



The Supplimentarity Challenge: CDM, JI & EU Emissions Trading

This policy paper is a contribution to the ongoing discussion on the Commission's proposal for a directive 'amending the Directive 2003/.../EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms' (henceforward called Proposed Directive and ET Directive respectively). It is largely based on a policy brief that has been produced within the framework of the IEEP/Ecologic contract 'External expertise on emerging regulatory and policy issues within the responsibility of the EP Environment Committee' (project EP/IV/A/2003/09/01). This policy brief can be downloaded from the European Parliaments website at

http://www.europarl.eu.int/comparl/envi/externalexpertise/default_en.htm.

The focus of this paper is on the question of supplementarity in the context of linking the project-based mechanisms CDM and JI to the EU Emission Allowance Trading. The EU 15 as a whole as well as many of its member states will find it very difficult to achieve compliance with the Kyoto Protocol. It might therefore become necessary to make use of the flexibility provided by the Kyoto Protocol. However, the EU's credibility crucially depends on meeting the supplementarity requirement, i.e. achieving at least 50% of its emission reductions through domestic action. The relevant provision contained in the Proposed Directive is not comprehensive enough to guarantee this outcome, the authors therefore recommend that a more wide-ranging approach is taken.

Introduction: The Situation in the EU with Respect to Compliance with the Kyoto Protocol

Most of the EU 15 member states will have to make significant additional efforts to achieve compliance with the Kyoto Protocol. Although there are indications that EU member states may be able to achieve compliance with the Kyoto Protocol through the adoption of further domestic measures, it seems advisable to build up the necessary infrastructure for purchasing significant amounts of emission certificates from outside the EU 15 as a safeguard. The analysis

presented here leaves out economic considerations and there might thus be further arguments for the use of CDM and JI.

According to Article 3(1) of the Kyoto Protocol, every Annex B Party has to surrender one of the internationally accepted emission certificates (Assigned Amount Units, Certified Emission Reductions, Emission Reduction Units, Removal Units) for every tonne of carbon dioxide equivalent (CO₂ eq.) that it emits from its territory during the respective commitment period. Prior to the commitment period, every Annex B Party receives an amount of Assigned Amount Units (AAUs) that is derived from its past emissions. Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs) are generated by CDM and JI projects respectively; Removal Units (RMUs) are generated by the use of 'sinks' on a Party's territory (see below).

The status quo compliance gap neatly illustrates the EU's current position with respect to compliance with the Kyoto Protocol. It is defined as the difference between a state's number of Assigned Amount Units and its projected emissions during the first commitment period (2008-2012) if the status quo is maintained (see Annex I and chart 1). Table 1 enumerates the status quo compliance gap for all EU member states, the accession countries (except Malta and Cyprus) and the candidate countries.

Every state with a positive compliance gap must reduce its emissions. If these emission reductions do not bring the compliance gap down to zero, the state must purchase an amount of emission certificates equivalent to the remaining compliance gap. A negative compliance gap means that the State can sell emission certificates and still remain in compliance.

Two very important caveats of the calculation in Table 1 must be mentioned.

- Firstly, the compliance gap of the EU can be reduced significantly through the use of sinks within the territory of the EU. According to Article 3(3) and 3(4) of the Kyoto Protocol, Parties can request the issuance of Removal Units (RMUs) for the removal of carbon from the atmosphere and its subsequent sequestration due to Land Use, Land Use Change and Forestry activities on their own territory. However, this option is highly controversial and also fraught with various technical problems. So far the EU member states have not yet announced officially whether they intend to use Article 3(3) and 3(4) of the Kyoto Protocol as a means of coming into compliance.

