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Linking national emissions trading systems with the EU ETS: A bottom-up approach for future global emissions trading

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Abstract

The paper focuses on links between the European Union Emissions Trading Scheme (EU ETS) and other (domestic) GHG emissions trading schemes (ETS) which could open up a perspective to keep the idea of emissions trading alive on a global scale. The approach consists of investigating qualitatively the essential requirements of this alternative bottom-up approach. It is evaluated if variations or inconsistencies in the structure and design of domestic ETS as well as legal and institutional characteristics harm or facilitate the concept of linking with the EU ETS. The evaluation of systems leads to the exclusion of systems with voluntary character, relative caps, unrestricted borrowing and price caps from the group of potential linking candidates. Regarding the cap setting in a linked system and bearing in mind the economic preference of a centralised allocation of certificates, the very crucial point concerning such a construction is the question how to limit the amount of certificates in a fair but also effective way so that the ecological necessity of climate change mitigation is met.

Highlights

- We analyse linking possibilities of the EU ETS with other (domestic) ETS.
- The ETS of Japan, New South Wales and Alberta are dropped out from possible linking scenarios with the EU ETS because of their voluntary character and relative caps.
- Considering the current framework, a centralised regulation of the multilaterally linked ETS is an economically desirable but legally and politically not feasible framework.

Keywords

Post-Kyoto, Bottom-up, International and domestic emissions trading, Linking, Institutional Design

1 Introduction

Uncertainty is growing about the future of the global climate regime as designed by the Kyoto Protocol (KP). The greenhouse gas (GHG) reduction targets that are laid down in the KP are only binding until 2012 and the prospects of settling legally binding targets beyond that date are practically zero in the short term. The United Nations Climate Change Conference in Durban in 2011 decided to conclude a legally binding agreement covering all countries which will be prepared by 2015 and enter into force by 2020. Given this treaty and assuming an agreement, the inclusion of the biggest polluters at the global level may be possible whereas the legal implementation of this process remains still unclear. Moreover, the flexible mechanisms which were established on a global scale by the KP for the first time seem to be jeopardised again in the case of a prolonged dissent concerning an amendment or a follow-up treaty to the KP. Thus, the question arises whether and which alternatives for a global climate policy exist besides this top-down orientated approach, allowing the continued application of such market-based mechanisms. Taking into account the important status that the European Union Emissions Trading Scheme (EU ETS) has reached in the meantime as well as the political and economic efforts that have been invested into the development and ongoing improvement of this instrument, the future perspective for a common international climate policy constitutes a question worth deliberating about.

Economically speaking, linking the EU ETS and other existing or emerging domestic emissions trading schemes (ETS) is highly desirable for a number of reasons because a linkage between two or more ETS will generate a market with a larger number of participants, increasing the diversity of control costs and increasing the liquidity of the market. This will further contribute to reducing the overall cost of compliance in the concerned systems while improving the overall economic efficiencies of the ETS. Secondly, linking of ETS also provides internationally competing companies a wider regulatory framework with a single price of carbon. Finally, an ETS linkage does not only promote technology transfer and sustainable development, but also the creation of a larger global market. Accordingly, its regulatory framework should help to attract other countries to join the development of the global GHG market (Jaffe and Stavins 2008).

Therefore, the paper focuses on multilateral links between the EU ETS and other (domestic) GHG ETS which could open up a perspective to keep the idea of emissions trading on a global scale alive. An interesting starting-point can be found in Article 25 of the ETS Directive[1] itself which initially states that “agreements should be concluded with third countries listed in Annex B to the Kyoto-Protocol which have ratified the Protocol to provide for the mutual recognition of allowances between the Community scheme and other greenhouse gas emission trading schemes…”. After its revision in the course of the EU climate and energy package in 2009, the additional paragraph 1a specifies that “[a]greements may be made to provide for the recognition of allowances between the Community scheme and compatible mandatory greenhouse gas emission trading systems with absolute emissions caps established in any other country or in sub-federal or regional entities” which will enter into force at the beginning of 2013. This opens up much more potential linking possibilities than the earlier wording. Although most ETS have actually been implemented in industrialised countries, yet an analysis of the linkage possibilities with domestic ETS e.g. in emerging markets like China or India is also of special interest.

The approach consists of investigating qualitatively the essential requirements of this alternative bottom-up approach. In order to allow an examination of such an undertaking, an overview and a classification of potential candidates for a global linking approach have to be provided. Particularly, it is evaluated if variations or inconsistencies in the structure and design of domestic ETS as well as legal and institutional characteristics harm or facilitate the concept of linking with the EU ETS. Whereas this

[1] Directive 2003/87/EC of the European Parliament (EP) and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community as amended by Directive 2004/101/EC, Directive 2008/101/EC, Regulation (EC) No 219/2009 and Directive 2009/29/EC.

institutional comparison is also evaluated from a legal background, the provision of economic efficiency and ecological effectiveness generated by linking are the crucial factors that this analysis focuses on.

In the course of this study, several questions arise from an economic as well as from a legal point of view, with regard to the institutional organisation of a globally orientated ETS that is supposed to grow step by step from the bottom by linking one national ETS to the other. In a decentralised system, international agreements (being bilateral or multilateral) according to the international law of contract might be the main mechanism for meeting the necessary regulations. Bearing in mind the economic preference of a centralised allocation of certificates (Helm 2003, D'Amato and Valentini 2011) the very crucial point concerning such a construction might be the question how to limit the amount of certificates in a fair but also effective way so that the ecological necessity of climate change mitigation is met. Besides the consideration of the establishment of a new international institution dealing with this challenge, already existing international institutions – preferably located within the UN or even the UNFCCC itself - shall be detected and examined with regard to their eligibility for this function.

2 Evaluation of key design elements of the EU ETS and their implications for linking

In the following, we discuss critical design features with respect to the linking of the EU ETS[2] with domestic ETS. This discussion builds the basis for the derivation of economic, ecological and legal implications of the analysed bottom-up approach. The central principles of climate policy in the context of linking are the generation of economic efficiency by an overall cost-minimisation and by environmental effectiveness through the decrease of GHG emissions as defined by the reduction target. Institutional harmony, i.e. the similar design of essential elements, is necessary in a few cases such as cap setting, allowance allocation, covered emissions, compliance and monitoring, whereas overall consistency of the main parts of these elements is desirable but not necessary.

2.1 The schemes' coverage

2.1.1 Gas coverage

The KP addresses the reduction of six GHGs (CO_2, CH_4, N_2O, HFC, PFC and SF_6), which is motivated by comprehensiveness and abatement costs. The mitigation of non-CO_2 greenhouse gases allows more cost efficiency as compared to the mitigation of CO_2 emissions. Hence, a coverage of CO_2 and non-CO_2 emissions can theoretically induce the realisation of an ecological target in a cost efficient manner. However, difficulties in calculating and monitoring non-CO_2 emissions lead to higher uncertainty, request great transparency and may generate higher economic costs.

Article 2 and 3a of the ETS Directive (concerning the amended aviation activities) determine the scope of the EU ETS and relate to the Annex I listing of categories for activities and specific emissions to which the Directive actually applies. While for the time being, CO_2 constitutes the only gas covered by the EU ETS, in the up-coming trading period also N_2O and PFCs will also be considered in a few cases. As Article 30 of the ETS Directive facilitates the future inclusion of further GHGs, depending on the progress achieved in the monitoring thereto, one day all six GHGs addressed in the KP could be included.

[2] Although at the moment, emissions trading partly follows different rules during the trading period 2008-2012, the focal point of the analysis is laid on the legal rules for the up-coming trading period 2013 -2020.

