The impact of surplus units from the first Kyoto period on achieving the reduction pledges of the Cancún Agreements

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Abstract. Countries with emission levels below their emission allowances have surplus Assigned Amount Units (AAUs) or other emission credits. Under the Kyoto Protocol, these surplus credits may effectively be carried from the first to a following commitment period. In the climate negotiations, various rules for carry-over and sale of surplus AAUs have been put forward. This paper analyses the effect of these options on the reduction pledges for 2020, taking into account the estimated credits from the Clean Development Mechanism, Joint Implementation projects, and land-use activities for the first commitment period. For current Kyoto Protocol rules of unlimited carry-over of surplus AAUs and limited carry-over of other credits, the environmental effectiveness of reduction pledges could be seriously undermined. For the group of countries that showed a willingness to participate in a second commitment period, it could imply that instead of an aggregated 2020 target resulting from the pledges of 18 to 28% below 1990 levels by 2020, their emissions could return to business-usual emission projections. For the EU, a 30% target by 2020 could imply higher emissions compared to a 20% target, if surplus allowances would be used for achieving the 30% but not for the 20% target. Restricting the use of Kyoto surplus units to domestic use only, would also seriously undermine the effectiveness of 2020 reduction targets.

1. Introduction

According to the Kyoto Protocol and the Marrakesh Accords, countries with Assigned Amount Units (AAUs) that are not required for achieving their Kyoto target in the first commitment period (CP1; 2008–2012) could carry-over and use or trade these surplus AAUs in subsequent commitment periods. Because of the economic collapse in certain countries following the dissolution of the Soviet Union and Eastern Bloc in the 1990s, emissions in these countries have strongly declined. As a result, these countries have surplus AAUs for reasons unrelated to climate change policy. In addition, surplus AAUs from CP1 are also expected for some western European countries, such as Germany and the United Kingdom. Apart from surplus AAUs, credits from land-use activities could increase the total amount of surplus units as well. Finally, credits issued through Clean Development Mechanism (CDM) and Joint Implementation (JI) projects could also lead to surplus units, even though these are based on specific emission reduction projects, unlike surplus AAUs. Different studies have shown that the total surplus AAUs at the end of CP1 – excluding the potential effect of land-use activities, CERs and ERUs – could amount to 9 to 13 GtCO₂eq (den Elzen et al., 2010; Point Carbon, 2009; World Bank, 2010). This could have a large potential effect on the mitigation ambition of future emission targets.

In the UNFCCC negotiations, Parties have been discussing potential rules for carry-over and use of these CP1 AAUs in several sessions under the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP), including the COP16 Cancún summit. There are basically four options of how to deal with CP1 AAUs in achieving future reduction pledges. This paper analyses the effect of these four options on future reduction levels. It focuses on all CP1 surplus units, including not only surplus AAUs, but the estimated CP1 credits from land-use activities and Clean Development Mechanism (CDM) and Joint Implementation (JI) projects as well.

2. Surplus units and options for carry-over and use

We calculate surpluses, Marrakesh Accord rules and the various regulatory options within the “Surplus AAU Check Tool” developed by the PRIMAP group at the Potsdam Institute for Climate Impact Research. The business-as-usual (BAU) emission data, including the extension beyond officially reported 2009 emission levels under the UNFCCC, is using the PRIMAP IV emission source, which is aggregated from various official data sources and complemented by emission growth projections from the World Energy Outlook 2009 (IEA, 2009) and EDGAR (JRC/PBL, 2009), among other sources¹. The aggregation process is performed within the PRIMAP emission module (Nabel et al., 2011).

Total CP1 surplus AAUs for all Annex I countries excluding the USA are expected to amount to 11.3 to 12.6 GtCO₂eq by 2012 (see SI), depending on whether or not countries with current deficits will buy emission credits from countries with surplus units. For the lower estimate, deficits of countries expected not to comply are deducted from the aggregate surplus units of countries expected to overachieve their Kyoto targets (net calculation). The higher, gross estimate ignores the deficits. Figure 1 shows the impact of net and gross surplus calculations for different groups of countries. Canada, Japan and Russia have indicated not to be on board for a second commitment period. Therefore, Figure 1 present total results for a case in which all Annex I countries excluding the USA join a CP2, and a case in which Canada, Japan and Russia do not join a CP2 (CP2 countries).