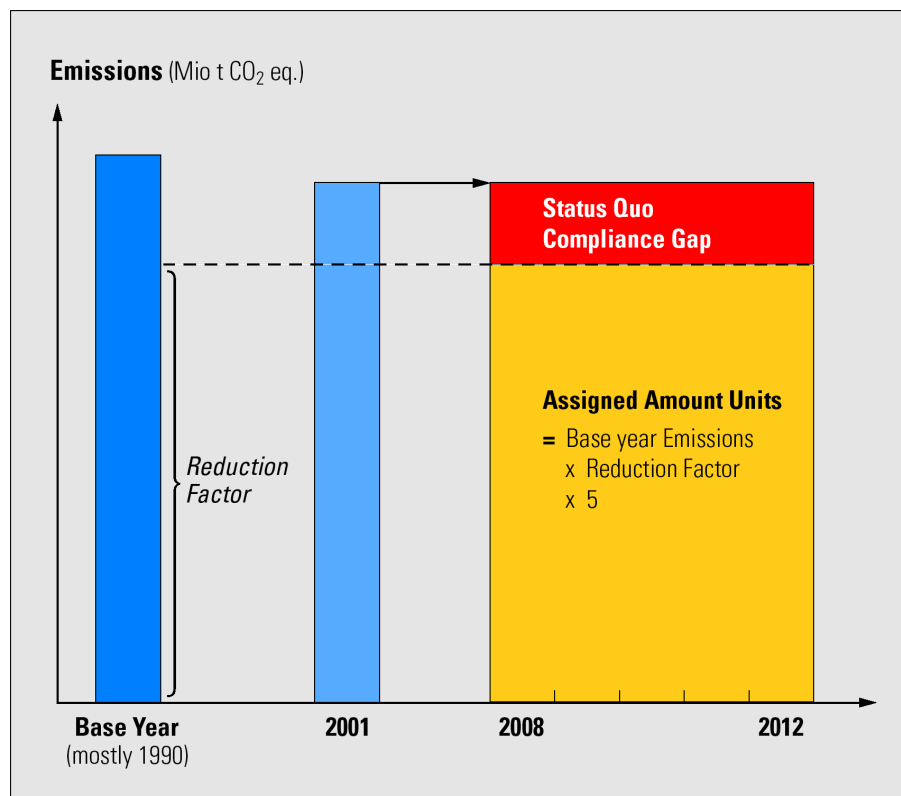


Chart 1: Calculation of the Status Quo Compliance Gap

The status quo compliance gap is defined as the difference between the number of Assigned Amount Units and the projected emissions during the first commitment period if the status quo is maintained (2008-2012)

- Secondly, the status quo compliance gap only paints a picture of the situation at the moment, but by definition it cannot illustrate the dynamics of emission trends. This can lead to either an underestimation or an overestimation of the severity of the current situation. For example, the status quo compliance gap of Greece suggests that Greece is on track with its climate policy, whereas almost all projections of Greece's emissions are showing a strong upward trend and hence a significant problem with compliance.

Despite these caveats, the status quo compliance gap was chosen as the means of illustrating the current situation in the EU since the use of projections would have required a lengthy discussion of the uncertainties and assumptions involved.

Table 1 highlights the special situation that will exist in the EU 25+. While the EU 15 member states will have to make significant further efforts in order to achieve compliance, most Acceding Countries as well as the Candidate Countries will dispose of significant surplus amounts of Assigned Amount Units. One, though highly controversial, option among many for using these is their transfer by International Emissions Trading, which could also include their transfer to the EU 15 member states.

	Status Quo Compliance Gap 2008–2012	EEA Assessment of BAU Scenario		Status Quo Compliance Gap 2008 – 2012	EEA Assessment of BAU Scenario
	Mio t CO ₂ eq.			Mio t CO ₂ eq.	
EU 15 Member States			Acceding States		
Austria	88.7	Insufficient	Czech Republic	-9.1	Sufficient
Belgium	97.8	Insufficient	Estonia	-76.0	Sufficient
Denmark	72.5	Insufficient	Hungary	-85.0	Sufficient
Finland	18.3	Insufficient	Latvia	-43.6	Sufficient
<i>France</i>	<i>11.8</i>	<i>Insufficient</i>	<i>Lithuania</i>	<i>-58.2</i>	<i>Sufficient</i>
Germany	164.9	Almost Suff.	Poland	-742.8	Sufficient
Greece	-8.5	Insufficient	Slovakia	-8.6	Sufficient
Ireland	48.3	Insufficient	Slovenia	7.0	Insufficient
Italy	353.3	Insufficient	Sum	-1,016.2	
<i>Luxembourg</i>	<i>-23.4</i>	<i>Insufficient</i>	Candidate Countries		
Netherlands	106.2	Insufficient	Bulgaria	-335.5	Sufficient
Portugal	28.9	Insufficient	Romania	-476.8	Sufficient
Spain	247.3	Insufficient	Sum	-812.3	
Sweden	-26.5	Sufficient			
<i>United Kingdom</i>	<i>17.2</i>	<i>Sufficient</i>			
SUM EU 15	1205.8	Insufficient			

The third column of Table 1 indicates which member states have already adopted measures that are sufficient to reduce the compliance gap to zero. The judgements have been taken from a recent European Environment Agency report (EEA 2003). According to the EEA, the total compliance gap of the EU 15 will not disappear with the measures that have already been adopted.