A connection of the EU ETS with as many involved GHGs as possible allows achieving ecological effectiveness at lower cost. Regarding economic efficiency, the coverage of lower cost abatement possibilities should decrease the total cost of meeting a defined emissions standard. Comparative advantages for the companies in the ETS with the broader coverage may occur because their access to lower cost options might increase their ability to sell allowances on the wider scheme (Blyth and Bossi, 2004; Ellis and Tirpak, 2006; Sterk et al. 2006).

2.1.2 Sector coverage

Diverse sector coverage between two schemes might be due to different political decisions and situations regarding the regulated sectors. A downstream approach, like the EU ETS, focuses on the emissions at the point of emission while an upstream approach focuses on the point of entry of a fossil fuel into the energy system. Ideally, variances in coverage of the ETS should not harm the possibilities of linking. However, an essential point regarding the linking of two ETS with different coverage will be the avoidance of any double-counting with respect to captured emissions and allocated allowances (Blyth and Bossi, 2004; Sterk et al., 2006).

Regarding the question if the participation is voluntary or mandatory, it can be stated that the price generated within a combined ETS will be higher than in the voluntary scheme because mandatory systems tend to be ecologically more effective and create a more intensive price signal. This strengthens the incentive to move production outside the ETS. Additional to this form of leakage, net sellers may enter the voluntary system. These problems could be addressed by monitoring systems with respect to leakage and entry-provisions to the voluntary system. For generating ecological effectiveness, it is crucial that the participants in the voluntary scheme accept serious targets which are at least lower than the business-as-usual (BAU) emissions (Sterk et al., 2006).

As Article 4 of the ETS Directive establishes a mandatory trading system, the European scheme has to face the challenge of so called carbon leakage. A very sophisticated regulation, particularly pursuant to Articles 10a and b of the ETS Directive, deals with the problem by additionally allocating free permits as an exception to the imposed auctioning of allowances.

2.1.3 Direct vs. indirect emissions

This design issue concentrates on the pass-through of emissions and their regulation from the point of generation (direct) to the point of end-use (indirect). In this respect, Annex I section 3 of the ETS Directive addresses the totally rated thermal input of an installation as a rule and hence focuses on monitoring of direct emissions. A linkage between ETS regulating different forms of emissions is possible but requires an appropriate avoidance of double-counting (Blyth and Bossi, 2004; Ellis and Tirpak, 2006; Mace et al. 2008; Sterk et al., 2006).

2.1.4 Opt-in and Opt-out provisions

Analogously to the discussion above regarding mandatory and voluntary systems, a restriction on opting-out possibilities has to be made in order to maintain the coverage of the system and its ecological effectiveness (Blyth and Bossi, 2004; Sterk et al. 2006). Further, the possibility of opting-in may lead to a higher supply of allowances (Ellerman, Joskow and Harrison, 2003). The EU scheme restricts opting-out to small installations with less than 25,000 tonnes of CO_2e and a rated thermal input below 35 MW. Moreover, they are subject to equivalent emission reduction measures and have to be notified to the Commission pursuant to Article 27 of the ETS Directive. Opting-in by unilateral inclusion of additional activities and gases has to be approved by the Commission according to Article 24 of the ETS Directive.

In general, if allowances are auctioned, new and old sources will be treated in the same way as current participants. However, rules regarding the treatment of old and new sources have to be defined before the systems are connected if one of the linked ETS provides free allowances.

2.2 Definition and recognition of trading units

There have to be clear rules indicating what trading units are included and which are excluded from the market. In the case of linking two domestic systems, it is necessary to provide a functioning legal framework which ensures a fair recognition and eligibility of diverse units. Improper exchange may lead to a higher total supply of allowances and harm the ecological effectiveness (Blyth and Bossi, 2004; Sterk et al., 2006).

Thereto Article 3 of the ETS Directive defines in section (a) that "´allowance´ means an allowance to emit one tonne of carbon dioxide equivalent [CO_2e] during a specific period". According to section (j) CO_2e means "one metric tonne of carbon dioxide (CO_2) of an amount of any other greenhouse gas listed in Annex II with an equivalent global-warming potential".

2.3 Cap setting

2.3.1 Absolute vs. relative caps

Absolute caps imply an absolute level of emissions during a defined period whereas relative caps are defined by a certain activity, e.g. emissions per unit of output, which provides more flexibility and certainty regarding the costs.

In the previous trading periods as well as in the extended scheme starting in 2013, the EU ETS adheres to an absolute cap. While the cap was set by the Member States themselves up to now, it was determined at approximately 2,04 billion allowances for 2013 by a decision[3] based on Article 9 of the ETS Directive. Each year, this absolute quantity of permits is supposed to decrease in a linear manner by 1.74% of the annual total quantity of allowances that are issued by the Member States in 2008-2012.

In an ETS based on a relative cap, the final endowment of allowances is allocated to the participants ex-post when the necessary variables are known. In contrast to that, an ETS with an absolute cap defines the allowance endowment ex-ante. This implies that a linking of a relative and an absolute ETS would have negative effects on the liquidity of allowances because the real amount of available allowances of the ETS with the relative cap is not known in advance (Blyth and Bossi, 2004; Sterk et al., 2006). Additionally, the higher administrative costs and risks concerning the ecological effectiveness induced by intensity targets lead to the abandon of the linking of ETS with absolute and relative caps (Mace et al., 2008).

Further, Fischer (2003) points out that in case of linking systems with absolute and relative targets there may be a feedback in the overall emissions of the scheme with a relative cap. Because of a marginally higher growth of both economies of the regulated countries due to linking, emissions will rise in the system with a relative cap in contrast to the situation without any connection of the two systems.

2.3.2 Stringency of caps

The stringency of a cap is described by the amount of allowances as compared to the overall environmental target. Concerning a partial regulation by an ETS like in the case of the EU ETS, the cap stringency is given by considering the overall target. The total allowance endowment of the trading sectors should be consistent with the Kyoto targets and the burden-sharing among trading and non-trading sectors.

[3] Decision 2010/634/EU adjusting the Union-wide quantity of allowances to be issued under the Union Scheme for 2013 and repealing Decision 2010/384/EU, Official Journal No. L 279/34, 23rd October .2010.

As the ETS Directive covers important but still not all GHG emitting sectors, the so called "efforts-sharing-decision"[4] has to be especially mentioned in this context. Together both provisions comprise GHG emissions rather comprehensively. Though their actual consistency in relation to the Kyoto targets shall not be assessed at this point, their concurrence has an important share in safeguarding the stringency of the caps for emission trading. As long as non-trading sectors did not have to face stringent reduction targets, the discussion about a potential violation of the principle of equality hindered effective implementation measures to a certain extent. The even more important factor to assure stringent caps results from the already mentioned linear decrease of issued allowances.

It seems to be questionable if full equity of abatement at the sectoral or installation level can be achieved between two different emission trading schemes. A central regulation authority planning the overall abatement burden of each ETS could resolve this problem in the case of linking. Nevertheless, these (international) competition concerns with respect to the relative stringency do not occur because of a linkage but would also appear in the case of unconnectedly running ETS. Only if a cap defines the emission standard above BAU emissions, the linking would lead to higher emission levels than in the separate Emission trading schemes (Blyth and Bossi, 2004; Sterk et al., 2006).

In order to prevent a too generous cap setting which avoids robust CO_2e price signals and positive emissions mitigation, a dynamic cap setting may be implemented in certain schemes. The connection of a scheme with a dynamic cap setting mechanism and a scheme with a fixed cap offers the possibility of ex-post adjustments regarding the stringency of the overall cap. In contrast, the system with the flexible cap may face a high abatement burden as a result of balancing abatement efforts, all of which is not possible in the ETS without a dynamic cap.

