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Work Stream 1:
Carbon Market Public Revenues

CONTENTS

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Executive Summary

This work stream focuses on three possible sources of finance: 1) the international auctioning of country-level emission allowances – referred to as Assigned Amount Units (AAUs)[1] in the Kyoto Protocol; 2) the auctioning of domestic allowances in emission trading systems (ETS); and 3) the application of a levy on carbon offsets similar to the existing 2% levy on Clean Development Mechanism (CDM) offsets, which is earmarked for adaptation in developing countries. The three mechanisms are interrelated, as the size of the market for each mechanism affects the size of the others.

The potential public revenues from the three sources are estimated under the three AGF scenarios proposed by the co-chairs to ensure consistency between the work streams. The three scenarios are: "low carbon price"; "medium carbon price"; and "high carbon price".

When a cap is set on emissions, the right to emit (the emission allowance) becomes a valuable asset. Auctioning of emission allowances may therefore represent a significant source of financing. The revenue potential depends on the volume of the carbon market, the percentage auctioned and the carbon price.[2] Considering the various parties' positions in the climate negotiations, the realistic alternatives are perceived to be either ETS auctioning alone or a combination of AAU and ETS auctioning for all developed countries.

The estimated revenues from a combination of AAU and ETS auctioning depend on the percentage auctioned. (The low price scenario assumes no market for AAUs.) In the middle price scenario, estimated annual revenues are a little less than USD 4 billion per percentage point, which means almost USD 8 billion with 2% auctioning and USD 38 billion with 10% auctioning. In the high price scenario, the equivalent estimates are USD 14 billion and USD 70 billion (USD 7 billion per percentage point). For ETS auctioning only, annual revenues for 2 and 10 percentage points auctioned are estimated at USD 2 and 8 billion; USD 4 and 20 billion; and USD 8 and 40 billion for the "low", "medium" and "high" price scenarios respectively. The expected

[1] This type of mechanism is referred to here as AAU auctioning, but it applies to any form of international allowances at the country level.

[2] The carbon price refers to the price of emission allowances of greenhouse gases.

revenue from offset levies is limited. However, under the highest price scenario with a 10% auction rate, the mechanism could provide USD 15 billion per year.

Auctioning mechanisms fulfill the agreed AGF criteria for **incidence and equity** (i.e. where the tax burden falls)**, and efficiency**. The entire burden will fall on developed countries participating in these mechanisms. Allowance auctioning is an efficient way of raising revenues because it does not interfere with other economic activity and utilizes a valuable asset created in the carbon market. Offset levies, on the other hand, increase the price of offsets thereby creating a disincentive for climate investments (i.e. the solution is taxed instead of the problem). Furthermore, part of the levy burden falls on the host country.

While there could be some **practical** challenges in setting up auctioning schemes, lessons are being learned both in the EU ETS and the CDM markets. In the case of offset levies there is direct past experience.

Political acceptability is linked to the international negotiations on country-level emissions targets. The politically realistic option would probably be AAU auctioning for Kyoto countries, with developed countries outside the Kyoto Protocol making a comparable contribution through ETS auctioning. Offset levies have demonstrated political acceptability as this mechanism exists under the Kyoto Protocol.

The expected annual revenues from the auctioning mechanisms will vary substantially, depending on the level of auctioning and the expected carbon price. However, once the targets and the design of the system have been decided upon, uncertainties will be substantially reduced and the **predictability** of revenues will be relatively high. The collective mitigation effort is the main price determinant in a market for emission allowances, and the level of auctioning can be decided in relation to the expected price. Predictability can be further increased, for example, by introducing buffer mechanisms and by setting "revenue targets" or an "auction floor price". Auction mechanisms are relatively reliable as they generate revenues that are independent of ordinary annual budgetary processes and draw on mechanisms that ensure compliance with emission reduction commitments. Revenue from offset levies is dependent on many of the same factors. In order for these mechanisms to work, be practical, and generate substantial revenues, there is a need for a tight carbon market – and that in turn requires ambitious mitigation commitments. In such a regime these sources could generate substantial, additional, and reliable revenues for climate actions in developing countries.

1. Introduction

When emissions are limited by binding legislation, the right to emit becomes a valuable asset. In a carbon market, auctioning of this asset creates revenues that can be used to finance climate actions.

The carbon market has grown considerably in recent years. According to the World Bank (2010), the total amount transacted in this market more than doubled from USD 63.0 billion in 2007 to USD 144 billion in 2009. More than 82% of the total transacted in 2009 was in the form of emission allowances under the EU emission trading system (EU ETS), followed by 12% in the form of Certified Emission Reductions (CERs) in the primary market under the Clean Development Mechanism (CDM) and 2% CERs in the secondary CDM market. The rest was split between Joint Implementation, Assigned Amount Units (AAUs) issued under the Kyoto Protocol, and voluntary markets. Under the Kyoto Protocol, more than 12 billion AAUs per year are issued to countries that have ratified the protocol. The market value of these AAUs is about USD 200 billion.[3]

This paper focuses on public revenues derived from carbon markets[4] through the following mechanisms: AAU auctioning (auctioning of international country-level emission allowances);[5] ETS auctioning (auctioning of national emission allowances); and offset levies. These instruments have the advantage of raising climate change funding from carbon-related sources. To the extent that this approach to climate finance moves the carbon price closer to its efficient level, it functions as a market corrective rather than a distorting instrument (it helps to internalize the carbon externality). Another major advantage of carbon market public revenues is that they are not part of countries' national budgets and therefore are less vulnerable to changing political or economic considerations. Considering the various parties' positions in the climate negotiations, the realistic alternatives are perceived to be either ETS auctioning alone or a combination of AAU and ETS auctioning for all developed countries.