It is unclear whether it will be possible to close this gap through the adoption of further measures: The EEA estimates that even if all the additional domestic measures that have been announced were adopted, the compliance gap could still not be closed completely (EEA 2003, p. 17). On the other hand the European Climate Change Programme's report of June 2001 (ECCP 2001) has identified measures, which would allow the EU to come into compliance with the Kyoto Protocol through domestic action alone. One of these measures is a Directive on energy end-use efficiency and energy services, which could tap a huge potential for emission reductions at low cost or even net economic benefits. The Commission has recently put its proposal for such a Directive on the table (Proposed Directive Energy Efficiency).

But the conclusion is that it cannot be taken for granted that the EU will be able to achieve compliance with the Kyoto Protocol through domestic action alone, even if significant further action is taken. In this case the member states would have to make use of either

Table 1: Status Quo Compliance Gap and Sufficiency of Domestic Action by EU Member States,
Source: Annex I and EEA (2003, p. 17)

- International Emissions Trading,
- the option provided by Article 3(3) and 3(4),
- or CDM/JI.

The same holds true for most of the individual member states.

All these options are highly controversial, but the authors regard the use of CDM and JI to be the least problematic one. Given the risk that the EU might fail to come into compliance with the Kyoto Protocol through domestic action alone, it might be advisable to prepare the necessary infrastructure for the use of CDM/JI certificates.

Acquisition of Emission Certificates from CDM/JI Projects: Linking European Emission Allowance Trading with CDM and JI

On 23 July 2003 the European Commission released its proposal for a ‘Directive of the European Parliament and of the Council amending the Directive 2003/.../EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol’s project mechanisms’.

The new Article 11(bis) that is proposed for the ET Directive establishes the link between CDM & JI on the one side and EU Emission Allowance Trading on the other (see Box 1 and Chart 2).

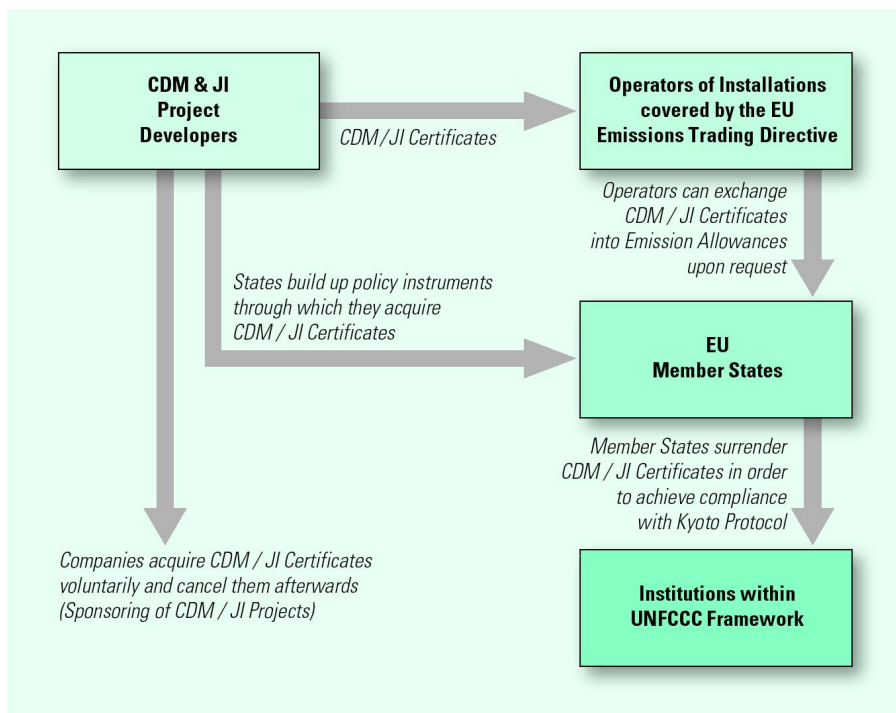


Chart 2: The flow of emissions certificates from CDM/JI project developers to the Institutions within the UNFCCC framework.