Annex I Parties may receive credits or debits from domestic Land Use, Land Use Change and Forestry (LULUCF) activities, contributing to achieving individual emission reduction targets of the Kyoto Protocol. Although credits from LULUCF accounting cannot be banked (UNFCCC, 2005), they can be traded or used domestically, and therefore result in additional surpluses. Current LULUCF accounting rules may result in additional credits that would increase the amount of surplus units by a maximum of 1.3 GtCO₂eq, leading to a total gross level of surplus units of 13.9 GtCO₂eq. Furthermore, acquisitions of credits of CDM (Certified Emission Reductions or CERs) and JI (Emission Reduction Units or ERUs) projects could increase the total expected surplus units to 15.5 GtCO₂eq gross, with a maximum estimate of up to 16.7 GtCO₂eq (see SI). The expected and maximum CERs and ERUs for the CP1 period are calculated from the UNEP Risoe CDM/JI Pipeline Analysis and Database (1 February 2012, <http://uneprisoe.org>).

¹ See tiny.url/primapIV for a full description.

Figure 1 Total expected CP1 surplus units, including surplus AAUs, CERs and ERUs. The expected (taking into account current project issuance success rates) and maximum (assuming 100% issuance success rates) estimates of CERs and ERUs are given. CP2 countries include the EU27, Australia, New Zealand, Norway and Switzerland. Source: Calculated from Surplus AAU Check Tool of PIK and UNEP Risoe CDM/JI Pipeline Analysis and Database, 1 February 2012 (see SI)

Russia (about 43%), the Ukraine (about 18%) and European countries (about 35%) have generated nearly all surplus units (Figure 2).² As Russia has announced not to participate in a second commitment period, it would not supply any surplus units. This would effectively reduce the total supply by 6.3 GtCO₂eq.

During the COP17 in Durban, Parties have tabled multiple proposals on how many surplus units could be carried over for trade and compliance purposes, sometimes without numerical details that would allow a specific quantification. Therefore, we here investigate four general options based on the AWG-KP negotiation text³ with various possibilities for how to set the numbers as illustrative guide only:

- **Option 1** is the status quo (current Kyoto Protocol rules), implying no restrictions for carry-over and use of surplus units, except for CERs and ERUs, for which the maximum amount of carry-over is 2.5% of total CP1 AAUs, based on the Marrakesh Accord. This would lead to a maximum estimate of carry-over of about 14 GtCO₂eq for all Annex I countries excluding the USA (compared to a maximum of CP1 surplus units of 16.7 GtCO₂eq).

² Russia and Ukraine have different experiences and practical approaches to implementing JI (Korppoo and Gassan-zade, 2012).

³ All options are presented in the CRP 4 paper of the AWG-KP negotiating text (FCCC/KP/AWG/2010/CRP.4/Rev.4). The Durban climate negotiations did not change the existing options.

Figure 2 Countries' contribution in total CP1 surplus units of all Annex I countries (excluding the US) under the default assumption for the availability of CERs and ERUs, and LULUCF credits in the first commitment period.

- **Option 2** restricts the carry-over of all surplus units to a percentage of CP1 AAUs for all countries. The percentages currently proposed are 1, 2, 5, and 10. For this option, we assume no separate restriction on the carry-over of CERs and ERUs. This would lead to a maximum expected carry-over varying from 0.6 to 4.8 GtCO₂eq.
- **Option 3** is the same as Option 1, but restricts the use of surplus units to future domestic compliance only, if a country exceeds its target in CP2. This means that surplus units cannot be sold, and may only be used for achieving future targets. This would lead to maximum carry-over similar as in option 1;⁴ however, only between 0.9 and 1.5 GtCO₂eq could be used for domestic compliance for achieving the low and high reduction pledges of all Annex I countries (excl. the USA) by 2020. This calculation assumes the EU uses its CP1 surpluses only at the national level. If the EU is treated as a bubble, the estimate would be higher (as discussed in Section 3).
- **Option 4** prohibits carry-over of all surplus units altogether, leading to zero carry-over.