The objective of this paper is fourfold: i) to describe different mechanisms included in this work stream (section 2); ii) to estimate the potential revenues from each mechanism under different scenarios (section 3); iii) to assess the different options against a common set of criteria (section 4); and iv) to discuss how or whether the mechanisms affect or are interlinked with other sources or mechanisms (section 5). Section 6 describes the subgroup's conclusions.

This paper shows that through carbon market public mechanisms, climate funding could be significantly scaled up. However, the revenue estimates will depend on the carbon market in 2020, and the estimates are clearly assumption driven. Typically, estimates are

[3] Based on a price of EUR 13.5 (USD 16.7), which is between the current price of CERs and the price in the EU ETS.

[4] Carbon market refers to a market for greenhouse gas emission allowances.

[5] Allowances for international aviation and shipping could also be auctioned in a global market. This instrument is covered in Work Stream 2.

higher in scenarios with: 1) broader coverage of emissions across countries and sources; 2) tighter emissions targets; and 3) larger shares of auctioning or a higher levy set aside for international finance. In a tight climate regime, emission allowances will be scarce and the carbon price high. The international carbon price is also influenced by the level of offsetting allowed in the markets.

2. Description of carbon market public mechanisms

In this discussion of carbon market public revenues we have chosen to focus on three financial mechanisms: 1) auctioning of Assigned Amount Units (AAUs); 2) auctioning under emission trading systems (ETS); and 3) offset levies (both the current CDM and possible future variations).

2.1 International AAU auctioning

Under a climate agreement, the right to emit may be shared between countries through an international system of allowances. Country-level allowances, referred to as Assigned Amount Units (AAUs) in the Kyoto Protocol, are created by the agreement and may be seen as the collective property of the parties to the agreement. A certain proportion of the pool of country-level allowances could be withheld and auctioned via one or more appropriate international institutions. The remaining country-level allowances could be allocated free of charge to participating countries that have taken on commitments to limit emissions. The implication is that countries with quantitative emission limitation targets would receive a smaller number of AAUs than at present, while those with a deficit and unchanged national efforts would need to buy more allowances in the market, and those with a surplus would have fewer permits to sell.

The mechanism entails selling a proportion of the international emission rights (instead of allocating them to countries free of charge), and buyers may be governments, private entities, financial institutions or intermediaries. An advantage with the mechanism is that it could be an integrated part of the burden sharing within a new climate agreement. It can also generate a substantial amount of financial resources that are less vulnerable to economic and political conditions in developed countries than pledges for contributions over national budgets. However, the amount of revenue collected depends on the mitigation ambition of the post-Kyoto international agreement, the carbon price and the percentage of AAUs withheld for auctioning.

AAU auctioning is an international mechanism that can be implemented whenever countries undertake quantitative emission limitations. Although it is referred to as AAU auctioning in this paper, the mechanism can be applied to any form of international allowances at country level.

2.2 ETS auctioning

Under an emission trading system (ETS) (often called a cap-and-trade system), companies and other entities covered by the system have an obligation to surrender allowances corresponding to their emissions. An ETS may cover all or a subset of sectors in one or more countries and all or some of the allowances may be auctioned or sold.

A number of developed countries already use emission trading systems and others have been proposed. The European Union Emission Trading System (EU ETS), which was started in 2005, currently includes the 27 member states and also Iceland, Liechtenstein and Norway. In New Zealand a cap-and-trade scheme that also covers forestry started operating in 2008. The Regional Greenhouse Gas Initiative (RGGI) is the first mandatory, market-based effort in the United States to reduce greenhouse gas emissions. The agreement involves 10 Northeast and Mid-Atlantic states.[6] Furthermore, the United States, Japan, Australia, the Republic of Korea and others have proposed domestic emission trading systems.

Both current and proposed ETSs include auctioning of allowances to some degree. In the EU ETS, only a small quantity of allowances is currently auctioned, but the share will increase in the next phase, starting in 2013. In the United States, legislation has been proposed for a cap-and-trade system in which the government would allocate most of the permits free of charge for the first stage, moving to full auctioning by 2030[7]. The proposal for the Australian Carbon Pollution Reduction Scheme (CPRS) mentions an initial auctioning level of around 65%, increasing to full auctioning over time.[8]

Countries that have a national cap-and-trade system and auction a share of the allowances can dedicate part of the proceeds to international climate finance. The amount dedicated can be formalized by an international commitment.[9] For example, two years ago the German government established the International Climate Initiative (ICI). In 2008 the government auctioned 8.8% of its CO_2 emission allowances, and around 30% of the revenue collected went to climate projects. For the third trading period of the EU ETS (2013–2020), it has been decided that Member States are to determine the use of revenues generated from the auctioning of allowances. The revised EU ETS Directive indicates that at least 50% of these revenues, or their equivalent in financial value, should be used among other things to reduce greenhouse gas emissions (for example by contributing to the Global Energy Efficiency and Renewable Energy Fund and to the Adaptation Fund as made operational by the Poznan Conference on Climate Change (COP 14 and COP/MOP 4); to develop renewable energies; for measures to avoid deforestation and increase afforestation and reforestation in developing countries; for forestry sequestration in the Community; and for the environmentally safe capture and geological storage of CO_2.

