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Abstract

The authors suggest a multi-layered system of three convergence criteria – similar to those used in the run-up to the European monetary union – that define the notion of “demonstrable progress” towards reaching the emission commitments under the Kyoto Protocol. These are the existence of an independently evaluated national emissions inventory, the level of domestic policies and measures, and the quantitative convergence of emissions towards the Kyoto target. While the first of these criteria constitutes a necessary condition for participation in the use of flexible instruments, the other two determine the degree of participation allowed for any given Annex I country.

Zusammenfassung

Wir schlagen – analog zur Bestimmung der Teilnehmer an der Wirtschafts- und Währungsunion in der EU – ein mehrschichtiges System von Konvergenzkriterien vor, die zur Definition des 2005 zu überprüfenden „nachweisbaren Fortschritts“ beim Erreichen der Treibhausgasemissionsziele des Kyoto-Protokolls dienen. Die Existenz unabhängig begutachteter Treibhausgasinventare ist unseres Erachtens eine notwendige Bedingung zur Teilnahme an den flexiblen Instrumenten. Das Niveau heimischer Politikmaßnahmen und die quantitative Konvergenz der inländischen Emissionen auf das Kyoto-Ziel hin sollen bestimmen, in welchem Maße die flexiblen Instrumente genutzt werden können.

1. Introduction

The Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC) in principle allows countries with binding emission¹ commitments to use four flexibility mechanisms: common targets or “bubbles” (Art. 4), emission trade (Art. 17), Joint Implementation (JI) (Art. 6) and projects of the “Clean Development Mechanism” (CDM) with countries without emission targets (Art. 12). The rules for the implementation of these mechanisms are subject of an intense debate. They are to be finalised by the 6th Conference of the Parties of the UNFCCC in 2000.

Many stakeholders fear that use of the flexible mechanisms can undermine the long-term ability to lower greenhouse gas emissions due to the lack of domestic action. This fear is not fully unfounded as e.g. the U.S. (Yellen 1998) have made clear that they intend to use the flexible mechanisms to the largest extent possible. As other countries such as the Netherlands start to realise that their domestic emissions growth is difficult to curb, they will also strive for unlimited use of the flexible mechanisms. Unfettered domestic emissions growth would make it more difficult to reach further emission cuts in subsequent commitment periods. Thus unlimited access to the flexible mechanisms could lead to low costs for emission reduction in the first commitment period, but sharply rising costs in subsequent periods due to the higher domestic emissions base and the “stickiness” of capital. Therefore, long-term policy has to start influencing “sticky” sectors with long lifetimes of equipment from now.

This has led to calls for a cap on the use of the flexible mechanisms as endorsed by many NGOs and the EU in the spring of 1999. Nevertheless, such a cap will not reach its aims as discussed in Michaelowa/Dutschke (1999) or CIRED (1999). It will lower permit prices and limit trade to “hot air”. The other way to spur domestic action is early crediting of domestic action. Nevertheless, also this instrument has some debatable properties (Michaelowa/Stronzik 1999).

Therefore, we suggest an alternative path to promote domestic action and safeguard long-term innovation. Its basic idea has first been suggested in Michaelowa/Dutschke (1998).

1 In this article, the word “emissions” means emissions of any of the six greenhouse gases controlled under the Kyoto Protocol.

2. Convergence Criteria – Showing “Demonstrable Progress”

Article 3 (2) of the Kyoto Protocol states that “each Party included in Annex I shall, by 2005, have made demonstrable progress in achieving its commitments under this Protocol”. This article was the modest result of the pressure of the EU to set a commitment already for 2005. Nevertheless, it could become decisive if one takes into account Article 3 (9) which states that negotiations on commitments for the second commitment period should be started by 2005.

We think that the determination of “*demonstrable progress*” could be linked to the fulfilment of a set of convergence criteria. Only if these criteria are fulfilled a country would be allowed to participate in all flexible mechanisms. This approach has proved very successful in the run-up to the European Monetary Union. Countries not eligible to participate in the flexible mechanisms may join the mechanisms in the next commitment period. It has been suggested that if a country fails to reach the criteria three years before the start of the first commitment period, it might only be allowed to buy permits at a price much higher than the market price to avoid non-compliance (CIRED 1999). Nevertheless, determination of this price seems a tricky task. It could take the form of a surcharge on the market price to be raised by the UN Climate Change Secretariat. Its revenues could either be invested into CDM climate projects, the adaptation fund to be created and/or be reimbursed after the commitment period in case of the non-convergent country’s compliance.