2.4 Allocation Methodology

Mainly, there are two forms of allocation of the allowances: free allocation and auctioning. In this respect the revised ETS Directive 2009/29/EC provides a fundamental change, because pursuant to Article 10 auctioning of allowances will become the rule rather than the exception within the third trading period starting in 2013. As already mentioned, sectors and sub-sectors exposed to a significant risk of carbon leakage will still be allocated free permits, given they comply with ambitious benchmarks.

When the initial allocation is complete, trading can start. Participants that have more certificates in their portfolio than they need (net suppliers) can sell these certificates on the market to participants (net purchasers) that have to cover their emissions with additional permits. Thus, the certificate price results from the interaction of the supply of certificates (the emission cap) and the demand behaviour of emitting firms (the aggregate marginal abatement costs). In principle, trading will result in an economically efficient outcome independently of the initial distribution of permits (Montgomery, 1972) because marginal abatement costs are met in any equilibrium, given perfect information, no transaction costs, a perfectly competitive trading market, and no government intervention.

Hence, the linkage of emission trading schemes with different initial endowment methodologies should therefore not generate any extra economic distortion. Though, differences may occur because of subsequent allocation rules that imply distributional impacts – these include updating of allocation in the future, management of plant closure and new entrants whereas harmonisation rules may weaken the distortions (Blyth and Bossi, 2004).

[4] Decision No. 406/2009/EC on the effort of Member States to reduce their greenhouse gas emissions to meet the Community´s greenhouse gas emission reduction commitments up to 2020, Official Journal, No. L 140/136, 5th June 2009.

2.5 Temporal flexibility

As far as the EU ETS is concerned, banking and borrowing are admissible in the current scheme, but only within one trading phase. This can be derived from Article 13 of the ETS Directive due to which allowances are valid for emissions during the entire trading period for which they are issued. While inter-period borrowing from subsequent trading phases has never been permitted, Member States were allowed to provide for banking on a national basis between trading phases I and II. However, this possibility has hardly been used in fact (Pohlmann 2009).

Linking two emission trading schemes with a different period of allowance validity would result in similar distortions to those generated by a linkage of ETS with updating and ETS without updating of the allocation (as discussed above). The ETS featuring the longer validity period could theoretically generate a marginal incentive for participants to minimise activities in that country, and launch activities in the other ETS if it provides attractive properties like free allowance endowment for new entrants. Nevertheless, analogously to the discussion of the allocation methodology, the extent of such an incentive may be little, and the impacts may be insignificant given the extensive influence of other aspects that promote investment decisions (Blyth and Bossi, 2004; Sterk et al., 2006). Further, problems within a linked system may arise in case of timely different negotiations of commitment periods. A confidence-supporting behaviour of the linking partners may overcome incompatible commitment periods. However, it is essential that the continuance of the linking candidates is assured. In case of no clarity or a too prompt expiration of one of the linking partners, credibility and commitment of the linking approach will seem to be questionable (Mace et al. 2008).

Other problems may be induced by the linking of two ETS with different banking rules. Participants of the ETS that ban banking may be able to bank via a third party in the ETS which tolerates banking. From the point of view of the company, this procedure will not produce substantial distortions but may induce an intensive banking behaviour in the ETS which authorises banking. This may not lead to substantial company-level distortion, but could imply a concentration of banking in the ETS that permits it. Depending on the size of these impacts, the ETS which allows banking may be confronted with unexpected higher allocation requirements in the following period (Blyth and Bossi, 2004; Ellis and Tirpak, 2006; Sterk et al., 2006).

Regarding the borrowing of allowances, a linking of systems with different borrowing rules may intensify the risk and price instabilities within the linked scheme. In case of unrestricted borrowing within one ETS, participants of this scheme may be able to borrow allowances against future periods. This implies that a linking may generate incentives to use borrowed allowances in order to destabilise the penalty frameworks which will weaken the (long- or mid-term) ecological and economic stringency of the scheme. Further, the credibility of the linked system may be damaged which harms future debates about expansions or stricter ecological objectives of the system (Mace et al. 2008).

2.6 Monitoring, reporting, verification and accounting

A well-functioning ETS involves monitoring, reporting and verification (MRV) at the level of operator or installation, whereas the measurements are reported to a central regulating authority. This is necessary to provide credibility and confidence in the ETS. All countries/regions covered by an ETS preserve an inventory of GHG emissions at national/regional and installation level. Thus, trading requires consistent inventories between regions. In particular, equivalent units and measurement techniques are necessary.

A robust and sufficiently transparent MRV structure generates confidence about the allowances' value and also supports the functioning of emission trading in the case of a linkage of two emission trading schemes. In case of the harmonisation of the MRV system, efficiency profits may be generated for covered companies and service providers acting in each of the two systems. Conversely, in case of a

not necessarily strong MRV process, incentives for the participants to report less or false emissions levels may exist in order to reduce compliance costs. In this situation, linking may become more difficult due to missing credibility and confidence (Blyth and Bossi, 2004; Mace et al. 2008; Sterk et al., 2006).

According to Article 14 of the ETS Directive, the European Commission proposed two draft regulations on the monitoring, reporting, verification and accreditation of the EU ETS. In general, industrial installations and aircraft operators are required to have an approved monitoring plan. The annual emissions report of the operators must be verified before 31st March each year. Then the equivalent number of allowances must be submitted by 30th of April of the same year. The procedure of monitoring, reporting and verification (MRV) is also known as the compliance cycle of the EU ETS.

2.7 Compliance and penalty framework

Regarding compliance, (project-based) offsets may help to accomplish the reduction target and induce numerous advantages, including increasing the scope of potential emission abatement activities and decreasing the overall cost of achieving a pre-defined emissions target. Within the framework of the Kyoto-Protocol, two project-based mechanisms exist: (1) the Clean Development Mechanism (CDM), generating Certified Emission Reductions (CERs), and Joint Implementation (JI), generating Emission Reduction Units (ERUs). In the context of linking ETS, offsets and their use may be constrained to their origin or project types. Hence, suppliers of offsets will need to take into account that not all project types are accepted in all schemes. On the other hand, Ellis and Tirpak (2006) state that allowable offsets between different ETS may create some degree of "common currency" (p. 26).

The EU ETS framework allows in article 11a of the ETS Directive the use of emission credits from third countries to cover up to 50 % of the overall reduction target until 2020. However, the credits must stem from JI and CDM projects that are officially recognised by the KP. Furthermore, the project types eligible for use in the EU ETS are limited, and from 2013 on, additional measures to restrict the use of specific credits will be implemented as a quality control mechanism. Credits from countries with which the EU has concluded an agreement are also limited to 50 % of the general reduction targets of the EU.

Further, emission trading schemes with comparable penalty systems can be linked directly, even in the case of different sanction levels. In this situation, it does not mean that the highest penalty rate is applied to each of the linked Emission trading schemes. It is rather important, that each ETS provides a penalty system which ensures overall compliance and hence, ecological effectiveness. Regarding compliance and penalty issues, it becomes clear that a linkage between a mandatory and a voluntary ETS will generate certain problems as the voluntary system may not exhibit any form of commitment to compliance. In general, combined ETS may have differently specified non-compliance penalties, but they should be comparably stringent (Mace et al. 2008). Furthermore, a combination of a fixed penalty type compliance system with a system that has a price cap type regime will lead to a breakdown in case of an increase of the market price above the price cap.

