisms that are national in scope and referring to mitigation and adaptation to climate change* (PNMC, Art. 6.XI)

as viable instruments of the National Policy on Climate Change. This may lead to the creation of an emissions trading system in the future. The new Climate Secretary of Brazil, Eduard Assad, recently pointed to the possibility of such a development: "Brazil has not yet created the cap and trade system, but many sectors, both public and private, are working on proposals which imply its possible future adoption", he is quoted in a PointCarbon article (Volcovici 2011).

Brazil's National Climate Change Law mainly deals with the reduction of emissions from deforestation by

80% in 2020, as deforestation accounts for 75% of Brazilian emissions. It further implements the Brazilian Emissions Reduction Market (MBRE). The law states that

> *The Brazilian Emissions Reduction Market (MBRE) shall be operated in commodities, futures and stock exchanges, and in over-the-counter trading companies authorized by the Securities and Exchange Commission of Brazil – CVM, where negotiations for securities representing certified avoided greenhouse gas emissions shall take place*. (PNMC, Art. 9)

The MBRE is already in place. It operates as a stock exchange for voluntary reduction permits and holds regular auctions in voluntary carbon units derived from renewable biomass projects as well as CERs. The MBRE is largely operated by private actors. It serves to create the basis for a Brazilian domestic carbon market by installing a secure trading environment for carbon credits (www.sustainablecarbon.com). However, no actual figures about the amount of offset carbon could be found.

3.2 China

The People's Republic of China has voluntarily pledged to reduce its CO_2 emissions intensity by 40-45% per unit of GDP by 2020 against 2005 levels. Key domestic legislation relating to climate change dates back to 2007, when the National Development and Reform Commission issued China's National Climate Change Programme. Mitigation, adaptation, climate change science and technology, public awareness, and institutional development were recognized as main issue areas to be addressed in order to effectively tackle the climate change problem. An important factor for the creation of the law seems to be the need to conserve as much energy as possible, and to heighten energy efficiency, as the law focuses heavily on this area.

China's domestic reduction targets are being put forward in 5-year-plans. In order to meet energy efficiency goals laid out in the 2006-2010 plan, China's central government forced thousands of industrial enterprises to shut down, and suspended thousands more due to strict energy rationing in the second half of 2010. Still, the target of a decrease in energy intensity of 20% was missed by almost one percent (Jianqiang 2011). However, the draconic measures taken indicate that China takes its targets very seriously. For the end of 2015, China's current 5-year-plan envisages energy intensity reductions of 16%, and emissions intensity reductions of 17% compared to 2010. Newer reports indicate that China is considering absolute caps on carbon emissions from its industry in addition to its purely intensity-based targets, and to initiate a nation-wide ETS in 2015 (Reklev 2011g).

In October 2010, proposals to gradually create an emissions trading market over the coming five years were approved by the Central Committee of the Communist Party. Initially, trading systems are to be developed regionally, with the province of Guangdong taking the lead because of their energy data, which is exceptionally good compared to other provinces. Guangdong, China's second-most populated province and one of its most economically developed, announced the start of a voluntary industrial sector carbon trading scheme by 2012 or 2013 in order to reduce its levels of carbon intensity by 30% against 2005 (Reklev 2011a).

Other officially recognized low-carbon provinces ("Pilot Low-Carbon Regions and Cities") that might follow up are Liaoning, Hubei, Shaanxi and Yunnan; low-carbon cities include Tianjin, Chongqing, Shenzhen, Xiamen, Hangzhou, Nanchang, Guiyang and Baoding (Hannon et al. 2011). Together, these provinces and cities cover over 300 million people, and 20% of China's annual GDP in the provinces alone (Janissen 2011).

Chinese officials recently unveiled more specific plans for the provinces Guangdong and Hubei, as well as the cities Beijing, Chongqing, Shanghai and Tianjin. Together these account for about 25% of China's annual GDP. Pilot schemes are to be developed before 2013 and shall be based on provincial energy consumption targets that are derived from the nation-wide target of approx. 4 billion tonnes of standard coal in 2015. The regional pilot schemes may be unified and scaled up to a national programme after a two-year test phase. However, no plans on the scope or design of such a scheme have as yet emerged (Chen 2011).