In our view, it would be more efficient to allow a non-convergent country to still participate in all flexible instruments but to discount the permits acquired by a certain percentage. This percentage should be linked to the degree of non-convergence to offset for the higher emissions in the pre-commitment period. However, a country would have to fulfil minimum criteria for participation.

3. Defining Convergence Criteria

There exists a lot of different criteria that could be used to show convergence. Some of them are centred on emissions, others on institutions and policy instruments. Monetary comparisons should always be done in purchasing power parity to avoid distortions due to temporary market exchange rate overshooting. We first focus on criteria that we think to be indispensable for participation and proceed to discuss a quantitative criterion that serves as base for discounting acquired emission permits.

3.1 Existence of a Credible Inventory and a Verification System with Recurrent Independent Evaluation

Countries that want to participate in flexible instruments need an inventory subject to minimum quality standards that has to be verified independently. This would give an incentive for a quick spreading of high-quality inventories and a convergence on high inventory standards. Article 6 already states that countries investing in JI projects have to fulfil this criterion by stating in Art. 6 (1c) that they cannot acquire emission reduction units if they have not set up inventories and freezes the emission reduction units if an in-depth review has raised concerns (Art. 6 (4)). This should be extended to cover all flexible instruments available to Annex I countries.

3.2 Existence of Domestic Climate Policy Instruments

Eligibility to participate in flexible instruments should also be linked to the existence of a minimum of domestic climate policy instruments. This could be formulated as positive catalogue (see Table 1 below). Either one category must exist to fulfil the criterion or one could envisage thresholds for a category to fulfil the criterion. A simple check on the presence of measures is not sufficient because it may lead to cheating (e.g. symbolic carbon taxes). It should at least be accompanied by a check if these policies are actually enforced. In case of emission-enhancing instruments, a negative catalogue would be sensible. The policy instruments criteria might be substituted by a single indicator, the shadow price of carbon equivalent in the economy. For energy-related carbon emissions CIRED (1999) has calculated it as total energy bill (including taxes) divided through total carbon content. Nevertheless, development of the shadow price depends on many factors outside the realm of climate policy, e.g. fuel price development. So the criterion would be fulfilled if the change in the shadow price of a country would be above the global average. CIRED's criteria of return to 1990 value or a certain growth rate does not exclude these indirect influence. A dollar-based indicator is also subject to the exchange rates.

For hybrid models, in our view, a combined index could ensure optimal freedom of every country's choice of policies and measures. The index would be expressed as monetary incentive per unit of GDP. This presumes a decision on comparing price-based and regulatory instruments by assigning them weights. For regulation, shadow prices would have to be calculated. A certain index value would have to be achieved to fulfil the criterion.

Table 1: Climate Policy Instruments Catalogue for Derivation of Thresholds or Calculation of Index

	Instruments category	Example threshold	Value in index
Positive value	Emissions trading	Coverage of domestic emissions > x%	Coverage times price divided by GDP
	Emissions or energy taxation	Average rate of carbon taxation above x \$/t	Tax revenue divided by GDP
	Efficiency standards	Rate of improvement > x% per year	Coverage times shadow price divided by GDP
	Voluntary agreements beyond business-as-usual	Absolute emission reduction percentage ≥ 0 and efficiency improvement > x% per year	Coverage times shadow price of emission divided by GDP
	Incentives for renewable energy and energy saving	Quota for renewable electricity > x% of supply or >x% rise since 1990; Subsidy > x% of state budget	Sales of renewable electricity divided by GDP; Subsidy divided by GDP
Negative	Subsidies for fossil fuels, energy use and transport	< x% of state budget	Subsidy volume divided by GDP

Assume a country with emissions of 100 Mt C and a GDP of 100 billion \$. It has introduced an emission trading system covering 40% of domestic emissions and a price of 10 \$/t, a carbon tax covering 30% at a tax rate of 30 \$/t, efficiency standards on 10% with a shadow price of 20 \$/t, a feed-in-tariff subsidy of 100 million \$ and coal subsidies of 500 million \$.