[6] More information: http://www.rggi.org/

[7] The proposal has, however, been withdrawn due to lack of political support.

[8] Recently Australia has decided to delay the implementation of its ETS until 2012.

[9] This could be a fixed number or a percentage of the revenue. The dedicated amount may be adjusted in accordance with differences in the national systems, such as the share of national emissions covered or the share of allowances auctioned.

The EU has also decided to increase the degree to which permits are allocated by auctioning for the third trading phase of the EU ETS. For the power sector, it is expected that 100% of the permits will be auctioned from 2013 onwards, while in other sectors 30% will be auctioned in 2013, increasing to 80% by 2020. However, sectors which are exposed to a significant risk of carbon leakage are to be allocated up to 100% of their allowances free of charge. Furthermore, the directive indicates that more than 50% of the revenues generated from auctioning of allowances should be used for climate and energy efficiency related purposes.

2.3 Offset levies/ share of proceeds

Offsets are financial instruments that help countries meet their commitments at reduced cost through the purchase of emission reduction credits from other countries. Such purchases are called carbon emissions offsets, and offer flexibility and cost savings in fulfilling a part of an international or national commitment, while the host country benefits from foreign investment and technology transfer. Due to the cost savings, offset mechanisms can facilitate the undertaking of more ambitious commitments, thus contributing to a tighter climate regime. Climate finance revenue may be generated though a levy on the credits issued or traded.

Under the Kyoto Protocol there are two offset mechanisms: the Clean Development Mechanism (CDM), where developed country governments or companies purchase certified emission credits (CERs) from mitigation projects in developing countries, and Joint Implementation (JI), where credits (Emission Reduction Units, ERUs) are generated from projects in another developed country. Under this regime, 2% of the CERs issued for most CDM projects are set aside for adaptation purposes (the Adaptation Fund).[10] However, the concept of offset levies includes any current or future offset mechanism under any climate regime, and the structure of the fee may vary between systems.

JI projects are expected to take place in economies in transition, and Russia and Ukraine are expected to host the largest number of JI projects.

3. Expected revenue from each mechanism in the different scenarios

Below are estimates of carbon market public revenues under the three proposed scenarios common to all AGF work streams: low carbon price, medium carbon price and high carbon price. We have considered different percentages for both auctioning and offset levies.

The **low carbon price scenario** is based on the lower bound of pledges made by countries to the UNFCCC in January 2010 in response to the Copenhagen Accord. It assumes there is no AAU market, and that some developed countries cap their emissions in line with their pledges and introduce domestic carbon markets based on these targets while others do not commit to caps. The assumed abatement is 5 $GtCO_2e$ resulting in global emissions of 53

[10] Some project types are exempt from the requirement to set aside a share of the proceeds for adaptation activities (e.g. those involving least developed Parties)

Gt in 2020 after abatement. The assumed market size is 5.4 $GtCO_2e$ for emission trading systems and 0.5-0.8 $GtCO_2e$ for the offset market.

The second scenario, **medium carbon price,** is based on the upper bound of pledges made by countries, such as the EU´s 30% below 1990 target and the proposed US 17% below 2005 emission cap. Abatement rises to 9.2 $GtCO_2e$ and 2020 emissions fall to 49 $GtCO_2e$. This scenario assumes a market size of 15.2, 8 and 1.5-2.0 $GtCO_2e$ for AAUs, ETSs and offsets respectively.

The **high carbon price scenario** assumes a 25% cap below 1990 across developed countries, and that all developed countries have introduced emissions trading schemes. Abatement rises to 14 $GtCO_2e$ and in 2020 emissions fall to 44 $GtCO_2e$. The estimated market size is 14.0 $GtCO_2e$ for AAU market, 8 Gt for emission trading and 3 $GtCO_2e$ for the offset market. [11]

3.1 Revenues from AAU/ ETS auctioning combined

The scale of financing will mainly depend on the coverage of the system, the percentage auctioned, and the international carbon price. As an illustration of the potential revenue from auctioning AAU and ETS assets, auction rates of 2, 5, and 10 percent have been considered; however, any percentage may be applied. In the present climate regime structure AAU auctioning seems more realistic in combination with ETS auctioning. This paper therefore examines a combination of AAU auctioning for the Kyoto-countries with developed countries outside the Kyoto Protocol making an equivalent contribution through ETS auctioning. Table 1 shows the expected revenue from combined AAU/ETS auctioning. Under the first (low price) scenario revenue comes from ETS auctioning only, since there is no AAU market; expected revenues are USD 2 and 8 billion for 2% and 10% auctioning respectively. In the second (medium price) scenario an agreement on a 2% or 10% auctioning scheme is expected to raise USD 8 or 38 billion respectively annually by 2020. The third (high price) scenario assumes a slightly smaller AAU market but a higher carbon price per ton. Auctioning of 2%, 5%, and 10% in this scenario implies estimated annual international public revenues of USD 14, 35 and 70 billion respectively. [12]

[11] For more details about key assumptions, market size, and prices that drive these figures see the AGF common assumption paper.

[12] For comparison estimations were calculated on potential revenues from Kyoto countries only. It was found that under the medium scenario, 2% auctioned would raise USD 5 billion by 2020; estimated revenues rise to USD 12 billion with 5% auctioned. In the high price scenario, auctioning of 2%, 5%, and 10% would give potential public revenues of USD 9, 23 and 45 billion per annum respectively.

