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**KEEPING TRACK: OPTIONS TO DEVELOP INTERNATIONAL GREENHOUSE GAS UNIT
ACCOUNTING AFTER 2012**

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The ideas expressed in this paper are those of the authors and do not necessarily represent views of the OECD, the IEA, or their member countries, or the endorsement of any approach described herein.

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FOREWORD

This document was prepared by the OECD and IEA Secretariats in May 2011 in response to a request from the Climate Change Expert Group (CCXG) on the United Nations Framework Convention on Climate Change (UNFCCC). The CCXG oversees development of analytical papers for the purpose of providing useful and timely input to the climate change negotiations. These papers may also be useful to national policy-makers and other decision-makers. Authors work with the CCXG to develop these papers in a collaborative effort. However, the papers do not necessarily represent the views of the OECD or the IEA, nor are they intended to prejudge the views of countries participating in the CCXG. Rather, they are Secretariat information papers intended to inform Member countries, as well as the UNFCCC audience.

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Executive Summary

There is still uncertainty surrounding the use of tradable greenhouse gas (GHG) units in a post-2012 international climate change policy framework, despite progress made at the 16th Conference of the Parties (COP 16) to the UN Framework Convention on Climate Change (UNFCCC) in Cancún. In particular, it is not clear whether the current approach under the Kyoto Protocol of allocating centrally-administered emissions allowances for Annex I countries will continue and be built upon, or whether a future system will be based on emission reduction pledges by countries and therefore less centralised. This paper examines environmental and institutional implications of the use of tradable GHG units under different international accounting scenarios, and explores elements of common ground between scenarios.

While a mix of policy instruments is normally needed to address GHG emissions across an economy, market-based mechanisms offer some advantages over more traditional regulatory approaches in obtaining environmental objectives. These include their ability to attain a mitigation goal at a lower total cost and to create on-going incentives for innovation. Market-based instruments usually rely on recognised tradable units that can command value in a marketplace. To ensure the environmental and financial integrity of such instruments, units must be defined through robust and transparent GHG accounting frameworks. Without this, the environmental and economic benefits of using international market mechanisms to enhance climate change mitigation could be diminished.

International accounting for emissions and traded units under the Kyoto Protocol currently relies upon a number of harmonised technical tools operating at national and international levels. Accounting is based on quantified emissions allowance units (Assigned Amount Units, AAUs) for Annex I Parties with Kyoto Protocol emissions commitments. These units are held in national Kyoto registries hosted by each Party. Registries are linked to one another via the International Transaction Log (ITL), a database that verifies the validity of each transaction as well as recording the movements of all GHG units. The Kyoto Protocol accounting system is also designed to link with national unit registry systems for domestic emissions trading schemes such as the European Union Emissions Trading System (EU ETS). Although a number of GHG unit types already exist – including allowances from regional trading schemes and voluntary offset units – international GHG accounting remains tightly woven around the Kyoto framework.

Two main factors are likely to render the post-2012 framework more complex than the existing accounting system. Firstly, until 2012 Annex I Parties with Kyoto Protocol commitments are the only countries to be held accountable to their emissions inventories and use of GHG units. The introduction of national mitigation pledges by some non-Annex I countries, even though voluntary in nature, may complicate how tradable units are accounted for; for example, emissions reductions could be ‘double counted’ as part of two countries’ pledges. Secondly, the creation of new unit types in parallel with units from the existing Kyoto Protocol mechanisms may require different tracking and accounting processes to be implemented. New units could be based on common guiding principles and minimum requirements.

The introduction of non-Annex I mitigation pledges creates three broad groups of countries based on their targets or pledges:

- Annex I countries with economy-wide targets: absolute economy-wide reduction or limitation targets, which may or may not be translated into quantified amounts for allocation of international allowance units;
- Non-Annex I countries with quantified mitigation goals: usually calculated as a national or sectoral goal for reduction in intensity relative to a base-year, or as a deviation from a pre-established business-as-usual emissions trajectory;

- Non-Annex I countries with pledged actions: could involve actions with direct measurable GHG impacts or more general policy changes with environmental benefits, without any overarching quantified mitigation goal.

Mitigation goals put forward by non-Annex I countries could result in double counting of emissions reductions achieved through offset mechanisms hosted in those countries after 2012. Depending on the particular conditions applied to non-Annex I mitigation goals, host countries may count reductions from CDM or other offset projects as support for the achievement of their domestic mitigation goal, even if these offsets are subsequently used by Annex I countries in meeting their own reduction targets. This can be interpreted as double counting of the emissions reduction.

The nature of emissions-intensity pledges made by developing countries means that the final environmental result is often dependent on economic performance and so is uncertain; the double counting or not of project-based emissions credits in developing countries would be another element of uncertainty in an already uncertain calculation. How this issue is resolved and how the overall level of global mitigation is determined is a matter of political negotiation and is not the focus of this paper. If the international GHG accounting framework can be designed to allow for accurate tracking of multiple GHG unit types and participation from a wide range of countries, then it could form the basis for a robust system allowing international co-operation and cost-effective reduction of global emissions, within which national pledges can be implemented.