Principally, options 2 and 4 could apply to the so-far unrestricted AAUs only (as is the case in the current negotiation text) or on all surplus units. Here we have chosen for the latter.

The four options differ with respect to (1) rules for the carry-over of units and (2) rules for the sale of units. Table 1 summarises the options based on this categorisation.

⁴ This option does not restrict the amount of carry-over to commitment periods after CP1, and surplus units not used in CP2 could still be saved and transferred to later commitment periods after CP2.

Table 1 Overview of the four options for dealing with CP1 surplus units in future commitment periods

	Option 1	Option 2	Option 3	Option 4
<i>1. Carry-over</i>	Full AAUs and LULUCF credits 2.5% CERs 2.5% ERUs	Carry-over surplus units (incl. AAUs, CERs, ERUs) are restricted to % of CP1 AAUs	Full AAUs and LULUCF credits 2.5% CERs 2.5% ERUs	None
<i>2. Restrictions on sale</i>	Unrestricted sale of surplus units	Unrestricted sale of surplus units	No sale of surplus units	Not applicable

3. The impact of CP1 surplus options on emission reductions by 2020

The impact of CP1 surplus units on CP2 targets not only depends on the option how to deal with the surplus units, but also on the countries joining such a second commitment period. With fewer countries joining, both the supply and demand for surplus units in the CP2 are reduced.

For estimating the effect of CP1 surplus units on the reduction levels by 2020 resulting from the pledges as put forward by the Annex I countries in the Cancún Agreements (2010)⁵, we assume a second commitment period of eight years (as adopted at the EU Environmental Council conclusions, March 2012) and that the use and trade of surplus units would increase between 2012 and 2020, with a maximum in 2020. Such a distribution of use and trade of surplus emission units, over time, would look like a linearly increasing wedge; see Rogelj et al. (2010a; 2010b). Under unrestricted carry-over of surplus AAUs as under option 1, this would result in a maximum amount of surplus units of 3.5 GtCO₂eq in 2020 – assuming that the maximum estimate of carry-over of 14 GtCO₂eq for all Annex I countries excluding the USA is used (as wedge) over the 8 years from 2013-2020.

Table 2 shows the impact of CP1 surplus units based on the various options on reduction levels by 2020 for selected countries, for the total reduction level of Annex I countries excluding the USA, and for CP2 countries (EU27, Australia, New Zealand, Norway and Switzerland). It shows that the choice of future rules regarding surplus units could strongly affect the ambition level of future emission reductions. It should be noted that the impact would be halved under equal instead of increasing use of CP1 surplus units over time (see SI). Given the way that pledges are turned into quantified emission limitations over the second commitment period, the impacts shown below do however better reflect the equivalent impact on the 2020 pledges when a ‘wedge’ or ‘increasing use’ assumption is followed.

⁵ Since the climate negotiations in Copenhagen (2009), 42 Annex I Parties have submitted quantified economy-wide emission reduction targets (pledges) for 2020 to the UNFCCC secretariat for inclusion in the Appendices to the 2009 Copenhagen Accord, see <http://unfccc.int/home/items/5265.php>. These pledges are ‘anchored’ in the Cancún Agreements (UNFCCC, 2010).

Table 2. Impacts of CPI surplus units under different options for dealing with these units on reduction efforts by 2020, as % of 1990 levels.