Thus, the combination of an ETS with a price cap, a so called "safety valve", and an ETS without any allowance price regulation will lead to a price cap applied in the newly generated ETS. Depending on the aggregated marginal abatement costs, the overall environmental effectiveness of the new system may be at risk. For this reason, price regulation mechanisms like banking and borrowing of allowances, ex-post adjustments in penalty systems and modification in the use of offsets may be more suitable instruments (Mace et al. 2008).

Finally, ex-post adjustments of allowances can always be used as an instrument for cost management in case of extremely high or low carbon prices. Analogously to the problem of a price cap, this

mechanism may induce a lack of ecological integrity, political feasibility and credibility of the linked system (Mace et al. 2008).

In the European Union, operators have to submit sufficient allowances by 30th April of each year to cover their emissions. Article 16 of the ETS Directive stipulates an excess emissions penalty of € 100 for each tonne of CO_2e emitted for which the operator cannot surrender allowances. Furthermore, the operator still has to submit an amount of allowances equal to its excess emissions in the following year.

2.8 Conclusion and overview of key design elements

Based on this discussion, the ETS generated by linking other schemes should fulfil the following requirements in order to provide economic efficiency and ecological effectiveness:

- The participation is mandatory for all relevant emitters, and all important emissions and sectors are covered by the scheme.
- The cap is stringent and displays serious but realistic ecological targets.
- Allocation is achieved by auctioning whereas temporal flexibility is induced and guaranteed by the possibility of linking.
- Ecologically ambitious offsets are accepted for compliance only to a certain degree.
- MRV & registry is operated via electronic systems.
- Penalty frameworks contain a monetary fine and the obligatory delivery of missing allowances.

Following Mace et al. (2008) the conditions for a successful linking of ETS are defined by the degree of consistency of the different schemes. Table 1 provides an overview of the considered key design issues which are assessed regarding their characteristics for linking (with the EU ETS).

Table 1: Key design elements and implications for linking - Overview

Key design elements		Possible linking effects & obstacles	Economic efficiency	Environmental effectiveness	Consistency with EU ETS
Scheme's coverage	Gas coverage	Linking to an ETS with a broader (lower) coverage → abatement options ↑ (↓)	basically given	basically given	desirable but not essential
	Sector coverage	Double-counting is possible, competition concerns may arise	basically given	basically given	desirable but not essential
	Mandatory vs. voluntary	Voluntary market may induce leakage and entrance of net allowance sellers	highly at risk	highly at risk	essential
	Direct vs. indirect emissions	Double-counting is possible, competition concerns may arise	basically given	basically given	desirable but not essential
	Opt-in and opt-out provisions	Unrestricted provisions may distort the coverage of the system and its ecological effectiveness, provision should be defined before linking in case of costless allocation in the linking partner's ETS	basically given	basically given	desirable but not essential
Definition and recognitions of trading units		Mal-functioning legal framework may disable a fair recognition, trading and eligibility of diverse units	basically given	basically given	desirable but not essential
Cap setting	Absolute vs. relative caps	Total emissions of ETS with relative cap are not known in advance → Liquidity of allowance ↓	highly at risk	highly at risk	essential
	Stringency of caps	Significant wealth transfers between linking partners in case of non-comparable stringency levels	basically given *(if overall cap is stringent)*	basically given *(if overall cap is stringent)*	politically required
Allocation Methodology		Differences may occur because of subsequent allocation rules that imply distributional impacts	given	basically given *(if overall cap is stringent)*	desirable but not essential
Temporal Flexibility	Continuance	Same continuance levels are necessary regarding credibility and commitment	highly at risk	highly at risk	essential
	Banking	Market and competition distortions in case of heterogeneous banking rules	basically given	basically given	politically essential
	(unrestricted) Borrowing	Destabilisation of penalty and compliance system	highly at risk	highly at risk	essential
Monitoring, reporting and verification		In equally stringent frameworks rigorous monitoring processes and robust basis for verification and calculations by equal MRV standards	basically given	basically given *(if systems are equally stringent)*	not essential if systems are equally stringent
Compliance and penalty framework	Use of offsets	Market and competition distortions in case of heterogeneous crediting rules, eligibility criteria and quantitative limits	basically given	basically given	politically required
	Penalty system	In equally stringent frameworks, high penalties lead to incentives to reduce CO_2 emissions	basically given *(if systems are equally stringent)*	basically given *(if systems are equally stringent)*	not essential if systems are equally stringent
	Price cap	Price cap will be applied in the overall linked systems	highly at risk	highly at risk	essential

Source: Own composition based on results derived in Sections 2.1 to 2.7 and Mace et al. (2008)

3 Results

3.1 Existing and planned ETS – an overview

Various ETS all around the world are already working, are being planned or enter into an important stage of design. In order to present the large variety of design issues the following schemes have been evaluated:[5] ETS of Switzerland; Japan Voluntary Emission Trading Scheme (JVETS); Japan - Integrated Domestic Market of Emissions Trading (IDMET); Tokyo ETS; South Korea ETS; Australia – Carbon Pollution Reduction Scheme (CPRS); New South Wales – Greenhouse Gas Abatement Scheme (GGAS); New Zealand ETS; USA – Regional Greenhouse Gas Initiative (RGGI); USA and Canada: Western Climate Initiative (WCI); USA / California: Global Warming Solutions Act of 2006 (GWSA)[6];Canada / Alberta: Greenhouse Gas Reduction Program.

Table 2 gives an overview of the sources of literature used in order to provide a well-founded basis for further comparison and to exclude non-relevant systems. These schemes are then evaluated regarding essential key design issues in Table 3 to Table 5.

Table 2: Literature for evaluating different ETS

System	Literature
ETS Switzerland	Bundesamt für Umwelt (2009, 2011)
Japan: JVETS	Ministry of the Environment (2010), Rudolph (2011), Rudolph and Schneider (2011)
Japan: IDMET	Ministry of the Environment (2010), Rudolph (2011), Rudolph and Schneider (2011)
Tokyo ETS	Tokyo Metropolitan Government (2010), The World Bank (2010), Thornly et al. (2011)
ETS South Korea	Ministry of the Environment Republic of Korea (2010, 2011)
Australia CPRS	Australian Treasury (2008), Department of Climate Change (2008), Hood (2010), Jotzo and Betz (2009)
New South Wales GGAS	Hood (2010), IPART (2011), Passey et al. (2008)
ETS New Zealand	Jiang et al. (2009), Ministry for the Environment (2011)
USA: RGGI	Perdan and Azapagic (2011), Hood (2010), Regional Greenhouse Gas Initiative (2012)
USA/Canada: WCI	Umweltbundesamt (2011), Tuerk et al. (2009), Hood (2010)
California: GWSA	Flachsland (2008), Hood (2010)
Canada: Alberta	Government of Alberta (2012), Hood (2010)

Source: Own compilation

[5] The authors are aware that there are further emission trading systems under consideration. Because of the lack of publicly available information, the following ETS are not considered in this analysis: Brazil, China, Ukraine/Russia/Kazakhstan/Belarus, Chile, Turkey, Mexico. A comprehensive overview of these schemes is offered by Hood (2010). In the United States of America a lively discussion about emission reduction programmes takes place at the moment. All initiatives are regionally negotiated to fix a model rule and are then implemented at state level. These individual cap-and-trade systems usually link together to form regional cooperations in the following. In this study, only the RGGI and the WCI are considered. California is here analysed as an example of a WCI member state. Accordingly, other state-bound emission trading systems are not examined in detail, as they follow the regional model rule. The Chicago Climate Exchange, a voluntary but legally binding emission trading system, is also not taken into consideration as it was closed in 2010. Federal legislative proposals on climate and energy in the US Congress, such as the Waxman-Markey Bill, the Kerry-Boxer Bill and the Kerry-Liebermann Bill are also not evaluated as their entry into force is rather improbable.

