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

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ISEE 2012 Conference – Ecological Economics and Rio+20: Challenges and Contributions for a Green Economy

Rio de Janeiro, June, 18th 2012

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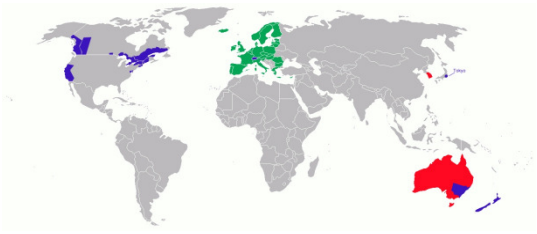
Motivation (I)

Uncertainty about a future global climate regime

- Kyoto reduction targets only binding until 2012
- Post-Kyoto treaty prepared by 2015 and implemented by 2020?
- Role of flexible project-based Kyoto instruments?
- Is a top-down approach the only way?

Bottom-up design as an alternative

- EU Emissions Trading Scheme (EU ETS) as a starting point for linking



Source: Own composition

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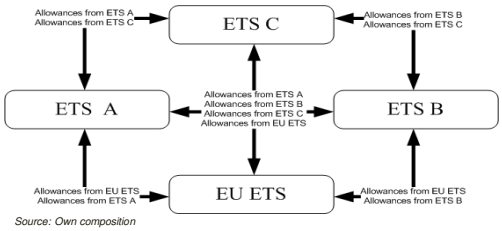
Motivation (II)

Bottom-up design as an alternative

- Direct multilateral links between EU ETS and other (domestic) ETS



Source: Own composition

Benefits of linking ETS

- # covered sources ↑ → cost-minimization ↑
- Market liquidity ↑, price volatility ↓
- Carbon leakage ↓
- Creation of a global regulatory framework

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Key design elements of ETS and linking impacts (I)

Table 1: Key design elements and implications for linking

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 / voluntary	Voluntary market may induce leakage and entrance of net allowance sellers	highly at risk	highly at risk	essential
	Direct / 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 / 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 and Mace et al. (2008)

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Key design elements of ETS and linking impacts (II)

ETS generated by linking systems with the EU ETS should fulfill the following requirements in order to provide economic efficiency and ecological effectiveness:

- **Mandatory** participation
- Stringent **absolute caps** displaying serious but realistic ecological targets
- **Identical continuance levels**
- **Identical price caps**
- Coverage of important emissions and emitters
- Penalty frameworks with monetary fine and obligatory delivery of missing allowances
- Allocation via auctioning
- Solid MRV frameworks

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Linking candidates (I)

Table 2: 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
CPM	Planned	1st July 2012	1st July 2012- 1st July 2015 1st July 2015 - ?	Australia	absolute	5% cut from 2000 emissions by 2020; from 1st July 2015 annual cap setting
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 composition

Linking candidates (II)

Table 3: Coverage issues of 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	-
CPM	CO_2, CH_4, N_2O	Entities with emissions ≥ 25 $ktCO_2$; stationary energy, industrial and fugitive processes, non-legacy waste, partly transport	Mandatory	Direct	Entities acquiring, generating or importing amounts of taxable fuel
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 composition

Linking candidates (III)

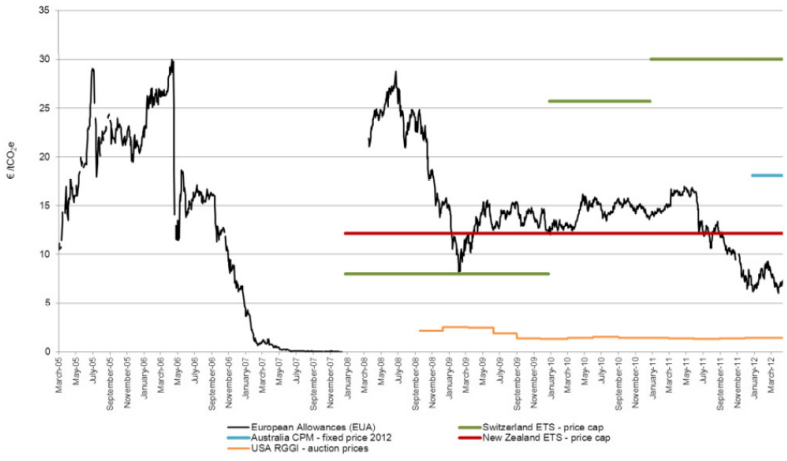
Table 4: Issues regarding trading, allocation, temporal flexibility and compliance in different emissions trading schemes