Table 1: Estimated revenue AAU/ETS auctioning combined

Scenario	Price	Share of AAU/ETS withheld for auctioning (billion USD)		
Scenarios		**2%**	**5%**	**10%**
Scenario 1: Low Carbon Price	USD 15	2	4	8
Scenario 2: Medium Carbon Price	USD 25	8	19	38
Scenario 3: High Carbon Price	USD 50	14	35	70

3.2 ETS auctioning revenues

The potential level of revenues from ETS auction proceeds depends on: a) the number of countries with domestic carbon markets, b) the share of total emissions in each country included, c) the carbon price, d) the percentage of emission credits auctioned and e) the percentage of the auction proceeds allocated to international climate finance.

Under the low price scenario, domestic auctioning with a 2% allocation to international climate finance would generate estimated public revenues of USD 2 billion, while a 5% and 10% allocation give an estimated USD 4 and 8 billion respectively by 2020. With a medium price scenario and a corresponding domestic market of 8 $GtCO_2e$ the estimated revenue is USD 20 billion for a 10% allocation for international efforts.

Table 2: Expected revenues from ETS auctioning (billion USD)

Scenarios	Price	Share of ETS to international fund		
		2%	**5%**	**10%**
Scenario 1: Low Carbon Price	USD 15	2	4	8
Scenario 2: Medium Carbon Price	USD 25	4	10	20
Scenario 3: High Carbon Price	USD 50	8	20	40

3.3 Offset levies

Under the low price scenario the potential revenues from imposing a levy on carbon offsets are relatively low. Even with a levy of 10% the maximum expected annual revenue would be USD 1 billion, which is 1% of the total financing needed.

Under the high price scenario with a sizable offset market of 3 $GtCO_2e$ and a carbon price of USD 50, the estimated contributions from this mechanism are USD 3, 8, and 15 billion with levies of 2%, 5%, and 10% respectively.

Table 3: Expected revenues from offset levies (billion USD)

Scenarios	Price	Offset levies to international fund		
		2%	5%	10%
Scenario 1: Low Carbon Price	USD 15	0	0	1
Scenario 2: Medium Carbon Price	USD 25	1	3	5
Scenario 3: High Carbon Price	USD 50	3	8	15

4. Assessment of options against AGF criteria

None of these mechanisms will work without a sufficiently ambitious climate regime. It is the scarcity of emissions allowances that is the main driver for the carbon price. Other important carbon price drivers are the availability and the permitted level of offsets. The carbon price could also be influenced by the fate of surplus AAUs from the first Kyoto period. Excessive banking could lower the carbon price if the next climate regime is not sufficiently ambitious.[13] The only way to ensure a price on carbon that is high enough to act as an incentive for cutting global emissions and generating the necessary financial flows to developing countries is to reach agreement on a real and substantial global emission reduction effort. It is therefore important that the issue of surplus AAUs is taken fully into account when new targets are set. The long-term price path depends on expectations and market perceptions for the complete duration of the climate regime and in a market that is perceived as becoming scarcer in the future, banking will help to generate a gradually increasing price over time.

International carbon prices have been highly volatile since the establishment of the carbon markets. The Center for Clean Air Policy has shown that the key short-term factors in EU ETS price fluctuations are: a) economic cycles, b) political uncertainty, c) variances in weather conditions, d) energy price fluctuations, and e) contagion from other carbon and commodity markets. However, for the mechanisms discussed here there are long lead times between commitment and spending and the establishment of buffer mechanisms. Therefore it is uncertainty in the long term that is relevant for the delivery of climate finance.

The potential ranges of revenue generated through public carbon market mechanisms could be characterized as new climate finance, and could contribute to the USD 100 billion target set out in the Copenhagen Accord.

[13] See *Stepping up international climate finance: A European blueprint for the Copenhagen deal*; COM(2009) 475/3

4.1 AAU auctioning

Practicality: The existing system of tradable international allowances must be maintained or changed, or a new system must be established. In a new system, countries that undertake AAU-type commitments would contribute by receiving a reduced number of AAUs to finance international climate projects and actions.

It will take some time to set up a new system (e.g. establish common rules), to develop and integrate the market, and to develop a trustworthy auctioning process in order to guarantee transparency and certainty in the market and avoid collusion and gaming behavior among purchasers. AAU auctioning faces some practical challenges that can be solved, such as setting up an international auction, selecting the auction method and rules, and choosing the institution to be responsible for running the auctions. This could be done in many ways. See Appendix 2 for more details and examples.

Efficiency:[14] AAU auctioning is efficient in the sense that the mechanism realizes a valuable asset created in the carbon market. In addition, switching from a free-of-charge allocation to auctioning has potential efficiency gains; because revenue is raised without distortions; and agents internalize the environmental externality to a larger degree[15]. However, countries could be tempted to increase their overall emissions or negotiate less ambitious targets in order to reduce domestic costs. Therefore, the quantity to be auctioned should ideally be decided before allowances are issued to the parties who taking on quantified emissions reduction commitments.