The chart illustrates the flow as envisioned in Article 11(bis) of the Proposed Directive, the direct acquisition by EU Member States, as well as the emerging segment of voluntary use of certificates.

‘Conversion of CERS and ERUs from project activities for the use in the Community Scheme

1. Following the entry into force of the Kyoto Protocol and subject to paragraphs 2 and 3 of this Article, Member States may convert CERs and ERUs from project activities into allowances for use in the Community scheme during each period referred to in Article 11(2) of this directive, at the request of an operator. This shall take place through the issue of one allowance by the Member State in exchange for one CER or ERU held by that operator in its national registry.
2. At such time as the number of CERs and ERUs from project activities converted for use in the Community scheme reaches 6% of the total quantity of allowances allocated by the Member States for the period, the Commission shall undertake a immediate review. In the light of this review, the Commission may consider whether a maximum of for example 8% of the total quantity of allowances allocated by the Member States for the period should be introduced in accordance with the procedure in Article 23(2).
3. All CERs and ERUs may be converted for use in the Community Scheme except from the following project activities:
 - a) In accordance with the Kyoto Protocol and subsequent decisions adopted thereunder, nuclear facilities; and
 - b) Land use, land-use change and forestry’

As envisioned in this article, the actual flow of emission certificates from a CDM/JI project developer to one of the EU member states will be as follows (see also Chart 2).

Box 1: Article 11(bis) of the Proposed Directive

1. The CDM/JI project developer receives CERs/ERUs after the project has successfully undergone the project cycle for CDM/JI projects respectively.
2. The developer sells these CERs/ERUs to an operator (i.e. a company that operates an installation that must participate in the EU emission allowance trading).
3. The operator can then request the conversion of the CERs/ERUs into the corresponding amount of Allowances, i.e. surrender the CERs/ERUs to the member state in which it is located and receive the equivalent in Allowances.
4. The operator can either use these Allowances in order to achieve compliance with its obligation to surrender Allowances equal to the total emissions of its installation in each calendar year (see Article 6(2), ET Directive) or sell them to another participant in the market.
5. It is important to note that after the conversion, the member state holds the CERs/ERUs on account and can use them for compliance with obligations under the Kyoto Protocol.

Limits to ‘Flexible’ Compliance with the Kyoto Protocol: The Supplimentarity Requirement

The supplimentarity requirement puts a limit on the use of the flexible mechanisms and therewith the use of CDM and JI. It is laid down in principle in the Kyoto Protocol and the European Union advocated a precise numerical definition up to the Bonn Agreement. Due to this stance the credibility of the EU’s climate policy crucially depends on complying with the Kyoto Protocol in line with the supplimentarity requirement.

According to the Kyoto Protocol, the exertion of the right for flexibility in achieving compliance is on the condition that the so-called ‘supplimentarity requirement’ is met. In the wording of the Marrakech Accords, this requirement stipulates that:

‘the use of the mechanisms [International Emissions Trading, CDM, JI] shall be supplemental to domestic action and that domestic action shall thus constitute a significant effort made by each Party included in Annex I to meet its quantified emission limitation and reduction commitments under Article 3, Paragraph 1.’ (Article 1 Draft Decision -/CMP.1 (Mechanisms) contained in Decision 15/CP.7, Marrakech Accords).

It was in fact the EU that insisted on the inclusion of the supplimentarity requirement, though parties eventually decided in the run up to the Bonn Agreement not to include a numerical definition of it. But due to its stance during the negotiations the credibility of the EU crucially depends on meeting the supplimentarity requirement.

The wording in the Marrakech Accords is far from precise. Unfortunately, even the formulation proposed by the EU during the negotiations is imprecise. In essence, the EU formulation stated that each party should acquire and surrender no more emission certificates from abroad than the equivalent of 50% of the difference between five times the emissions in one of the years between 1994 and 2002, on the one hand, and its number of AAUs, on the other (Para 8, Draft Set of Guidelines for Joint Implementation, EU Submission (1999a), Para 9, Draft Modalities and Procedures for Clean Development Mechanism, EU Submission (1999b)). This cap on the amount of emission certificates acquired from abroad (through International Emissions Trading, CDM and JI) and surrendered was to ensure that, starting from the level in any of the years between 1994 and 2002, at least half of the emission reductions that will be necessary to achieve compliance with the Kyoto Protocol will be realised domestically.