[6] The Californian ETS started on 1st January 2012. However, its GHG emissions caps will only become enforceable from 2013 on.

Table 3: General issues of different emissions trading schemes

	Level of implementation	Starting date	Time scale / continuance	Participating countries	Relative vs. absolute cap	Cap
EU ETS	Operating	1st January 2005	2005-2007 2008-2012 2013-2020	EU-27 + Iceland + Liechtenstein + Norway	absolute	2005-2007: 4.3% reduction of proposed amount of allowances 2008-2012: 6.5% reduction of 2005 emissions 2013-2020: 21% reduction of 2005 emissions
ETS Switzerland	Operating	1st January 2008	2008-2012	Switzerland	absolute	2008: 3.3 $MtCO_2$, 2009: 3.1 $MtCO_2$, 2010: 3.4 $MtCO_2$
JVETS	Operating	1st January 2005	2005-?	Japan	absolute	2005: 1.3 $MtCO_2$, 2006: 1.1 $MtCO_2$, 2007: 1.6 $MtCO_2$, 2008: 3.4 $MtCO_2$, 2009: 0.6 $MtCO_2$
IDMET	Operating	Autumn 2008	2008-2012	Japan	absolute / relative	50% of Japanese CO_2 emissions, 70% of the Japanese industry's CO_2 emissions
Tokyo ETS	Operating	1st April 2010	2010-?	Tokyo (Japan)	absolute	2010-2014: 6% reduction for 5 year average 2015-2019: 17% reduction for 5 year average
South Korea ETS	Planned	2015	2015-2020	South Korea	absolute	30% cut from BAU emissions by 2020
CPRS	Planned	1st July 2012	2012-2020	Australia	absolute	5% cut from 2002 emissions by 2020
GGAS	Operating	2003	2006-2020	New South Wales (Australia)	relative	2007-2012: 7.27 t CO_2 per capita
New Zealand ETS	Operating	2008	2008-2011 2009-2010 2010-2012 2013-2020	New Zealand	absolute	No overall reduction target; emitting as long as allowances are available
RGGI	Operating	1st January 2009	2009-2011 2011-2014 2014-2017	9 North-Eastern + Mid-Atlantic US States	absolute	2009-2014: stabilisation at 2009 levels; 10% reduction below 2009 levels by 2018
WCI	Operating	1st January 2012	2012-2014 2015-2017 2018-2020	California + 4 Canadian Provinces	absolute	15% reduction below 2005 levels by 2020
GWSA	Operating	1st January 2012	2012-2014 2015-2017 2018-2020	California	absolute	15% reduction below 2005 levels by 2020
Alberta	Operating	2007	2007-?	Alberta	relative	Annual reduction of energy intensity by 12%

Source: Own compilation (see Table 2 for the detailed list of sources)

Table 4: Coverage issues in different emissions trading schemes

	Gas coverage	Sector coverage	Mandatory vs. voluntary participation	Direct vs. indirect emissions	Opt-in and opt-out provisions
EU ETS	CO_2, N_2O from acid production, PFCs from the aluminium sector	Power stations, combustion plants, oil refineries, coke ovens, iron and steel plants and factories making cement, glass, lime, bricks, ceramics, pulp, paper and board, aviation	Mandatory	Direct	Opt-out for small emitters and hospitals from 2013 to 2020
ETS Switzerland	CO_2	Cement, pulp, paper, glass, ceramic production	Voluntary alternative to mandatory CO_2 tax	Direct	Participation of private sectors is possible
JVETS	CO_2	energy-intensive industry, power generation, transport and service)	Voluntary	Direct	-
IDMET	CO_2	Facilities with combustion processes (energy-intensive industry, power generation, transport and service)	Voluntary	Direct	-
Tokyo ETS	CO_2	Commercial buildings and industrial facilities with consumption of fuels, heat and electricity ≥ 1,500 kBOE	Mandatory	Direct	-
South Korea ETS	CO_2	Industry (power generation, manufacturing), buildings (universities, amusement parks), waste (incineration, waste water treatment) and forestry	Mandatory	Direct	-
CPRS	CO_2, CH_4, N_2O, HCFs, PHCs, SF_6	Entities with emissions ≥ 25 ktCO_2; exclusion of transport and agriculture sector	Mandatory	Mainly direct	Participation in reforestation activities possible
GGAS	CO_2, CH_4, N_2O, HCFs, PHCs, SF_6	Electricity sellers, retailers and generators in New South Wales, large electricity users with a consumption > 100 GWh per year	Mandatory (voluntary for large electricity users consuming more than 100 GWh/year)	Indirect	-
New Zealand ETS	CO_2, CH_4, N_2O, HCFs, PHCs, SF_6	Certain production and deforestation activities, fuel users and suppliers	Mandatory for certain production and deforestation activities and fuel users and suppliers	Direct and indirect	-
RGGI	CO_2	Electricity sector (fossil fuelled electric power plants ≥ 25MW)	Mandatory	Direct	Single states can opt in and out
WCI	CO_2, CH_4, N_2O, JDCs, SF_6 and NF_3	Electricity and Industry (facilities ≥ 25,000 t CO_2e) from 2012, transport, commercial and residential fuel from 2015	Mandatory	Direct and indirect	Single states can opt in and out
GWSA	CO_2, CH_4, N_2O, JDCs, SF_6 and NF_3	Electricity and Industry (facilities ≥ 25,000 t CO_2e) from 2012, natural gas and liquid fuels and transport fuels from 2015	Mandatory	Direct and indirect	-
Alberta	CO_2	Facilities emitting ≥ 100,000 t CO_2 per year	Mandatory	Direct	-

Source: Own compilation (see Table 2 for the detailed list of sources)

Table 5: Issues regarding trading, allocation, temporal flexibility and compliance in different emissions trading schemes

	Allocation	Banking	Borrowing	Use of offsets	Penalty system	Price cap
EU ETS	Gratuitous (Grandfathering, benchmarking) 2005-2012: at least 90-95% 2013-2020: ~ 50%	Yes	No	JI- and CDM-Offsets	100 €/tCO_2 & delivery in next period	No
ETS Switzerland	Gratuitous, according to the firm's targets	No	No	JI- and CDM-Offsets	From 2010: 36 CHF/tCO_2	CO_2 tax: 36 €/t CO_2
JVETS	Gratuitous (Amount = base year emissions (average for past 3 years) – committed reduction)	Yes	No	JI- and CDM-Offsets	Disclosure of performance & redemption of subsidies for CO_2 reduction	No
IDMET	Gratuitous	Yes	Yes	JI- and CDM-Offsets	-	No
Tokyo ETS	Gratuitous, amount = base year emissions x (1-compliance factor) x compliance period (5 years)	Yes	No	Domestic Offsets	Monetary fine (¥ 500,000) & requirement to reduce 1.3 times the shortage & disclosure of performance	No
South Korea ETS	Gratuitous (95%) based on historical emissions, designed capacity and best available technology (BAT)	-	-	CDM Offsets	3.0 times of market price, disclosure of performance	-
CPRS	Auctioning of approx. 70% of allowances, gratuitous allocation for emission-intensive and trade-exposed industries	Yes	5% of year ahead	JI- and CDM-Offsets	2009: 12,5 A$/$tCO_2$, 2010: 14 A$/$tCO_2$$	23$A/$tCO_2$
GGAS	-	No	10% of year ahead	-	-	-
New Zealand ETS	Partial gratuitous allocation	Yes	No	JI-, CDM-, Carbon Sinks-, Kyoto-Offsets	30 - 60 NZ$/$tCO_2$ & delivery in next period	25NZ$/$tCO_2$
RGGI	Auctioning of approx. 90% of allowances, allocation of rest is up to individual state law	Yes	No	JI- and CDM-Offsets	3 allowances per missed t CO_2 are automatically deducted for the next period	-
WCI	Auctioning of approx. 10% of allowances; rest is up to individual state law	Yes	No	JI- and CDM-Offsets	3 allowances per missed t CO_2 are automatically deducted for the next period	-
GWSA	At the beginning high degree of free allocation, then gradual shifts to auctioning	Yes	No	JI- and CDM-Offsets	3 allowances per missed t CO_2 are automatically deducted for the next period	-
Alberta	-	Yes	No	-	Purchase of Alberta-based offset credits, Emission Performance Credits or pay to the Climate Change and Emissions Management Fund	-