Acceptability: To a large degree, the acceptability of the mechanism depends on the outcome of international negotiations on binding country level targets that have proven difficult in the last few years. The mechanism implies that countries with AAU-type commitments would receive fewer allowances free of charge. This could limit the percentage of AAUs that developed countries collectively would agree should be held back for international auctioning. However, it could be argued that the difficult political issues related to auctioning are closely linked to the acceptability of international emission trading systems as such. The politically preferable option would probably be a combination of AAU auctioning for Kyoto countries, while developed countries outside the Kyoto Protocol make a comparable contribution through ETS auctioning; the latter option – AAU/ETS auctioning combined – was examined in the section 3. The Center for Clean Air Policy has carried out a survey on the acceptability of AAU auctioning. The respondents strongly support the mechanism, but are concerned about the international market development for offset

[14] For a source of financing to be efficient in the light of social welfare maximization it must not introduce distortions. In the absence of market failure, the raising of public revenues should not alter private economic decisions. In the case of climate change, we face a specific externality; private economic agents ignore the impact of their investment, production, and consumption decision on the global climate as a result of the greenhouse gases that they generate. Therefore, agents should internalize the externality and change their behavior through market corrections (e.g. limited number of pollution permits).

[15] If the system has more than one period, the mere expectancy of free of charge allowances in the next period will cause distortive behavior.

credits and future emission targets. There could be a risk if countries reduce emissions targets to avoid purchasing those allowances. Germanwatch (2009) suggested that this behavior could be minimized if the countries concerned had to purchase all their AAUs. This could be an option, but it could also reduce the political acceptance of this mechanism.

Reliability: AAU auctioning is relatively independent of national budgetary decisions and has the potential to be scaled-up over time (through a higher share of AAUs auctioned or more countries that take on commitments). Because the value of the allowances would depend on market prices, there is some uncertainty about annual contributions from this mechanism. There are however several ways of ensuring a reliable flow of funding. One option would be to auction AAUs until the target revenue is reached and then allocate the remaining AAUs free of charge. Another would be to establish a buffer between auctioning and disbursements. The international auctioning could be done well in advance and the proceeds held as liquid assets until disbursements are needed. Alternatively, disbursements could be made with borrowed money to be repaid later with revenue from international auctioning. Furthermore, to be on the safe side, the amount set aside could be larger than perceived necessary and any surplus AAUs could be banked. A fourth option would be to use a flexible auctioning percentage with a fixed revenue floor. Reliability is higher if the quantity to be auctioned is decided prior to the allocation and there is no need for collection. In any event this must be seen in connection with the total finance solution from all chosen sources.

The revenue raised also would depend on the fate of surplus AAUs from the first Kyoto period. It is therefore important that the issue of surplus AAUs is taken fully into account when new targets are set. The long-term price path depends on expectations and market perceptions for the complete duration of the climate regime, and in a market that is perceived as being tighter in the future, banking will help to generate a gradually increasing price over time. Furthermore, expected revenues could be reduced if some developed countries are exempt from auctioning their AAUs. Nevertheless, the mechanism is expected to generate lower revenues in the beginning and higher revenues in later years (closer to 2020).

Some question the reliability of this mechanism due to the fact that AAUs are issued at the beginning of a period, while compliance – the surrender of allowances – is not apparent until the end. This is not a problem if compliance periods are short or the regime is tight. In a tight climate regime, parties would want to make sure they have enough allowances to comply, and in order to secure compliance they would need to buy along the way. It will be risky to wait until the end of the compliance period.

Auction mechanisms are relatively reliable as they generate revenues which are independent of ordinary annual budgetary processes and draw on mechanisms that ensure compliance with emission reduction commitments. Furthermore, uncertainties in expected annual revenues will be significantly reduced once decisions have been reached on the level of targets and the design of the system.

Incidence and equity: AAU auctioning is in accordance with the polluter pays principle. Countries that undertake AAU-type of commitments would contribute by receiving a reduced number of AAUs. Participating countries will bear the costs and the relative distribution between countries will depend on negotiations.

4.2 ETS auctioning

Practicality: The feasibility of ETS auctioning is not questioned as there is prior experience and implementation would be relatively fast and easy. New systems will need to incorporate auctioning for international purposes into national legislation, and participating countries will to reach agreement on earmarking part of the revenue for climate finance. ETS systems that are already in operation will have to make the necessary changes. **Efficiency**: There is a direct link to carbon emissions and the mechanism applies the "polluter pays" principle. Rules should ensure equitability in terms of regulation of and participation in the market, especially for those sectors that compete internationally, otherwise considerable distortions could be created. For an optimal solution, the coverage of entities and sectors should be complete.

Acceptability: The political acceptability of earmarking part of the auction revenue is uncertain as this will interfere with national sovereignty. Compared with ordinary budget contributions, some countries might not consider domestic ETS auctioning to be a politically easier option for contributing to international financing. For other countries, revenue raised through climate related policies will naturally have an affinity for climate related uses. Nevertheless, once an agreement on earmarking is reached, the decision could be made for several years, and the revenue would not be subject to domestic annual budget procedures. In contrast to annual appropriations, the decision to set aside funds under an ETS would be taken once and for all until the ETS legislation is changed. The decision in itself may be no easier than the annual appropriations, but it would have much greater longevity. The level of acceptability may correlate to the percentage earmarked for climate finance. Acceptability will also be linked to whether international or national collection of funds is chosen, and the preferred option would vary between countries.

Reliability: An international agreement on earmarking a percentage of ETS auction revenue for international financing could potentially generate a substantial financial flow. The scale of financing will, amongst other things, depend on the demand within the ETS, the percentage auctioned, the percentage allocated to international climate finance, and the carbon price. Revenue fluctuation will tend to be pro-cyclical because activity decreases in an economic lowturn, resulting in reduced emissions, and hence businesses will require fewer permits. The opposite occurs in periods of growth. Predictability can be increased by setting revenue targets or an auction floor price. Volatility could be reduced by imposing a price band, or minimum and maximum prices. Uncertainties regarding expected annual revenue will be significantly reduced once the system design has been settled.