The corresponding calculation for the EU Member States is set out in Annex

I to this paper. If the EU 15 is taken as a whole, this formula stipulates that at a maximum 729.1 Mio t CO₂ eq. of the status quo compliance gap can be closed through the acquisition of emission certificates from abroad. Given that the status quo compliance gap is 1,205.8 Mio t CO₂ eq. as shown in Table 1, this obviously means that even if it wanted to, the EU would not be able to rely exclusively on the flexible mechanisms for coming into compliance but will in any case need to adopt significant further domestic action.

But the cases of Greece and the Acceding Countries show that the supplementarity requirement as advocated by the EU during the international negotiations is not always well defined. The numerical computation for these states results in negative figures and therefore cannot be reasonably interpreted. In the case of Greece, the corresponding base figure would be 132.2 Mio t CO₂ eq., times 5 is 661 Mio t CO₂ eq., and its Assigned Amount will be 669.7 Mio t CO₂ eq.. Under this proposal Greece would therefore be allowed to acquire -4,35 Mio t CO₂ eq. from abroad. This shortcoming is probably due to the fact that the parties gave up on the formulation of a precise definition before there was a watertight proposal.

It is also important to note that the supplementarity requirement must in principle hold for each Party to the Kyoto Protocol, i.e. the EU member states individually, as well as the EU as a whole (i.e. the EU 25+ in the years 2008 to 2012). Moreover, it could be argued that the EU 15 as a whole must also meet the supplementarity requirement since it has reached an agreement (the burden-sharing agreement) to fulfil its commitments jointly.

Various Proposals for the Implementation of the Supplementarity Requirement

During the negotiations between the EU member states as well as in the European Parliament various proposals for the implementation of the supplementarity requirement have been made. The authors present four of the proposals discussed and compare them with the supplementarity requirement. The comparison is done along the dimensions a) comprehensiveness, b) concrete implementation and c) preciseness of the numerical computation.

The regulation in the Proposed Directive

The Proposed Directive acknowledges the importance of the supplementarity requirement in its 6th recital, which highlights the importance of 'supplementarity under the Kyoto Protocol' as well as the importance of preserving 'the overall objective of the Community scheme to achieve emission reductions thereunder'. The concrete implementation of

the supplementarity requirement is stipulated in the proposed new Paragraph 2, Article 11(bis) (see Box 1).

It foresees a review by the Commission as soon as an amount of CERs/ERUs equal to 6% of the quantity of allowances allocated to the operators is converted into Allowances. This review might lead to the adoption of a cap of, for example, 8% of the Allowances allocated to the operators.

The numerical computation of the maximum amount of emission certificates from CDM/JI projects that could thus be converted into Allowances is well defined numerically. However, it differs significantly from that of the supplementarity requirement as previously advocated by the EU. For example, if Italy allocates an amount of Allowances to operators taking part in EU emission allowance trading that is equivalent to half its Assigned Amount Units (i.e. 1186,75 Mio t CO₂ eq.), with a cap of 8 per cent the maximum amount of emission certificates that could be converted into Allowances would be 94,94 Mio t CO₂ eq. This is significantly lower than the amount of emission certificates from abroad that can be acquired and surrendered in line with the supplementarity requirement (176,6 Mio t CO₂ eq.) (see Annex I). Similar estimates for the other EU member states lead to similar results.

A second major difference between the proposed regulation and the supplementarity requirement as previously advocated by the EU is the comprehensiveness. The proposed regulation only includes those emission certificates that member states acquire through the conversion of CERs/ERUs into Allowances. But there are other channels, notably International Emissions Trading and the direct acquisition described above, which would remain unregulated.

Alternative I (UK-Proposal)

During the negotiations in the Council the UK has suggested to establish a cap at the operator level, i.e. cap the amount of CERs/ERUs that each operator can surrender in order to achieve compliance with the EU emission allowance trading scheme. The numerical computation of the cap in this proposal is equal in structure to that in the Proposed Directive, i.e. operators can at maximum surrender an amount equivalent to x percent of the allowances that were allocated to them.