Source: Own compilation (see Table 2 for the detailed list of sources)

3.2 Identification of linking candidates

Regarding the definition of concrete linking scenarios the outcomes of the assessment of key design issues of ETS (Section 2) and of existing and planned ETS (Section 3.1) are combined. In order to identify serious candidates for a focused bottom-up approach, the schemes are studied with regard to key design elements where consistency with the EU ETS is essential for an economically efficient and environmentally effective linking.

As discussed in Section 2.1.2, the combination of voluntary and mandatory systems may induce the leakage of emitters facing a high abatement burden of the voluntary scheme, and hence, economic efficiency and environmental integrity may be highly at risk. Further, the voluntary market may attract net sellers of allowances, which weakens the cap's overall stringency and in turn endangers environmental effectiveness. In Japan the system shall be understood as a pilot project which helps to gain information about building up national emission trading schemes. Absolute ecological effectiveness and CO_2 price signals are not significant regarding environmental regulation at national and international level. Regarding the linkage of the JVETS and the IDMET with the EU ETS, the voluntary character of these two Japanese systems would reduce ecological and economic benefits induced by linking. As stated by the Ministry of the Environment (2010): "Whether Japan's emissions trading scheme should be linked with other schemes internationally is an issue to be considered in the future, taking into account merits such as restraining allowance price increase and demerits such as financial resource outflow to overseas allowance market, and cautiously examining harmoni[s]ation of schemes (e.g. MRV level, allocation method, level of cap)." Hence, the incentives to connect these systems to larger and stricter markets might not be existent in the present assuming the perpetuation of the schemes' design.

Another crucial aspect for successful linking is the cap's design. In case of a combination of relative and absolute caps (Section 2.3.1) the fact that total emissions of the system with the relative cap are not known in advance harms the market liquidity. In addition, Fischer (2003) points out that in case of linking systems with absolute and relative targets there may be a feedback in the overall emissions of the scheme with a relative cap disabling ecological effectiveness. For those reasons, the New South Wales GGAS and the Greenhouse Gas Reduction Programme of Alberta should be excluded from further analysis.

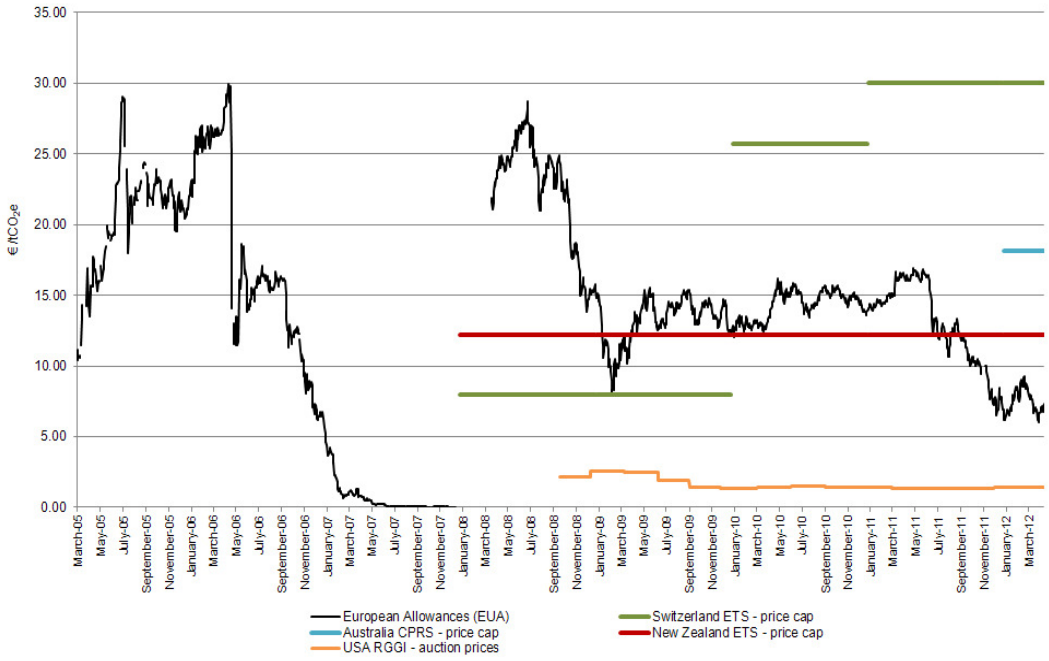
Thirdly, continuance builds an essential element when systems are linked. The combination of schemes in case of unclear expiration dates and legislation reduces credibility in the permanence of compliance and serious abatement burdens for covered sectors. The evaluated schemes mostly feature time-scales until 2020. The linking of the considered schemes in the mid and the long term may strengthen the negotiation process, regarding the globally binding climate agreement focused on by the UNFCCC as a follow-up treaty to the KP, which shall enter into force in 2020.

Fourthly, unrestricted borrowing of allowances within one linking partner scheme would destabilise the overall penalty and compliance system (Section 2.5). As a result, economic efficiency and ecological integrity might be highly at risk because the obligation to reduce could be unlimitedly transferred to future periods. Within the analysed ETS, only the IDMET, which already was disqualified from further analysis because of its voluntary character, featured unrestricted borrowing.

It was also derived that in case of linking the EU ETS to schemes with price caps, the safety valve will be applied in the linked system (Section 2.7). This means that depending on the level of this price cap economic efficiency and environmental integrity in the EU ETS might be endangered. The analysis of the existing and planned ETS showed that the operating ETS of New Zealand features a price cap of 25 NZ\$/tCO_2 (~16 €/tCO_2) from 2012 and the planned Australian CPRS features a price cap of 23 A\$/tCO_2 (~18 €/tCO_2). In Switzerland, sources which are not covered by the domestic ETS are regulated by a CO_2 tax which imposes 36 CHF/tCO_2 (~30 €/tCO_2). As the participation in the Swiss

ETS is a voluntary alternative to the mandatory CO_2 tax, the tax can also be understood as the price cap of the ETS. Regarding the CO_2 price generated by the EU ETS, a level of 6 - 8 €/tCO_2 was ultimately achieved during spring 2012. Assuming similar price levels in the third trading period, the mentioned price caps would not put the ecologic and economic performance of a linked approach at risk. On the other hand, a higher positive price signal (≥ 20 €/tCO_2) in the EU ETS would weaken the benefits of a linkage with the Australian CPRS and the ETS of New Zealand.