In fact, the newly-commissioned regional trading schemes are likely to follow very different design routes. Whereas Guangdong is likely to put in place a trading system based on absolute emission caps, Tianjin and Beijing have indicated that their trading scheme might be based on energy saving credits. Shanghai has not yet decided on which route to follow – absolute caps on carbon dioxide, carbon and energy intensity-based credits are all being considered. No information on Hubei's and Chongqing's choice of schemes is available at this point in time, but Chongqing has announced its willingness to set up a carbon trading exchange (Reklev 2011a).

How the competing trade schemes are to be linked domestically and how – and if – international trade in carbon will be possible, remains to be seen. According to sources quoted by Reuters, international traders are sceptical of business opportunities at least from the outset, as China's focus on domestic trade tends to favour Chinese companies over international brokers. This has been the case before with China's pilot forestry crediting mechanism (Reklev2011a). Carbon trading specialists are also sceptical about the implementing speed of the Chinese ETS systems. Due to the widely different designs as well as a lack of dependable carbon data and trustworthy MRV systems, it is not expected that a Chinese ETS system will be operational by 2013. Indeed, even a small market by 2015 would be seen as a success (Reklev 2011b), which does not yield high hopes for China's plans for a nation-wide scheme. The potential volume of these very diverse approaches remains unclear, the proposed systems are in early stages of development.

On the international level, Greg Combet, the Australian Environment Minister, has announced that Australia and China will cooperate in the development of low-carbon cities and lessons learned from the use of market mechanisms (Climate Connect 2011).

Most recently, the People's Republic of China has been one of the first to receive an initial grant of 350.000 USD under the World Bank's Partnership for Market Readiness for the development of its planned provincial systems and to build up domestic capacities in the carbon market field, including the analysis of different approaches to an MRV framework (World Bank 2011).

3.3 India

India introduced its National Action Plan on Climate Change (NAPCC) in 2008, which outlines eight "national missions" to be tackled by 2017 (India 2008).

The solar mission sets the goal to increase photovoltaic power production to 1000 MW per year, and to generate the same amount in solar thermal plants. It also includes plans to strengthen research, development and deployment in solar energy.

The mission for enhanced energy efficiency strives to save 10 000 MW by 2012 through current initiatives, and to build on this through tradable energy efficiency certificates (PAT, see below), and other positive incentives to conserve energy. India's mission on sustainable habitat furthermore seeks to strengthen energy

efficiency in buildings and households, as well as better waste management. The water mission sets the goal to heighten water use efficiency by 20%. Automotive fuel efficiency is to be strengthened, and the use of public transportation encouraged.

India's forest cover is to be expanded by 10% to 33%, and 6 million hectares of degraded forest lands shall be regrown. Adaptation in agriculture is to be tackled through development of climate-resilient crops and adaption of agricultural practices. A special mission is set up for the conservation of biodiversity in the Himalayan Region. A Climate Science Research fund is to be created, and international collaboration is strongly called for.

India has not shown much propensity towards designing a domestic emission trading system. The reason, as discussed by Prabhat Upadhyaya (Upadhyaya 2010), is two-fold:

First of all, there is a political reluctance to commit to an emissions target for India as the country is adamant in its position that in view of historical responsibility only developed countries should take on such targets. In view of major industrialised states not adhering to their commitments, it seems politically unviable for India to take on commitments for itself.

Secondly, there seems to be institutional overlap between possible ET systems and already enacted policy tools in India. CDM has been very successful in India, which raises the issue of possible double-counting of carbon credits if a possible domestic ETS allows CERs to be used. Furthermore, market mechanisms for renewable energy and energy efficiency are already in place. The Perform Achieve and Trade (PAT) system is aimed at large and energy-intensive industries. It involves setting an energy consumption goal for each participating facility, followed by a three-year-reduction phase. If the reduction target is overachieved, the facility gets tradable energy permits, which may be bought by consumers falling short of their set goals (Agneya Carbon Ventures 2001).

Also, as of 2011, India has implemented a Renewable Energy Certificates (REC) trading system, a scheme to trade surplus renewable energies across state boundaries. Every REC represents one MWh of either solar or non-solar renewable energy, purchases of RECs are treated as consumption of such. The aim of this scheme is to promote the use of renewable energy even in Indian states that have low renewable energy capacities. This way, utility companies may fulfil their targets to purchase a certain percentage of renewable energies without having to rely on local conditions and at the best price. The REC Mechanism divides renewable energy generation in two components, the actual electricity, which can be sold at an agreed tariff, and a REC certificate which is traded at India's two major power exchanges, IEX and PXIL (ABPS 2009, EAI 2011).