There is one peculiarity of the UK proposal that must be explained in detail. The UK proposal does not foresee the conversion of CERs/ERUs into EU allowances. Instead the CERs/ERUs shall be traded on the market for emission certificates and operators can surrender them exactly as they surrender EU allowances in order to comply with the obligation under the ET directive.

The UK proposal clearly remedies the lack of implementation of the regulation in the Proposed Directive. It does however not attempt a more comprehensive implementation of the supplementarity requirement than the Proposed Directive. With respect to comprehensiveness. The numerical computation is straightforward and well-defined.

Alternative II (Liberal Model)

A second proposal made during the negotiations in the Council has been to leave the decision on the amount of CERs/ERUs to be converted into Allowances and the concrete implementation of this cap to the member states. The proposal furthermore urges the member states to meet the supplementarity requirement as it is formulated in the Kyoto Protocol and the Marrakesh Accords.

This proposal clearly does not lead to a comprehensive implementation of the supplementarity requirement; it merely repeats the formulation in the Marrakesh Accords. The objective of the provisions in this proposal is to establish regulation for the amount of CERs/ERUs that every member state converts into EU Allowances. There is no numerical computation foreseen in this proposal.

Alternative III (De Roo Proposal)

A third proposal, which has been made by Alexander de Roo, the Rapporteur for the Proposed Directive of the European Parliament's Environment Committee, adopts a more comprehensive perspective. It proposes to cap the total amount of emission certificates that each member state may acquire through International Emissions Trading, the Conversion of CERs/ERUs into Allowances, or the direct acquisition described above. The proposal does not attempt to implement concrete mechanisms that make sure the cap is not violated.. Numerically, the proposal is not well defined. It stipulates that the amount of CERs/ERUs converted shall not exceed fifty percent of each member states effort to reach its emissions reduction target.

Obviously, the third proposal attempts a comprehensive implementation of the supplementarity requirement. It does not propose a very detailed implementation and it struggles with the numerical computation.

	Comprehensiveness (relative to supplimentarity requirement as previously advocated by the EU)	Implementation	Preciseness of the Numerical Computation
Proposed Directive	Narrow	Weak	Well - defined
Alternative I	Narrow	Concrete	Well - defined
Alternative II	Narrow	Weak	None
Alternative III	Comprehensive	Weak	Not well-defined

Table 3: Overview of the various proposals for the implementation of the supplimentarity requirement

As table 2 shows, only alternative III attempts a comprehensive implementation of the supplimentarity requirement. But it has problems with the concrete implementation as well as with the numerical computation of the cap for the amount of emission certificates that EU member states acquire through any of the permissible channels.

Analysis and Policy Recommendations

From the authors' point of view, a sound implementation of the supplimentarity requirement is crucial for the credibility of the EU's climate policy. In the authors' view the implementation of the supplimentarity requirement must consist of two components: The first component must make sure that each member state and the European Union as a whole achieve compliance with the Kyoto Protocol in line with the supplimentarity requirement. It must thus include all channels through which member states can acquire emission certificates and it must be more concrete than the formulation in the Marrakesh Accords. The second component must ensure that the amount of CERs/ERUs that will be used within the EU Emission Allowance Trading does not violate the supplimentarity requirement.

Implementation of the first Component

Of the proposals that were presented in the section before only the de Roo proposal provides a starting point for this first component. This proposal however suffered from weak implementation and vagueness of the numerical definition.

In terms of the practical implementation and the numerical computation, the authors propose to use the National Allocation Plans (NAP) and the formula proposed by the EU during the climate change negotiations. The NAPs do not only contain the allocation of Allowances to the installations covered by EU Emission Allowance Trading, they also contain a plan for meeting the respective member state's overall Kyoto target. The NAPs could therefore

be made to include a national target for the overall extent to which a member state intends to use the flexible mechanisms. As part of the NAPs these targets would be notified to the EU Commission, which would then have to ensure that the sums notified by the EU 15 member states do not exceed the supplementarity requirement for the EU 15 as a whole, as well as for each member state.