	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	-
CPM	Full auctioning from 1st July 2015; gratuitous allocation for emissions-intensive trade-exposed sectors	Yes from 1st July 2015	5% of year ahead from 1st July 2015	JI- and CDM- and ACCU-Offsets from 1st July 2015	Strict civil and criminal penalties	$A 20/t$CO_2$ above international carbon price from July 2015 – July 2018; yearly increase by 5%
GGAS	-	No	10% of year ahead	-	-	-
New Zealand ETS	Partial gratuitous allocation	Yes	No	JI-, CDM-, Carbon Sinks-, Kyoto- Offsets	30 - 60 NZ$/t$CO_2$ & delivery in next period	25NZ$/t$CO_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 composition

Linking candidates (IV)

Figure 3: EU ETS CO_2 price and price levels of other ETS



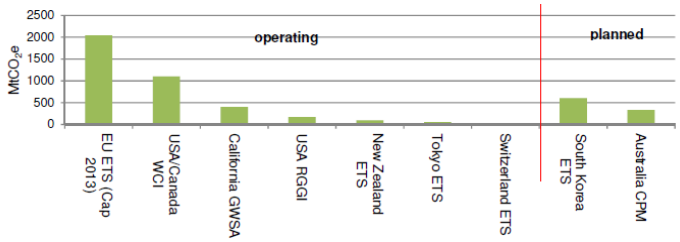
Source: Own composition

Linking candidates (V)

Linking the EU ETS with promising candidates

- Linked system covers ca. 4,400 $MtCO_2e$
- **EU ETS** comprises ca. **46%** and **WCI** ca. **25%** of covered CO_2e emissions in the linking scenario

Figure 4: Linking scenario – covered CO_2e emissions of candidates



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Institutional design (I)

Suggestions from economic literature

- How should a bottom-up approach be regulated?

  How should the **overall cap** be set?
  - Centralized setting – one single authority
  - Decentralized setting – individual authorities remain in force
- Decentralized setup → international externalities of transboundary pollution are disregarded within the cap setting → **first-best solution of a centralized cap can never be achieved** (*D'Amato and Valentini (2007, 2011), Helm (2003) and MacKenzie (2011)*)
- Theoretical illustration via a two-stage game (*here:* two domestic schemes):
  - Allowance price displays the cap's stringency
  - p = allowance price, D = damages (increasing, convex), w = allocated allowances
  - Centralized cap setting: $p^{cen} = \frac{\partial D_1}{\partial w_i} + \frac{\partial D_2}{\partial w_i}$
  - Decentralized cap setting, simultaneous choice: $p_{sim}^{dec} = \frac{1}{2}\left(\frac{\partial D_1}{\partial w_i} + \frac{\partial D_2}{\partial w_i}\right)$
  - Decentralized cap setting, sequential choice: $p_{seq}^{dec} = \frac{\mu}{1+\mu}\left(\frac{\partial D_1}{\partial w_i} + \frac{\partial D_2}{\partial w_i}\right), \quad \mu = 1 + \frac{\partial w_2}{\partial w_1}$

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Institutional design (II)

From global commons to global governance

- Linking options from a legal point of view
  - EU enjoys an exclusive competence to negotiate and conclude treaties regarding linkages of the EU ETS – Directive 2003/87/EC, Art. 25
  - Realistic approach? → non-EU countries might not agree to a EU institution taking on cap setting and compliance
- Creation of a new institution or improvement of the UNFCCC
  - UNFCCC as a starting point?
  - Uncertainty about effectiveness regarding compliance system
- Linking climate and trade
  - WTO constitutes one of the most effective international organizations with compliance rules
  - Bringing together the objectives of fostering trade and climate change
  - Adjustments in case of carbon leakage and considerations of WTO rules

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- Scenarios of linking the EU ETS with schemes of Japan, New South Wales and Alberta are dropped out because of their **voluntary character and relative caps**.
- Assuming a EU CO_2e price below the other schemes price caps, the bottom-up approach of linked systems covers ca. **4,400 MtCO_2e**.
- Even a polycentric climate governance system created by multilateral treaties will require a **central authority** in order to secure efficiency and effectiveness of the linked system.
- A centralized regulation of the multilaterally linked ETS is **economically desirable but legally and politically not feasible**. The **linkage of climate and trade** may be the most promising field for future action in climate policies.

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Contact

Thank you for your attention!

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