The question is how these energy efficiency and renewable energy trading systems would be coordinated with an emissions trading system, especially to avoid double counting.

3.4 Kazakhstan

Kazakhstan has announced that it is willing to introduce a carbon trading system. At the moment, a joint project of Climate Focus and the Dutch government supports the country in the design of a domestic ETS (www.climatefocus.com).

A draft law has been proposed, which would allow the ETS to start immediately. It seems likely that the targets will fall in line with the voluntary targets set by the Kazakh government to reduce domestic emissions by 15% or 39 $MtCO_2e$ compared to 1992 until 2025, and up to 25% or 65 $MtCO_2e$ until 2050, and that the

national allocation plan will include associated caps for the system.[1]

The proposed system would cover activities in industry, oil and gas, energy, mining and metallurgical and chemical industries, agriculture and transport. The draft law envisages a combination of market and administrative mechanisms. Installations above a threshold of 20,000 t CO_2 per year would receive an allocation whereas installations with emissions below this threshold would be subject to a CO_2 tax. Installations above 20,000 t CO_2/a would have to annually submit trading units corresponding to their emissions. In addition to allowances, they would also be allowed to submit CERs, ERUs and credits from domestic projects. Domestic projects would be allowed in the areas of mining and smelting, agriculture, housing and utilities, planting of forest and grassland areas, prevention of land degradation, renewable energy, recycling of municipal and industrial waste, transport, and energy-efficient construction.

Companies that fail to submit allowances would have to pay fines and be subject to criminal prosecution. However, these sanctions would not free companies from submitting the required amount of trading units.

Furthermore, Kazakhstan has announced a cooperation with Russia, Ukraine and Belarus for the creation of a regional trading system (Hood 2010). However, no further details are available at the moment.

3.5 Mexico

Mexico launched a National Strategy on Climate Change (ENAC) in 2007, which recognizes climate change as one of the major challenges of the modern world and identifies specific measures for adaptation to as well as mitigation of climate change (Mexico 2007). Mexico also elaborated a Special Program on Climate Change 2009-2012 (PECC) under which it aims to reduce emissions by 51 million t CO_2-eq./year in 2012 compared to BAU. Mexico also has committed to achieve a 30% reduction from BAU levels by 2020 under the condition that financial and technological support is made available by industrialised countries (Mexico 2008).

One of the measures deemed appropriate to mitigate GHG emission in the ENAC was the creation of a domestic ET system. Seven steps to a consolidated national ET scheme included

1. Consolidation of the Mexican Oil Company (PEMEX)'s virtual emissions trading scheme, setting limits on emissions from participating facilities and linking it to the voluntary GHG accounting and reporting system promoted by SEMARNAT. Integration of the Federal Electricity Commission (CFE, Mexico's national utility) and Central Light and Power (LFC, the utility for central Mexico) to the voluntary accounting and reporting system. Sustained promotion of CDM projects in all sectors, particularly energy.
2. Assignment of carbon and real exchange values by PEMEX, with minimum budgetary affectations for participating facilities. Periodic review of emissions caps. Integration of CFE and LFC within a national emissions capping system.
3. Establishment of a carbon credit exchange system with capped values, between PEMEX, CFE and LFC. Introduction of regulatory measures that allow the consolidation and extension of this system, including any necessary changes to laws, regulations and standards.
4. Promotion of carbon credit trading with other economic sectors, public or private, managed via projects with simplified criteria, based on the CDM.
5. Integration of chosen economic sectors within a national "cap and trade" scheme, with capped

[1] Information based on informal email by inside specialist

carbon prices set by central government, which do not threaten the development of a healthy and competitive economy.

6. Integration of further economic sectors within an increasingly consolidated national scheme, with progressive price liberalization.
7. Coupling of the national cap and trade scheme with existing international schemes, whether derived from the Kyoto Protocol or not (ENAC 2007).

However, the current Special Climate Change Program 2009-2012 (PECC) does not mention cap-and-trade as an option to mitigate GHG emissions domestically. Resources for the Future conducted a feasibility study on different GHG abatement options for Mexico in the wake of President Calderón's announcement of the PECC at the World Environment Day in Cozumel in 2009. The study concludes that there is a range of viable options for monetizing offsets, especially if a link to the European Union or the United States were provided. The authors find that especially in the electricity, oil/gas, and forest/land-use sector, large-scale emissions reductions could be achieved with little to no cost (Burtraw et al. 2010).