The calculation of the index would thus look like the following:

Emissions trading:	$40 \text{ Mt} * 10 \text{ \$} / 100 \text{ billion \$}$	$= 0.004$
Carbon tax:	$30 \text{ Mt} * 30 \text{ \$} / 100 \text{ billion \$}$	$= 0.009$
Efficiency standards:	$10 \text{ Mt} * 20 \text{ \$} / 100 \text{ billion \$}$	$= 0.002$
Feed-in-tariff	$100 \text{ million \$} / 100 \text{ billion \$}$	$= 0.001$
Coal subsidy	$500 \text{ million \$} / 100 \text{ billion \$}$	$= -0.005$
Index		$= 0.011$

The criterion should be set conservatively, e.g. at 1% of GDP as the minimum threshold for the index. Countries that invest less than this amount in climate related policies and measures should be excluded as a seller of Assigned Amount Units (AAUs) because

these are supposedly not a result of real emission reductions. This is why the certified results from project related mechanisms (Joint Implementation and acquired CERs from the Clean Development Mechanism) have to be exempt from this rule. Any AAUs not used nor sold will automatically be banked for subsequent commitment periods.

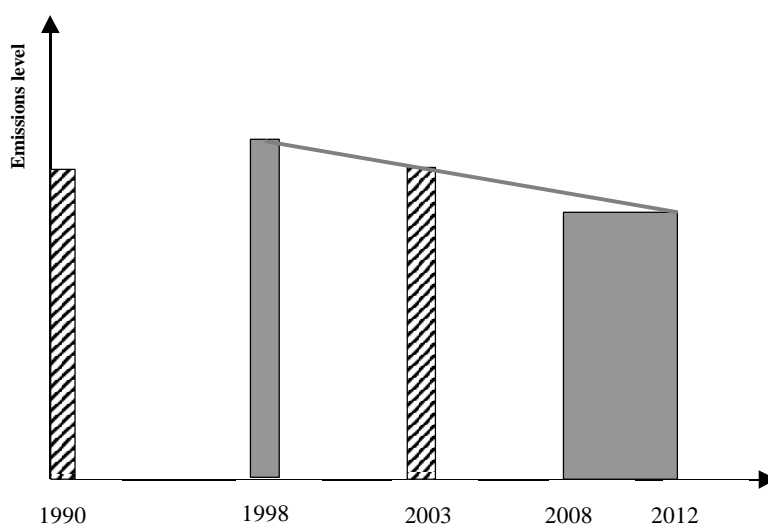
3.3 Emissions on Track to reach Kyoto Commitment

The quantitative criterion would be that a country is on track to reach its Kyoto commitments. The calculation depends on the nature of the target. There are basically three different options: reduction target, stabilisation and growth target.

The year 1998 is set as a reference year because it was the first year after the adoption of the Kyoto Protocol, countries had the opportunity to react on its provisions. This period allows to consider a maximum number of years in determination of convergence. For a quantitative criterion in 2005 at best data until 2003 will be available.

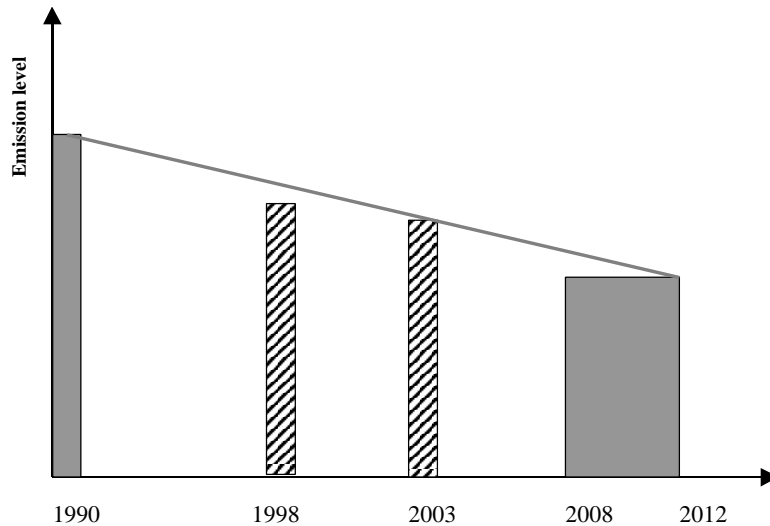
In the case of a reduction target, emissions would have to be below a line between 1998 level (see Figure 1) or 1990 level (see Figure 2) and the level of the commitment period. In the stabilisation and growth target case however, only the year 1990 would serve as a reference from where the line was to be drawn.