It would probably also be helpful to establish a monitoring mechanism. One option would be to use Council Decision 93/389/EEC of 24 June 1993 (as amended by Council Decision 1999/296/EC), which establishes a mechanism for monitoring the EU's greenhouse gas emissions and evaluating progress towards meeting its international commitments. Under this decision, the member states annually report their greenhouse gas inventories to the Commission. The Commission assesses, in consultation with the member states, whether their actual and projected progress is sufficient to meet the commitments made by them and the EU under the UNFCCC and the Kyoto Protocol, and reports to the European Parliament and the Council. This Decision could be amended such that the member states would also have to report and the Commission would have to assess in how far member states' and thus the EU's climate policy as a whole is in line with the supplementarity requirement.

Implementation of the second Component

As for the second component of a comprehensive supplementarity regime, the proposed directive, from the author's point of view either a liberal model at the member state level or the UK proposal could be implemented. The Proposed Directive on the other hand is an attempt to regulate at the EU level that lacks concrete implementation; it is therefore not considered further.

If one just considers the supplementarity requirement, it does not seem necessary to implement the second component. As long as a cap on a state's overall use of the flexible mechanisms is in place it does in theory not make a difference whether a member state prefers to acquire emission certificates through International Emissions Trading, programmes for the direct acquisition of CERs/ERUs or through the conversion of CERs/ERUs into EU Allowances. Therefore the liberal model, i.e. to let the member states choose the amount of CERs/ERUs that they wish to convert into EU Allowances, may be seen as appropriate.

But such a model would inevitably have the result that in comparison to each other member states would convert disproportionate amounts of CERs/ERUs into EU Allowances and this could be seen to contradict the idea of a harmonised European Emission Allowance Trading system. If operators in one member state were allowed to convert a significantly higher

amount of its ‘flexibility quota’ into Allowances than those in another, this could also give rise to competition issues since those in the first state would arguably have a cost advantage. The minimum requirement to remedy this competition problem would be to skip the provision in Article 11(bis) of the Proposed Directive that only operators can request the conversion of CERs/ERUs into Allowances.

This liberal model should also be questioned from another point of view. The stated aim of the EU Emission Allowance Trading is to achieve emission reductions within the EU itself. Allowing states to convert a huge part of, if not even their entire, ‘flexibility quota’ into Allowances has the potential to undermine this goal.

For these reasons the authors consider that EU wide regulation that limits the amount of CERs/ERUs that operators use for compliance with their obligations under the ET directive is advisable. The UK proposal provides a good mechanism.

The UK proposal neatly avoids the selection problem (Which CERs/ERUs shall be converted? Those offered early in time? The best quality?) associated with the conversion of CERs/ERUs into EU allowances since the operators are free in choosing which CERs/ERUs they wish to use. They only have to make sure that they do not surrender more CERs/ERUs than they are allowed.

As for the figure, with a view to the calculation done by the European Commission the authors regard a cap of six per cent of the amount of allowances allocated to the operator a reasonable figure.