	Option 1	Option 2				Option 3		Option 4
		1%	2%	5%	10%	low pledge	High pledge	
EU27* (net)**	19	0	1	4	9	3 ⁱ – 0 ⁱⁱ	5 ⁱ – 10 ⁱⁱ	0
Australia	5	2	4	5	5	5	5	0
Belarus	25	1	2	5	11	0	0	0
Japan	4	1	2	6	6	4	4	0
New Zealand	17	1	3	7	13	17	17	0
Russia	48	1	2	6	12	0	0	0
Ukraine	71	1	2	6	12	0	0	0
CP2 countries ^a (net)**	25	1	2	5	10	3 – 1	5 – 8	0
Annex I countries excl. USA ^b (net)**	27	0	1	4	8	2 – 1	3 – 5	0

* The numbers for the EU27 only applies for the pledge of 30%, as for the 20% reduction pledge, the EU has decided not to use surplus units to reach their pledge (although domestic legislation would allow to use a part of the surplus due to a surplus in the EU emission trading sector).

** The gross calculations would be about 1% higher for option 1 and 2.

^a All Annex I countries excluding the USA, Japan, Russia, Canada and Croatia

^b Annex I countries excluding USA, Turkey and Croatia

ⁱ treating EU as individual countries; ⁱⁱ treating EU as a bubble.

Source: Calculated from Surplus AAU Check Tool of PIK and UNEP Risoe CDM/JI Pipeline Analysis and Database, 1 February 2012 (SI)

Option 1 (current Kyoto rules) effectively would decrease the ambition levels resulting from the pledges of the EU by 19% of its 1990 emission level (net calculations) by 2020, and for the Ukraine and Russia by as much as 71% and 48%, respectively. The ambition level resulting of the pledges for the CP2 countries as a whole would decrease by about 25% of 1990 emission levels. As this would lead to a total emission level above BAU levels by 2020, option 1 would result in no emission reductions compared to BAU (also see Table 3). However, the total impact of surplus units would strongly depend on whether countries will buy surplus units. The EU, for instance, does not allow surplus units to be used to comply with its unconditional 20% reduction pledge under current internal EU legislation. Hence, Option 1 would result in supply exceeding demand for surplus units. Therefore, it is likely that this option would result in only part of the surplus units being sold. Most, if not all surplus units would be carried over for use in future commitment periods (if this were allowed).

Since the EU does not allow surplus units to be used to comply with its 20% unconditional target, the total impact for the EU under Option 1 could be substantially lower, by 2020, than the projected decrease of 19%. The rules for the conditional 30% target are still unclear. If, for the 30% target, surplus units could be used, Option 1 could cause such a decrease in effective emission reduction, that the reduction would be less than the 20% unconditional target.

The other options lead to much smaller impacts on the ambition levels resulting from the pledges. For option 2, the impact strongly depends on the level of the cap, defined as

percentage of CP1 AAUs. At higher levels of 10% of CP1 AAUs, the ambition level for the CP2 countries reduces by about 10% of 1990 emission levels. At lower levels of 1–2%, the impact is much smaller (1–2% of 1990 emission levels).

For option 3, we calculate two variants of domestic compliance: (1) treating EU as a bubble (CP1 surplus units from any EU member state could be used for domestic compliance in other EU member states if emissions from EU as a whole were to exceed its target); (2) enforcing domestic compliance at member state level. Since for the EU low pledge hardly any emission reductions compared to BAU are expected, when treating the EU as bubble, the impact is very low when restricted to domestic use. Some individual member states, however, do have a higher reduction compared to BAU. Therefore, treating the EU as individual countries does lead to a higher impact. For the high pledge, treating the EU as a bubble leads to a higher impact, as a higher emission reduction for the EU as a whole compared to BAU is expected. Treating the EU as individual member states would imply that quite some CP1 surplus units cannot be used for domestic compliance (or trade), in particular for member states with 2020 targets exceeding BAU emissions. Therefore, for the high pledge treating the EU as individual countries does lead to a lower impact.

The impact of option 3 on the ambition of the CP2 countries is of the same order of magnitude as option 2 with a 2% or 5% cap, and is much higher for the high pledges than for the low pledges. The reason for this is that for the high pledges, surplus emissions can for a higher degree be put into use to meet the pledges by 2020.

The impact of the options on reduction levels as % of 1990 levels from the pledges cannot directly be translated into actual reduction efforts by 2020. For this, the absolute reductions resulting from the options can be compared by the reductions compared to BAU emission projections by 2020 (Table 3).