Figure 1: Emission Reduction Compared to 1998



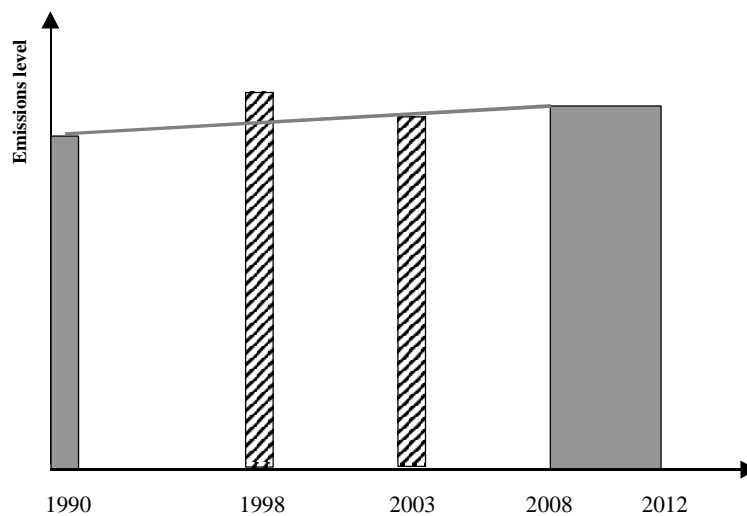
This line intersects the average budget level at the most favourable point for the country, i.e. 2012 for a reduction and 2008 for a growth target. We choose this provision because the Kyoto Mechanisms will offer efficiency gains during the budget period that will supposedly bend the curve down.

Figure 2: Emission Reduction Compared to 1998



In case of a growth target emissions would have to lie below a line between 1990 level and the average commitment level at the start of the commitment period (see Figure 3).

Figure 3: Growth Target (Likewise Stabilisation Target)



A general formula for the convergence criterion would be:

$$(1) \quad E_{2003} \leq E_{1990} - \frac{E_{1990} - T_{Kyoto}}{23} * 13$$

with T_{Kyoto} = Kyoto target. Otherwise the following formula can be chosen:

$$(2) \quad E_{2003} \leq E_{1998} - \frac{E_{1998} - T_{Kyoto}}{15} * 5$$

This second formula is attractive if $E_{1998} > E_{1990} - \frac{E_{1990} - T_{Kyoto}}{23} * 8$

For selected Annex I countries, we have calculated the respective results (see Table 2). If a country does not fulfil the quantitative criterion, acquired permits should be discounted by the degree a country has overshoot the convergence criterion.² If e.g. the 2003 emissions lie 10% above the threshold, permits should be discounted by 10%. Using business-as-usual-projections from the second national communications to the UNFCCC, discount rates are listed in the last column of Table 2. In this example, we use only the data for energy-related CO₂ emissions as these were the only available for 1998. It is likely that the inclusion of other gases will reduce the business-as-usual emissions for 2003 for both 1998 and 2003.

Table 2: Calculation of Convergence Criteria (Energy-Related CO₂ Emissions in Mt C)

	1990	1998	Formula 1	Formula 2	2003 BAU	2012	Discount rate
USA	1329	1498	1276	1411	1540	1236	9.2%
Russia	647	392	647	477	511	647	
Japan	290	312	280	299	328	272	9.7%
Germany	268	239	236	230	232	211	
UK	160	152	148	148	156	140	5.3%
Canada	117	130	113	123	129	110	4.4%
Italy	111	118	107	114	106	104	
France	103	104	103	104	105	103	1.0%
Australia	72	85	75	83	85	77	2.8%
Poland	95	86	92	87	91	89	
Spain	59	72	64	70	69	67	
Netherlands	44	49	42	47	46	41	
Kazakhstan	63	37	63	45	50	63	

Sources: OECD (1999), Jefferson (1999), UNFCCC (1998), Russian Federation (1998), Kazakhstan (1998), own calculations.

2 The necessary condition for discounting is a central registry for emissions transactions, like proposed by Michaelowa/Koch (1999).

The cited discount rates seem a very weak incentive for convergence. Therefore, as an option for increasing the pressure on non-convergent countries, we propose the quantitative convergence test to be repeated annually as part of the inventory submission. The discount rates would then be added to constitute the overall discount during the budget period. Thus, a country could over the years 2005 up to 2008 maintain its performance or even achieve an alleviation of the initial discount rate imposed on it. In no case, a negative discount rate shall be applied during the commitment period.