Under the World Bank's Partnership for Market Readiness, Mexico has been one of the first eight countries to receive an initial grant of 350.000 USD in order to build up domestic capacities for the implementation of carbon markets. However, if Mexico's Expression of Interest for the Partnership is any indication, focus seems to have shifted from a domestic ET scheme to the development of credited NAMAs in energy efficiency in housing, appliances and other end uses, methane destruction or use in solid waste disposal, improved cement blended production, and urban transport. Mexico envisages that part of the financing for these NAMAs may come from crediting, but the ideas revolve around improving national regulation or establishing local projects rather than introducing a domestic ETS (Government of Mexico 2011).

3.6 South Korea

The Republic of Korea has pledged to reduce its emissions by 30% by 2020 against BAU. This pledge has recently been backed up by a cabinet approval, and has now been handed over to the Korean parliament with a high chance of approval (Reklev 2011f). Its Framework Act on Low Carbon, Green Growth (April 2010), stipulates in Article 46, that

> *The government may operate a system for trading emissions of greenhouse gases by utilizing market functions in order to accomplish the State's target of reduction of greenhouse gases; the method of allocation of the allowable quantity of emission, the methods of registration and management, and the establishment and operation of an exchange shall be provided by another Act separately.*

This article may in due time lead to a fully functional cap-and-trade system in South Korea. The process has been delayed as the business sector protested against high cost and double regulation: apart from plans for a nation-wide ETS the Korean government has also introduced a Greenhouse Gas & Energy Target Management System (businessgreen 2011, see below). Original plans included a three-year cap-and-trade scheme starting 2013 and covering over 470 enterprises across all sectors with emissions above 25.000 tonnes CO_2/year. Together, these account for ca. 60% of Koreas total greenhouse gas emissions of about 600 million tonnes per year. After the first phase, trading periods were to be expanded to 5 years. Banking and borrowing of permits were to be allowed under the proposed system, as well as direct trading among participants and the use of CERs generated through CDM projects. Ten percent of the credits were to be auctioned, while 90% were to be allocated for free. Reports have stated that the government might raise this quota to

95% free allocation, if and when the ETS takes off (Mee-young 2011). Very recently, the Korean Cabinet has finalised a bill for the creation of an ETS by 2015, which is going to be reviewed by a special climate change committee before being put to vote in parliament. The future system will, if approved, force industry to cut emissions by 83, electricity producers by 68.2, the building sector by 48, and transport by 36.8 million tonnes, totalling 236 million tonnes of CO_2-eq. Korea estimates its baseline emissions at 813 million tonnes of CO_2-eq. in 2020, so a total cut of 244 million tonnes of CO_2-eq. will be necessary to reach the 30% target (Reklev 2011f).

The interim Greenhouse Gas & Energy Target Management System serves to ensure that the pledged emissions reduction of 30% below business as usual by 2020 will be met. Even though government officials coined it a precursor to the ETS to come, it is at the moment not a real trading system. Instead, the nationally-set target will be broken down to company level and individual targets for the country's 470 largest emitters will be imposed. As with the planned ETS, the system covers more than 60% of the nation's emissions. The largest sector covered will be the Korean industry with 779 individual facilities emitting 239.5 Mt CO_2-eq., followed by the electricity sector (137 installations / 186.4 Mt CO_2-eq.), and the agricultural sector (648 facilities / 16.2 Mt CO_2-eq.).

If individual targets are not met, the failing company will first be issued an improvement order. If targets are overshot for a second time, a fixed fee of 100 million won (ca. 6.300 €) will have to be paid, even if the company is only marginally off-target. In order to meet imposed cuts, credits from the voluntary ETS (see below) may be used. It is not clear if these may actually be bought from other companies or otherwise traded. However, as only a very small number of enterprises participates in the voluntary scheme, there will not be a high amount of tradable certificates. Other means of reduction include voluntary energy-saving agreements with the Ministry of Knowledge Economy as well as Korean certified (KCERs) emissions reductions, issued by the same ministry. Issuance of KCERs and validation of agreed reductions depend on cuts in the companies' own facilities and may not be traded at this point in time. Emissions cuts bought abroad (e.g. CERs) are also specifically excluded from the scheme (Reklev 2011c). The Greenhouse Gas & Energy Target Management System will be discontinued if the planned ETS takes off in 2015 (Reklev 2011f).