Incidence and equity: Participating countries will bear the costs. ETS auctioning assumes the existence of operating emissions trading systems, therefore this mechanism applies to those countries only. If businesses need to abate CO_2 emissions that are not covered by their

allowances or purchase additional allowances in the market they face an increase in production costs. Depending on the price sensitivity of the demand for their products, part of this increase may be passed on to the consumers.

4.3 Offset levies

Practicality: An advantage of offset levies is the experience that has already been gained of this mechanism. It is already used in the CDM (2% levy), and increasing the rate or applying it to other offset mechanisms such as Joint Implementation should be possible.

Efficiency: While the measure is directly linked to carbon markets, it does not tax the externality directly, but rather the solution, and it is therefore less efficient than the auctioning mechanisms. An offset levy is de facto a tax on the action to reduce emissions. Offset levies thus work as a fiscal disincentive for investment: the demand for emission reduction certificates from private investors and market buyers will be less as the tax increases. However, for very small levies the efficiency loss could be close to negligible.[16]

Political acceptability: This mechanism has demonstrated political acceptability as it has been used under the Kyoto Protocol. Moreover, national sovereignty is anly indirectly affected because the levy applies to private market transactions and the revenue will serve to finance other climate projects (Germanwatch, 2009).

Reliability: Taxing the proceeds from offset transactions in carbon markets can increase possible revenues if a larger part of the developed country obligations can be met through offsets. Revenues can be further increased if the levy is applied to all offset credits issued. However, the potential revenues from imposing a levy on carbon offsets are limited. Even with a levy as high as 10% the maximum expected revenue is USD 1 billion by 2020 in the low carbon price scenario. The expected revenue could change significantly because this instrument is pro-cyclical. In 2008 404 million tons CO_2e were contracted in the primary CDM market and the volume fell to 211 million in 2009, explained by the effects of the economic crisis and the lack of international agreement post 2012.

Incidence and equity: In the Kyoto regime, 2% of the CERs issued for a CDM project is set aside for adaptation purposes (the Adaptation Fund). However, the concept of offset levies applies to any current and future offset mechanism under any climate regime and the structure of the levy can vary between systems. It is possible to increase the levy and to apply it to other offsets as well, such as Joint Implementation. Participating countries bear the costs, but part of the burden falls on the host country. The incidence burden of the levy in the first instance could either be on the suppliers of the offsets (CDM or JI projects or programs) or on the buyers. The ultimate bearers of the burden would depend on the relative bargaining power of suppliers and buyers, which is likely to be tilted in favor of the developed countries. This is because the supply of offsets is likely to exceed demand as a

[16] To estimate the deadweight loss from the levy you need the elasticities of demand and supply of offsets. The literature notes that economic distortion or deadweight loss related to these mechanisms is fairly small; Fankhauser et al (2009) estimated that a CDM levy of 2% implicated practically zero economic distortion and a levy of 10% concerned a deadweight loss between 1 and 2 percent of the total expected revenue, which is small compared with total trading.

result of restrictions imposed by developed countries or UNFCCC to ensure that the bulk of developed country emission reductions take place at home. The implication is that the offset levy is likely to be regressive, as the larger share is likely to be paid by the offset suppliers (developing countries). To minimize this effect the levy should be kept low (e.g. 2 to 5%).

5. Whether/ how the mechanisms are interlinked

Economically speaking, AAU and ETS auctioning are similar mechanisms, whereas offset levies are of a quite different nature. However, there is also a key difference in that AAU auctioning and offset levies could apply to both public and private actors all around the world, while in ETS auctions, buyers are from the national or regional private sector only. Furthermore, an ETS auctioning mechanism can only be used by those countries that have an ETS in operation, while AAU auctioning could be implemented in all countries with quantitative emission limitation commitments.

An international agreement is needed to determine the implementation and synergies of AAU and ETS auctioning, for example, countries could agree to: 1) AAU auctioning only; 2) ETS set aside only; 3) a combination of AAU and ETS set asides where some countries participate through both mechanisms; and 4) a combination of AAU and ETS set asides, but not in the same countries. One possible option is to exempt from AAU auctioning those countries that have an ETS for climate financing purposes (Germanwatch, 2009). A more realistic alternative would be either ETS auctioning alone, or AAU auctioning for the Kyoto-countries, while developed countries outside the Kyoto Protocol make an equivalent contribution through ETS auctioning.An increase in the supply of AAUs could have an effect on the carbon price and on the volume of transactions of credits from other mechanisms, such as offset instruments. Possible means of reducing volatility are a price band for AAUs, and the introduction of a price collar, i.e. increasing the price of carbon permits at a fixed rate over inflation in the long term (e.g. US draft bill proposal). However, there are concerns with respect to price control mechanisms. The European Commission for example has stated that a "well-designed and properly implemented scheme should not require price intervention" (World Bank, 2009). There are good reasons for keeping structures and marketplaces as simple and transparent as possible. Complicated rules may dramatically increase administrative costs and reduce accessibility to auctions.

Through carbon market public mechanisms, climate funding could be significantly scaled up. Nevertheless, we note that expected revenue will be volatile due to volumes and prices being given on the basis common scenarios and assumptions.