We want to illustrate this idea at the fictitious case of the US remaining at their degree of non-convergence over the period 2003 to 2006 (always considering the data time-lag of two years). In that case, the 9.2% discount rate would add up to 27.6% to be applied during the commitment period. If in the years after 2003 the non-convergence would linearly decline to zero, the second year discount rate would halve to 4.6%, falling to zero in the third year, the final discount rate would amount to 13.6%. If an “over-convergence” of e.g. -5% in the third year would occur, it should be discussed, whether the all-over discount rate declines to 8.6%. In no case the resulting discount rate can fall below zero (see above).

A special case is the so-called “bubble” (Kyoto Protocol Art. 4), which is the joint target for a number of countries. Actually, only the EU member states form a bubble. Applying the convergence rule defined above, we could encounter the following cases:

Case 1: The bubble achieves overall convergence, but some member states do not.

In this case, permit acquired by non-convergent member states should be subject to discounting, even if they acquire these permits from other member states.

Case 2: The bubble does not achieve overall convergence, but some member states do.

Two different consequences could be envisaged in this case. One is, that analogously to the rule in Art. 4 (5), the converging member states would not be subject to discounting. However, sales to non-converging member states would be discounted in order not to create a loophole. We prefer the alternative to institute a rule of joint liability, which means that all trade with outside Annex I Parties would be subject to the discount rate, while internal trade would be exempt.

4. Conclusions

We have analysed a set of possible convergence criteria for domestic climate policy action that could be the base for allowing countries to participate in the use of flexible mechanisms. This analysis leads to the following recommendations for operationalizing Article 3 (2):

All countries wishing to acquire emission permits through any of the flexible mechanisms have to prove high standards of emissions inventory with a recurrent independent evaluation. Furthermore, they have to show that they use domestic climate policy instruments and have reduced incentives that enhance emissions. A methodologically appealing indicator to prove this would be a positive economy-wide shadow price of carbon equivalent. An index weighting domestic climate policy instruments' impacts might be more easily operationalised.

We further suggest a set of quantitative “on track”-criteria for countries. A country would be found “on track” in 2005 if

- its 2003 emissions were below a line 1998 emissions – 2012 Kyoto commitment level or
- its 2003 emissions were below a line 1990 emissions – 2012 Kyoto commitment level, if it has a reduction or stabilisation target,
- its 2003 emissions were below a line 1990 emissions – 2008 Kyoto commitment level if the country has a growth target.

These criteria would still leave the countries room to buy emission permits which would however be discounted. The same procedure may be repeated until the beginning of the commitment period.

Our proposals put into practice would secure the integrity of the Annex I emissions budgets by setting minimum standards for inventories. They will reward domestic action while maintaining to a high extent the efficiency of the Kyoto instruments. In case a state does not meet the proposed convergence criteria domestic actions will become more attractive due to increased domestic prices for foreign emission rights. Moreover, the environmental integrity of the Kyoto system will be enhanced as more reduction activities will be needed to fulfil non-convergent countries' demand for emission rights.

References

*CIRE*D (1999)

Critères d'évaluation comparative des politiques et mesures de réduction des émissions de gaz à effet de serre, Nogent-sur-Marne

Jefferson, Michael (1999)

Personal communication on 1998 CO₂ emissions data, Oct. 25, 1999

Kazakhstan (1998)

First national communication to the UNFCCC, Akmola

Michaelowa, Axel; Dutschke, Michael (1999)

Do Quotas for Cooperative Implementation Make Economic Sense?, in: Proceedings of 2nd AWMA International Speciality Conference Global Climate Change, Washington, forthcoming

Michaelowa, Axel; Dutschke, Michael (1998)

Der Handel mit Emissionsrechten für Treibhausgase, HWWA Report No. 187, Hamburg

Michaelowa, Axel; Koch, Tobias (1999)

Critical issues in current climate policy, HWWA-Report No. 194, Hamburg 1999, 47 pp

Michaelowa, Axel; Stronzik, Marcus (1999)

Early crediting of emission rights – a panacea or Pandora's box?, FEEM Discussion Paper No. 48.99, Milan

OECD (1999)

CO₂ emissions from fossil fuel combustion 1971-1997, Paris

Russian Federation (1998)

Second national communication to the UNFCCC, Moscow

UNFCCC (1998)

Second compilation and synthesis of second national communications, Addendum, FCCC/CP/1998/11/Add.2, Buenos Aires

Yellen, Janet (1998)

Testimony before the U.S. House of Representatives Commerce Subcommittee on Energy and Power, October, 6, Washington