One of the most remarkable results is that the current Kyoto Protocol rules for carrying over surplus units would, for all Annex I countries excluding the USA, lead to total 2020 surplus levels that are about four times the projected emission reduction implied by the high pledges. For the EU, current rules for carrying over CP1 surplus units would lead surplus levels by 2020 of about twice the level needed for reaching the 30% high pledge. Restricting the use of surplus units to domestic use only would still reduce the necessary emission reductions for the high pledge by 50%.

The results in Table 3 depend on (i) BAU emission projections in 2020, and (ii) the assumed wedge-like usage of carry-over CP1 surplus units. As mentioned earlier, the impact would be halved under equal instead of increasing use of CP1 surplus units over time (see SI). The SI also includes a sensitivity analysis of an alternative BAU, consisting of constant 2009 emissions until 2020. This shows that many results are quite robust to BAU assumptions, except that for all Annex I countries excluding the USA, the numbers double, mainly as Russia's BAU projection is much lower.

Table 3. Impacts of CP1 surplus units under different options for dealing with these units on reduction efforts in 2020, as % of the emission reduction level relative to BAU for the high, conditional reduction pledges (only those countries with pledges that lead to reductions relative to BAU are shown)

	Option 1	Option 2				Option 3	Option 4
		1%	2%	5%	10%		
EU27 (net)	180%	3%	14%	43%	84%	51% ⁱ	0%
Australia	3%	0%	0%	3%	3%	3%	0%
Japan	24%	7%	14%	33%	33%	24%	0%
New Zealand	40%	0%	0%	20%	40%	40%	0%
CP2 countries ^a	398%	17%	36%	85%	152%	72%	0%
Annex I countries excl. USA ^b	424%	1%	18%	68%	134%	49%	0%

^a All Annex I countries excluding the USA, Japan, Russia, Canada and Croatia

^b Annex I countries excluding USA, Turkey and Croatia

ⁱ treating EU as individual countries.

Source: Calculated from Surplus AAU Check Tool of PIK (Nabel et al., 2011) and UNEP Risoe CDM/JI Pipeline Analysis and Database, 1 February 2012 (SI)

4. Conclusions

This paper analysed the possible effect of different options for carrying over surplus units, including surplus AAUs, CERs and ERUs, from the first commitment period of Kyoto. Options for addressing the carry-over and use of CP1 surplus units vary from prohibiting carry-over or restricting the use or sale, to no restrictions at all (current Kyoto Protocol rules). The main conclusions are:

- Under the assumption of a wedge-like usage of CP1 surplus units, effective target levels by 2020 will be weakened by between 0 and 3.5 GtCO₂eq, depending on the option to deal with surplus units. An equal usage of carry-over CP1 surplus units would halve this impact.
- Excluding Russia, that has indicated not to join a second commitment period, from the analysis, total CP1 surplus units by 2020 are projected to vary between 0 and 1.8 GtCO₂eq (under wedge-usage assumption).
- Since the total reduction expected from the pledges is much less than 1.8 GtCO₂eq, current rules of no restrictions on the carry-over of surplus, except for the 2.5% limit for CERs and ERUs, could lead to no emission reduction compared to business-as-usual emission levels by 2020.
- If carry-over of surplus units would be restricted, such as under the other options, the decrease in ambition levels would be much smaller.
- The impact of surplus allowances could also be much smaller if countries put restrictions on buying these allowances, like the EU did for its 20% unconditional target. Under current internal EU legislation for achieving its 20% target, surplus AAUs cannot be used for compliance within the EU.
- For the EU, the rules on the use of surplus units for achieving its conditional 30% target are still unclear. Having no restrictions put on the use of surplus units could imply that the

30% conditional EU target in effect would involve less reduction than the 20% unconditional EU target.

- Moreover, without the participation of Russia as largest potential seller and Japan and Canada as potential buyers in a second commitment period, it is unlikely that much surplus units will be traded.

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