On 29 June, South Korea announced overall targets for the power and heavy industry targets. The power sector will be required to reduce emissions 26.7% below BAU by 2020 while industry will be required to reduce emissions by 18.2%. These targets will serve as the basis for the installation-level targets in the Greenhouse Gas & Energy Target Management System and will probably also be the basis for the national ETS when it is introduced (Reklev 2011d).

Back in 2009, South Korea introduced a voluntary ETS with a two-track approach. On one hand, participating sectors can set voluntary targets, which are then monitored and concrete reductions validated by governmental authorities. Targets are put down in individual contracts among industrial entities and the government. On the other hand, local governments may voluntarily set overall targets for their municipalities through a Memorandum of Understanding with the federal environment ministry, setting up a regional ETS (Ministry of Environment Emission Trading System, MEETS) for local governments and public agencies. At the same time, programmes to manage emission accounts and credit issuance, transfer and history were set up, and a National Registry was created (Chang-Gil Kim 2011). Reports indicate that the Environment Ministry's MEETS Scheme has only attracted very minor interest in the Korean business, with at the moment only 23 participants (Reklev 2011e).

Very recently, a second pilot carbon trading scheme has been launched by the Ministry of Knowledge Econ-

omy. The newly introduced scheme will cover 172 facilities from 67 companies. The system operates without non-compliance costs, but with positive incentives through certificates tradable among the participants of the scheme, and financial payoffs if targets are met (Reklev 2011e).

4 Conclusions

The creation of a global carbon market is a key goal of the EU. Even after Copenhagen the European Commission had still optimistically assumed that a OECD-wide carbon market could be achieved by 2015 and that some advanced developing countries might be included as early as 2020.

This survey has shown that the outlook differs substantially from country to country. Kazakhstan and South Korea are the most advanced, specific emission trading bills have been put on the table in these countries. However, even here not all design elements are clear and it is uncertain when these laws might actually be passed. China's new-found commitment to absolute targets and the creation of a nation-wide scheme by 2015 gives reason for optimism. However, the implementation pathway is as yet unclear. The question is in particular how the very diverse design choices of the envisaged pilot schemes are to be aligned to form a convergent system on such short notice. Nevertheless, as Chinese announcements are becoming increasingly ambitious, the creation of a large-scale Chinese system by the middle of this decade is a distinct prospect.

Such a system by the world's largest emitter would have a substantial impact on the market, but in general it is not yet clear how large the emerging systems are going the be. An exception is South Korea where current plans envisage a coverage of around 400 Mt CO_2-eq. per year. The Korean system would hence have the size of ca. 1/5 of the EU ETS.

The trading systems that do emerge may not necessarily be based on GHG emissions. India is establishing trading systems for energy efficiency and renewable energy and some Chinese provinces are also considering efficiency-based systems. On the one hand, such systems might optimistically be seen as potential precursors to a GHG trading system that help to build capacity and gain first experiences with trading. On the other hand, institutional lock-in and path dependencies might prevent a later shift from energy consumption to GHG trading.

In addition, even where GHG emissions trading is pursued such a system will not necessarily be compatible with the global carbon market. The environmental benefits of emissions trading and by extension of linking crucially depend on the design of a trading system. This relates especially to the nature and stringency of the targets and the inclusion of cost-containment features. Through linking, such features would impact the whole combined trading scheme and thus impair rather than enhance its environmental effectiveness.

Finally, there is the sheer complexity of establishing an ETS. Even in the EU, where implementation of an ETS was fast-tracked as much as possible, the process from the publication of the Commission's Green Paper on emissions trading to the start of the system took five years.

On the positive side, China, the world's largest emitter, is becoming increasingly committed to emission trading and there is also clear interest in various other developing countries to explore the possibilities of introducing emissions trading systems. The EU is engaging with these countries through initiatives such as the International Carbon Action Partnership (ICAP) and the Partnership for Market Readiness. These initiatives should be further pursued and strengthened.

However, it can be assumed that at least until 2020 climate policy even in many of the rapidly industrialising developing countries will mainly revolve around non-ETS policies and measures. International climate cooperation should therefore not neglect improving the CDM and supporting transformational policies and measures through fund-based instruments.

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