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Aggregate anthropogenic emissions of CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs and SF ₆ - excluding CO ₂ emissions/removals from land-use change and forestry													
I	II	III	IV	V	VI=V-IV	VII=I+VI	VIII	IX = VIII*VII*5	X = III *5	XI = X-IX	XII=(II*5-IX)/2		
Emissions in base year (mostly 1990)	Maximum Emissions 1995-2001	2001	Aggregate anthropogenic emissions of HFCs, PFCs and SF ₆ / baseline correction			base year emissions incl. baseline correction	Reduction factor	AAU	Appr. Emissions 2008 - 2012	Appr. Compliance Gap	Supplementarity Cap		
Mio t CO ₂ eq.	Mio t CO ₂ eq.	Mio t CO ₂ eq.	Mio t CO ₂ eq.	Mio t CO ₂ eq.	Mio t CO ₂ eq.	Mio t CO ₂ eq.		Mio t CO ₂ eq.	Mio t CO ₂ eq.	Mio t CO ₂ eq.	Mio t CO ₂ eq.		
Austria	78,1	85,9	85,9	1,5	1,7	0,3	78,3	0,870	340,7	429,4	88,7	44,3	Austria
Belgium	141,1	154,5	150,5	0,0	0,4	0,4	141,6	0,925	654,7	752,6	97,8	58,9	Belgium
Denmark	69,2	90,8	69,4	0,0	0,3	0,3	69,5	0,790	274,6	347,1	72,5	89,6	Denmark
Finland	77,2	82,1	80,9	0,1	0,1	0,0	77,2	1,000	386,2	404,4	18,3	12,2	Finland
France	568,2	589,5	568,2	7,6	5,3	-2,3	565,8	1,000	2.829,0	2.840,8	11,8	59,2	France
Germany	1.213,5	1.079,5	995,3	10,1	14,8	4,6	1.218,2	0,790	4.811,8	4.976,7	164,9	292,8	Germany
Greece	104,9	132,2	132,2	1,2	3,5	2,3	107,2	1,250	669,7	661,2	-8,5	-4,3	Greece
Ireland	53,2	70,0	70,0	0,0	0,2	0,2	53,4	1,130	301,8	350,1	48,3	24,1	Ireland
Italy	508,6	545,4	545,4	0,9	0,0	-0,9	507,7	0,935	2.373,5	2.726,8	353,3	176,6	Italy
Luxembourg	13,4	10,2	5,0	0,0	0,0	0,0	13,4	0,720	48,4	25,0	-23,4	1,4	Luxembourg
Netherlands	210,0	232,9	219,7	7,1	8,2	1,1	211,1	0,940	992,2	1.098,5	106,2	86,1	Netherlands
Portugal	61,4	83,8	83,8	0,0	0,0	0,0	61,4	1,270	390,2	419,1	28,9	14,5	Portugal
Spain	287,6	387,1	382,8	3,3	5,5	2,2	289,9	1,150	1.666,6	1.913,9	247,3	134,4	Spain
Sweden	72,8	78,7	70,5	0,5	0,6	0,1	72,9	1,040	378,9	352,4	-26,5	7,3	Sweden
United Kingdom	744,1	709,1	657,2	14,4	17,4	3,1	747,2	0,875	3.269,0	3.286,2	17,2	138,2	United Kingdom
Sum EU 15*	4.203,5	4.116,8	4.116,8	46,7	58,1	11,3	4.214,8		19.387,4	20.584,1	1.196,7	1.135,5	Sum EU 15*
EU 15**	4.199,6	4.166,5	4.116,1	47,4	59,6	12,3	4.211,9	0,920	19.374,6	20.580,4	1.205,8	729,1	EU 15**
acceding countries													
Czech Republic	162,7	158,9	148,1	0,0	0,2	0,2	162,9	0,920	749,4	740,3	-9,1	22,6	Czech Republic
Estonia	37,6	23,7	19,4	0,0	0,0	0,0	37,6	0,920	173,1	97,1	-76,0	-27,4	Estonia
Hungary	101,6	86,5	78,5	0,0	0,0	0,0	101,6	0,940	477,7	392,7	-85,0	-22,5	Hungary
Latvia	22,0	13,7	11,5	0,0	0,0	0,0	22,0	0,920	101,1	57,5	-43,6	-16,3	Latvia
Lithuania	37,1	22,5	22,5	0,0	0,0	0,0	37,1	0,920	170,8	112,6	-58,2	-29,1	Lithuania
Poland	564,4	437,4	382,8	0,0	0,8	0,8	565,3	0,940	2.656,7	1.914,0	-742,8	-234,9	Poland
Slovakia	56,3	53,4	50,1	0,3	0,1	0,0	56,3	0,920	259,2	250,6	-8,6	3,9	Slovakia
Slovenia	19,9	19,7	19,7	0,0	0,0	0,0	19,9	0,920	91,6	98,5	7,0	3,5	Slovenia
Sum	1.001,8	732,7	732,7	0,3	1,2	1,0	1.002,8		4.679,5	3.663,3	-1.016,2	-2.339,7	Sum
candidate countries													
Bulgaria	144,4	87,1	65,8	0,0	0,1	0,1	144,4	0,920	664,5	329,0	-335,5	-114,4	Bulgaria
Romania	264,3	212,3	148,3	0,0	0,5	0,5	264,8	0,920	1.218,1	741,3	-476,8	-78,3	Romania
Sum	408,7	214,1	214,1	0,0	0,6	0,6	409,3		1.882,6	1.070,3	-812,3	-941,3	Sum

Source: UNFCCC (2003) and own calculation

* Sum of EU 15 national member states data

** EU 15 own data system