All estimations indicate that ETS and AAU auctioning have the potential to generate much higher financial flows than offset levies. And, assuming much wider coverage, AAU auctioning could generate more revenues than ETS auctioning. However, the relative contribution would depend on who contributes through which mechanism. It is also possible that some countries could contribute through both auctioning mechanisms.

6. Concluding remarks

Through public carbon market mechanisms, funding for mitigation and adaptation actions in developing countries could be significantly scaled up, dependent on the situation in the carbon market in 2020. The three mechanisms are interrelated, as the size of the market for each mechanism will affect the size of the others. However, the total size of the carbon market will be determined by the ambition and robustness of the collective emission reduction target.

Revenues will depend on several variables, such as price, market size and the percentage of allowances set aside to be auctioned. In this paper, the expected annual revenues vary substantially. The main drivers of variations in the estimates are the level of auctioning and the expected carbon price. The carbon price will depend on the robustness of targets, the prevailing economic conditions, and any limits on offsets. Once the level of targets and the design of the system have been decided upon, uncertainties will be significantly reduced and the predictability of revenues will be relatively high.

The collective mitigation effort is the main price determinant in a market for emission allowances and the level of auctioning can be decided in relation to the expected price. Predictability can be further increased, for example, by introducing buffer mechanisms and by setting "revenue targets" or an "auction floor price". Auction mechanisms are relatively reliable as they generate revenues that are independent of ordinary annual budgetary processes and draw on mechanisms that ensure compliance with emission reduction commitments. Furthermore, once an agreement on earmarking part of the revenue for climate finance is reached, the decision to take part in these mechanisms could be made for several years. The revenue would not be subject to annual procedures but have a long-term basis in legislation.

Revenue generated through public carbon market mechanisms could be regarded as new climate finance, and could contribute towards the USD 100 billion target set out in the Copenhagen Accord. However, in order for these mechanisms to work, be practical, and generate substantial revenues, there is a need for a tight carbon market – and that in turn requires ambitious mitigation commitments. Only then will the right to emit become a valuable asset. In a tight climate regime, emission allowances will be scarce, offset levels substantial, and the carbon price high. In such a regime these sources could generate substantial, additional, and reliable revenues for climate actions in developing countries.

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Appendix 1.
Comparing revenue estimations

As seen in Table A1 there is a high volatility in the potential carbon market public revenue that range from zero (under AAUs auctioning mechanism in the low-end scenario) to USD 70 billion per year under the central-probability illustration scenario and auction 10% of AAUs.

Table A1: Summary of expected revenues from each carbon market based financial mechanism (billion, USD)

Scenarios	AAU auctioning			ETS auctioning			Offset levies		
	2%	5%	10%	2%	5%	10%	2%	5%	10%
Scenario 1: Low Carbon Price	0	0	0	2	4	8	0	0	1
Scenario 2: Medium Carbon Price	8	19	38	4	10	20	1	3	5
Scenario 3: High Carbon Price	14	35	70	8	20	40	3	8	15

These results are in the same order of magnitude as previous estimates. For example our estimate of the annual public revenues from auctioning 5% of the AAUs is USD 19-35 billion to USD 35 billion by Oaxfam (2008). Our estimate of revenues from ETS auctioning of 5% is in the range of USUSD 4-20 billion, while UNFCCC (2008) estimated €8-12 per year and Project Catalyst (2009) is in the range of €5-20 billion annually.

Regarding offsets levies our central estimate for a 2% levy raises between USD USD 0-3 billion of public revenues which is comparable to the estimate of USD 2 billion by Fankhauser et al (2009). The actual trajectory will be different with significantly lower revenues in earlier years (2013-2016) and higher revenues in later years (2017-2020).

The expected revenue found in several documents regarding AAU auctioning, as well as in our paper, depends on market size, price, and the percentage earmarked for climate finance. As we can see in table A2, the annual public revenues from 2% AAU auctioning are between USUSD 3.5 and USD 25 billion; and USD 35 billion with 5% auctioning. These results are in the same order of magnitude as our estimations.

The potential revenue from ETS auctioning seems to be volatile, as well as with AAU mechanism. In particular, the potential revenue from ETS auctioning found in documents varies significantly because they use diverse percentage on the set aside for international finance; and also due to distinct assumptions about the market´s coverage. The prices used in these papers are in the same order of magnitude of the AGF common assumptions (table A3).

Table A2: Revenues estimated in several documents from AAUs auctioning

Paper	General assumptions			Estimate for financing (USD billion)
	AAUs auction (%)	Price	Target	
Investment and financial flow. UNFCCC (2008).	2%	n.a.	n.a.	USUSD 15-25 annually
Funding adaptation in developing countries. UNFCCC (2008).	2%	USUSD 13.5-33.7	25-40% below 1990	USUSD 3.5-7.0 per year 2013-2020
Turning Carbon into gold. Oaxfarm (2008).	5%	USUSD 45	12% below 1990	USUSD 35 by 2015
	7.5%	USUSD 45	12% below 1990	USUSD 52 by 2015
	10%	USUSD 45	12% below 1990	USUSD 69 by 2015
Norway´s proposal to auction AAUs: Implementation Op. (2009)	Each percentage point	€40	75 billion AAUs created 2013-2020	€30 from 2013-2020; USUSD 5.5 annually
Scaling up Climate Finance. Project Catalyst (2009)	2-6%	€15-30	25% below 1990	€5-30 by 2020

n.a.: Not available.