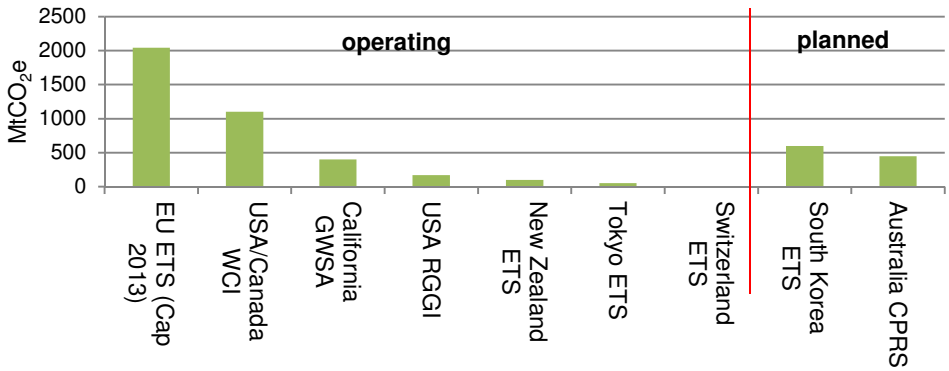
Figure 1: CO_2 prices in the EU ETS, price caps and auction prices in other ETS until April 2012



Source: Own compilation based on data from BlueNext and results of Section 3.1

For all those reasons, a basic linking scenario derived is defined by the simultaneous and sequential combination of the EU ETS with the following linking candidates: ETS of Switzerland, Tokyo ETS, South Korea ETS, Australia – Carbon Pollution Reduction Scheme, New Zealand ETS, USA – Regional Greenhouse Gas Initiative, USA and Canada – Western Climate Initiative and USA / California – Global Warming Solutions Act of 2006. Hence, in this scenario the linked system covers ca. 4,500 m tCO_2e.

Figure 2: Covered CO_2e emissions of linking candidates



Source: Own compilation based on the results of Section 3.1

4 Notes on the institutional design of a bottom-up-approach

Since the Copenhagen Accords the alternative of a bottom-up approach by linking domestic ETS has been increasingly discussed.[7] Presupposing that the primary objective shall not be to reduce the costs of abatement but to enhance ambitions to accelerate mitigation by improving the ecological efficiency of a linked ETS regime, the question cannot be ignored whether such a decentralised approach will bear the comparison with a more centralised abatement regime as originally set forth within the UNFCCC. In the following, the economic requirements for effective linking are analysed from a theoretical point of view. Thereupon, potential ways to implement such linking approaches are discussed from a legal point of view, also dealing with the question whether such a regime can really be successful regarding economic efficiency and ecological effectiveness without any kind of centralised authority or governance structure.

4.1 Suggestions from economic literature

The concept of implementing a multilaterally linked ETS by means of a centralised system requires the determination of the overall objective of emissions reduction. This determination quantifies the level or size of the scheme's emissions cap which is given by the linking partner's sum of reduction targets. Further, the linkage defines the scope of the cap's coverage which incorporates the identification of the types of greenhouse gas emissions and sources covered by the overall cap. The question is whether the linkage of ETS may increase the overall cap and reduce the total abatement and lead to lower economic efficiency and ecological effectiveness as compared to a situation without linkage. In this case, the cap setting process of the linking partners turns into a multi-stage game with strategically acting regulators.

Holtsmark and Sommervoll (2008) point out that the linkage of different (domestic) schemes modifies governments' motivations and may distort the number of allocated allowances or the individual caps, respectively. They find that in a non-cooperative equilibrium, international emissions trading probably increases the overall cap. Additionally, although trading generates a more cost-efficient allocation of emissions across the different schemes, efficiency may still decrease because already inefficiently low set caps are likely to be further reduced.

As shown by D'Amato and Valentini (2011), Helm (2003) and MacKenzie (2011), the socially efficient setting is represented by the centralised system where the equilibrium price is equalised to the aggregation of marginal damages of emissions. For the case of a multilateral linkage covering two domestic schemes, this implies that

$$p^{cen} = \frac{\partial D_1}{\partial w_i} + \frac{\partial D_2}{\partial w_i}, \qquad (1)$$

where p^{cen} denotes the allowance price in the centralised setting, D_1 and D_2 the increasing and convex damages induced by emissions or allocated allowances, respectively, in each system and w_i the allowance endowment in system i with $i=1,2$.[8]

[7] From the extensive literature thereto, a few representative works are cited here: Mace et al. (2008), Schüle and Sterk (2009), Cao (2010) and Cole (2011).

[8] The basic model framework consists of a two-stage structure assuming complete but imperfect information. In the first stage the regulating authorities set the cap by endowing covered sectors with allowances in the centralised and the decentralised setting whereas social welfare is defined by the sum of the covered sectors' profits and environmental costs. In the second stage, the sectors act as price takers and maximise their net profits.

D'Amato and Valentini (2011) figure out, that allowing for a simultaneous decentralised allowance allocation in an international ETS generates a lower allowance price and less stringent emissions abatement. This occurs because in the decentralised framework international externalities caused by transboundary pollution are disregarded by the national regulators. Furthermore, the increase of the allowance endowment in one ETS lowers the overall allowance price and generates incentives to abate less emissions in the other ETS. In the case of sequentially acting governments in the decentralised framework, MacKenzie (2011) finds that the difference of the equilibrium price as compared to the first-best solution depends on the following government's reaction on the leading government's allowance endowment: If the following government interprets its allowance endowment as a complement, aggregate emissions will be greater than in the centralised system but smaller than in the simultaneous game within the decentralised framework. If the following government interprets its allowance allocation as a substitute, aggregate abatement will be lower than in the centralised and the decentralised scheme with simultaneously acting governments. Assuming that an increase in the allowance price results in higher abatement, the socially optimal outcomes of the centralised setting given by (1) cannot be achieved in any case.

The models from D'Amato and Valentini (2011) and MacKenzie (2011) display these finding as follows:

$$p_{sim}^{dec} = \frac{1}{2}\left(\frac{\partial D_1}{\partial w_i} + \frac{\partial D_2}{\partial w_i}\right), \tag{2}$$

$$p_{seq}^{dec} = \frac{\mu}{1+\mu}\left(\frac{\partial D_1}{\partial w_i} + \frac{\partial D_2}{\partial w_i}\right), \tag{3}$$

where p_{sim}^{dec} and p_{seq}^{dec} denote the allowance price in the decentralised setting with simultaneous and sequentially acting regulators, respectively, and $\mu = 1 + \frac{\partial w_2}{\partial w_1}$ symbolises the response of the following regulator to the leading regulator's cap setting.

4.2 Linking options from a legal point of view

In virtue of Article 12 of the ETS Directive *"Member States shall ensure that allowances can be transferred between … (b) persons within the Community and persons in third countries, where such allowances are recognised in accordance with the procedure referred to in Article 25 without restriction other than those contained in, or adopted pursuant to, this Directive."* Accordingly, bilateral links as defined above are envisaged by the European ETS scheme in general.

A competence of the EU concerning a unitary representation of European linking-interests at the international stage could already be deduced from case law by the European Court of Justice (ECJ) which decided on the exclusive competence for the conclusion of an international agreement concerning subjects that have already been regulated internally. Thus Mace et al. (2008) concluded that by the means of establishing a scheme for GHG emission allowance trading within the EU as laid down in Directive 2003/87/EC based on Article 192 TFEU[9] (ex-Article 175 (1) TEC[10]), an internal competence of the EU has been exercised which founded an exclusive competence to conclude treaties with respect to the scope and content of this directive. Moreover Article 25 (1) of the ETS Directive expressly notes a competence for concluding agreements *"in accordance with the rules set out in Article 300 of the treaty."*[11] In addition, the above mentioned ECJ jurisdiction has been codified in Article 216 (1) TFEU in the course of the adoption of the Lisbon Treaty, so that the EU enjoys an exclusive competence to negotiate and conclude treaties regarding linkages of the EU ETS with third parties.