Table A3: Revenues estimated in several documents from ETS auctioning

Paper	General assumptions		Estimate for financing (USD billion)
	Price	Volume	
Harmeling, Bals, Sterk and Watanabe (2009)	€30	n.a	€ 50 by 2020
State and Trends of the Carbon Market (2009)	n.a.	1.3 billion annually	€25-40 annually
Norway´s proposal to auction AAUs: Implementation Op. (2009)	€40	If 1.0 billion per year	€40 billion annually
To Earmark or Not to Earmark? Muller (2008)	€40	1.88 billion annually	€75 billion by 2020 and with 20% €15 billion for climate change
Scaling up Climate Finance. Project Catalyst (2009)	€15-30	n.a.	€60-120 per year 2010-2020; assuming 50% ETS auctioning and €5-20 with 10-15% auction
Funding adaptation in developing countries. UNFCCC (2008).	n.a.	n.a.	€40-60 annually; and for green purpose €8-12 per year

n.a.: Not available.

Finally, the potential revenues from Offset levies between our estimations and the literature are very similar. In that sense, we estimate that with 2% the levy scheme is expected to raise between USD 0 and USD 3 billion annually by 2020, while literature expected between USD 0 and USD 2 billion per annum. We found similar patterns related with levy of 5 and 10% (table A4).

Table A4: Revenues estimated in several documents from Offset levies

Paper	General assumptions			Estimate for financing (USD billion)
	Levy	Price	Volume	
UNFCCC (2008). Investment and financial flow.	2%	USUSD 23.6	300-450 million CERs	USUSD 0.08 – 0.3 annually by 2008-2012
UNFCCC (2008). Investment and financial flow. Bangladesh-Pakistan proposal	3%-5% CDM	n.a.	n.a.	USUSD 0.3 – 1.7 annually
Fankhauser, Martin and Prichard (2009)	2%	USUSD 40.3	1,200 million CERs	USUSD 1.0 by 2020
	10%	USUSD 40.3	1,200 million CERs	USUSD 4.9 by 2020
	2%	USUSD 41.5	2,500 million CERs	USUSD 2.0 by 2020
	10%	USUSD 41.5	2,500 million CERs	USUSD 10.1 by 2020

n.a.: Not available.

Table A5 shows revenue estimates on the basis of volumes from the given scenarios but applying an average price of USD 19 per ton.[17] The results show that the total expected revenue from AAU/ETS auctioning combined, including Kyoto and non-Kyoto countries, would raise between USD 6 and 14 billion for a 2% and 5% allocation respectively under the medium price scenarios; which is between 6% and 14% of the USD 100 billion climate finance goal.[18] The potential revenue from AAU/ETS auctioning under the high price scenario is in the range of USD 5 and 14 billion with an allocation of 2% and 5% respectively to international funding, and the potential revenue from offset levies is USD 1 and 3 billion for a 2% and 5% allocation to international climate financing respectively. USD 19 per ton is, however, perceived to be too low considering the tightness of the carbon market assumed in

[17] The price corresponds to EUAs in the first week of June 2010.

[18] The total expected revenue from AAU auctioning corresponds only to Kyoto countries is between USD 43.7 and USD 9.2 billion for a 2% and 5% allocation to international purpose respectively in the high-end scenario.

the medium and high price scenarios. (In the medium price scenario, the price is assumed to be USD 25 and in high price scenario USD 50.)

Table A5: Expected revenues from each source at current price (billion, USD)

Scenarios	AAU auctioning		ETS auctioning		Offset levies	
	2%	5%	2%	5%	2%	5%
Scenario 2: Medium Carbon Price (using market size and current price)	6	14	3	8	1	2
Scenario 3: High Carbon Price (using market size and current price)	5	13	3	8	1	3

Appendix 2.

The practicalities of auctioning or selling of emission allowances

The easiest way to trade allowances is through direct sales or auctioning. Norway is currently selling European Union Allowances (EUAs) in the market, using Barclays Bank as an intermediary. Barclays won this mandate in an open tender. The agreement with Barclays is based on a standard contract (ISDA, International Swap Dealers Association), which is commonly used in the market, and which is also used in Norway's debt management. Norway's proceeds are equal to average published market prices in the sales period. Administrative expenses and transaction fees are quite low.

Auctions may be arranged in a quite straight-forward manner, thereby keeping the administrative costs low. A good example of such a simple manner is Germany's weekly auction of EUAs. Germany held a tender for an auction platform, and selected European Energy Exchange (EEX), which is an established exchange for electricity and emission allowances. EEX has created a separate auction product that satisfies the requirements of the German tender. Any electricity and commodity exchange can do this relatively easily.[19]

Another way to arrange auctions, as in the UK, is to use financial institutions as intermediaries (Primary Dealers). In this case one may require that Primary Dealers are regulated by an appropriate public body in order to be eligible. The procedure allows the use of existing systems for auctioning of government bonds.

Existing structures and marketplaces are generally regulated in the country where they are operating, and thus there is usually little need for additional regulations. If the regulation is deemed not to be satisfactory, additional regulations such as KYC (Know Your Client) of companies who wish to participate in the auction might be considered.

Utilizing existing structures and marketplaces reduces costs and complexity. One should be very careful not to create complicating additional rules. Such rules may dramatically increase administrative costs and reduce accessibility to the auctions.

[19] http://www.eex.com/en/