[9] Treaty on the Functioning of the European Union, Official Journal No. C 115, 9th May 2008.
[10] Treaty establishing the European Community, Official Journal No. C 325, 24th December 2002.
[11] Article 218 TFEU since the entry into force of the Lisbon Treaty.

With respect to the disadvantages of a decentralised multilaterally linked ETS as detected in the economic analysis, starting points for conceivable approaches to achieve an overall centralised allocation of allowances shall be identified at least. In order to provide for the theoretical background thereto, the legal nature of linking options shall be illuminated at first.

From such a legal point of view, Mace et al. (2008) identify five ways in which a linkage between different trading schemes can be reached in theory:

- Binding international treaties
- Political cooperation arrangements
- Mutual reciprocal commitments
- Unilateral linkages
- Contracts based on private international law.

Out of this enumeration only international treaties that are concluded in accordance with international public law, actually create a binding type of cooperation. Though this is based on reciprocal obligations and in some cases even safeguarded by the possibility of sanctions and measures to remedy default, an effective implementation still has to face several challenges.

With regard to schemes on sub-national levels, constitutional obstacles may occur that relate to the power to enter into international treaties, as these may only be concluded by formal subjects of international law and their respective representatives. As regional bodies and sub-national entities lack the status as state parties under public international law as well as under most federal systems, they accordingly do not have the authority to conclude legally binding agreements with foreign countries.

In addition, a country´s sovereignty is in principle not limited by the conclusion of an international treaty. Hence a single state party might change its mind any time and decide to cancel its participation, as it never has lost its full capacity to act that way. Although in some cases certain consequences are sustained, the application as well as the withdrawal from a treaty itself, often depend above all on political and not least economic considerations. All in all, a country´s reputation plays a very important role in international law. So beyond doubt, such concerns will also have impact on a country´s decision to enter into a climate change treaty or a linking agreement with the EU.

Finally, regarding the economic analysis above, international treaties or arrangements that only regulate the mutual recognition of allowances without agreeing on a common mandatory cap, run the risk of turning into a multi-stage game with states acting strategically and putting any environmental effectiveness at stake. Pursuant to this outcome the question has to be raised which opportunities can be envisaged to settle this conflict. Answering the problem of a global common, any proposals thereto will obviously relate more or less to the field of global governance.

4.3 From Global Commons to Global Governance

It seems to be evident that even a polycentric climate governance system created by bi- and/or multilateral treaties or in part only by non-binding arrangements will also require a central authority to a certain extent – in particular concerning the allocation of allowances and compliance.

A realistic approach will have to concede that national governments might neither be willing to give up their sovereignty and subordinate to a global government, e.g. by transferring the competence of cap setting to such a central authority, nor that non-EU countries might agree to a European institution taking on this responsibility. Still, within the EU the gradual abandon of legal competences in favour of a strengthened Union has always constituted a long and difficult process, as can be witnessed with the implementation of the internal market.

Maybe solution will be found in the area of global governance which can be defined as governing beyond the nation state. Governance without government indicates that activities at the international level are characterised by shared goals but are not backed by a formal legal authority. The focus of global governance is thus on cooperation and harmonisation in order to attain compliance (Behrens, 2009). In this context, the following approaches have to be mentioned.

4.3.1 Creation of a new institution or improvement of the UNFCCC

In principle, a new institution could be installed by the means of bi- and/or multilateral linking agreements, which is responsible for matters that need to be dealt with comprehensively. These include in particular the setting of reduction targets for each participating country, the managing of the auctioning of the corresponding overall allowances if required, and the monitoring of their compliance as ultimate authority. In practice, such structures do already exist within the UNFCCC, so that it seems more reasonable to look for a way to adopt and improve these frameworks with the aim of harnessing them in a bottom-up driven system. For the latter, simplification and tightening of the UNFCCC structures seem to be especially necessary. In addition, global fairness aspects have to be taken into account more seriously, with respect to the permits allocation.[12]

Nevertheless, uncertainty persists about the question whether an improved UNFCCC will be effective enough to achieve the fundamental climate targets, or whether a general shortcoming in this system is perhaps innately embedded. For example, a strong compliance system that leads countries to withdraw from the Kyoto treaty – as announced by Canada recently – might indicate little acceptance of this regime at the moment.

4.3.2 Linking climate and trade

Today the WTO constitutes one of the most effective international organisations with compliance rules that are thoroughly implemented. Traditionally, international trade and climate change communities look at each other with suspicion, judging “globalisation” as key source of climate problems on the one hand and criticising that climate policies are harming trade and economic growth on the other hand. Nevertheless, a future reconciliation of both regimes might show the greatest promise concerning climate politics. Without bringing together the objectives of fostering trade and climate change, and recognising them as two sides of the same coin they will continue constraining each other. Additionally, it should be taken into account that every – more or less globally – linked ETS will have to face carbon-leakage problems depending inversely on the number of schemes involved. Thus, such a system might have to introduce some kind of adjustments and need to take WTO rules into consideration.

Hence, although this approach might not rely on a central authority in the sense of a global government, combining these two regimes seems to be the most promising field for future action in climate politics.

5 Conclusions

As prospects for the adoption of a binding post-2012 climate policy agreement and thus for a consolidated top-down global emissions trading scheme seem rather uncertain, building such a system step by step by national links could be an important contribution to a sustained development of market-based climate policies. Such an approach can happen in parallel or in addition to the negotiation process under the United Nations Framework Convention on Climate Change (UNFCCC). Even in the case of an actual conclusion of a follow-up treaty to the Kyoto Protocol, the additional integration of domestic ETS offers a sound perspective in the face of the set emission limits.

[12] Interesting starting points can be found in Cao (2010) as well as Ekardt and von Hövel (2009).

The analysis of key design elements of ETS focuses on the scheme's coverage (gas and sector, direct vs. indirect emissions, opt-in and opt-out provisions), the definition and recognition of trading units, cap setting (absolute vs. relative, stringency), the allocation methodology (free vs. auctioning), the temporal flexibility (banking, borrowing), monitoring, reporting, verification and accounting, and compliance and penalties.

In order to present the large variety of design issues the following schemes have been evaluated with regard to the key design elements: ETS of Switzerland; Japan Voluntary Emission Trading Scheme (JVETS); Japan - Integrated Domestic Market of Emissions Trading (IDMET); Tokyo ETS; South Korea ETS; Australia – Carbon Pollution Reduction Scheme (CPRS); New South Wales – Greenhouse Gas Abatement Scheme (GGAS); New Zealand ETS; USA – Regional Greenhouse Gas Initiative (RGGI); USA and Canada: Western Climate Initiative (WCI); USA / California: Global Warming Solutions Act of 2006 (GWSA);Canada / Alberta: Greenhouse Gas Reduction Program. After due consideration, the basic linking scenario derived is defined by the simultaneous and sequential combination of the EU ETS with the following linking candidates: ETS of Switzerland, Tokyo ETS, South Korea ETS, CPRS, New Zealand ETS, RGGI, WCI and GWSA. In case of a combination of the listed schemes, the linked system covers approx. 4,500 m tCO_2e.

Based on the findings of the evaluation, the question remains whether such a bottom-up system will be able to meet the climate change challenges in an adequate manner without any centralised institution adopting certain common regulations at an international level such as the allocation of certificates within a certain cap. Although such an idea might have to face significant political obstacles, a discussion about adequate legal structures must be launched in order to promote the continued development of international climate politics.

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