Another type of double counting could also occur, whereby a single emissions reduction is credited by two different offset mechanisms. This could be avoided through ensuring rigorous standards for all mechanisms that become eligible for helping to meet national mitigation commitments, and by employing an international tracking system for unit transactions.

Figure 1 shows a range of options for international GHG accounting, from a top-down, centralised model based on the Kyoto Protocol to a fragmented, bottom-up approach with minimal international co-ordination. It also shows a series of building blocks for the accounting system, such as accounting rules, the role of the UNFCCC and offset governance. The extremes of this range are unlikely to be feasible outcomes of international negotiations. Two more central scenarios are therefore considered in detail – one based on a second commitment period (CP) of the Kyoto Protocol without participation of all Annex I countries and one based on country-led objectives ('Pledge and review' in Figure 1). Elements from each of these approaches could also be combined in a 'middle ground' scenario.

Scenario: Kyoto Protocol for some Annex I countries

This scenario, with some Annex I Parties continuing to participate in a second commitment period of the Kyoto Protocol, could involve the following characteristics:

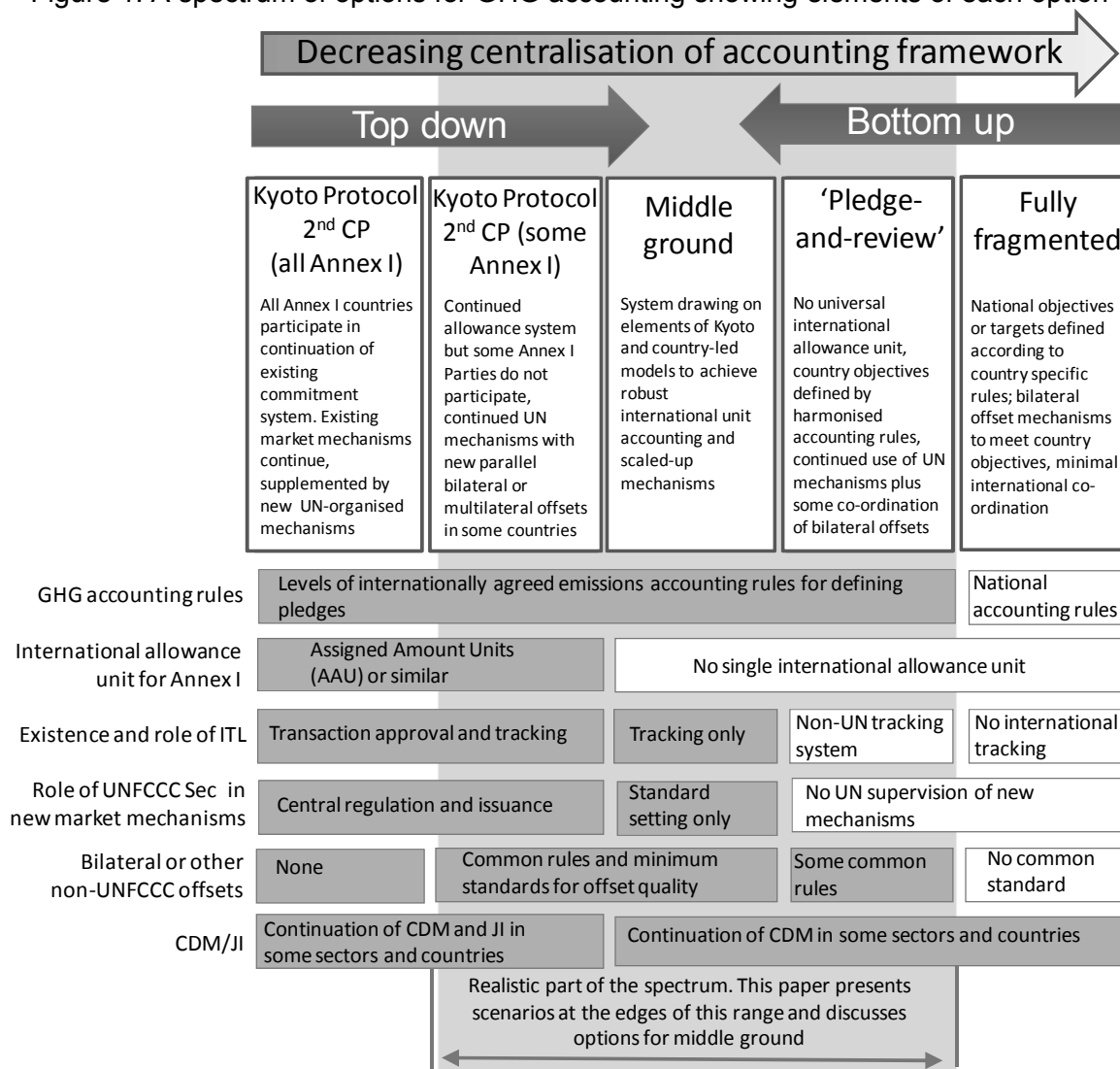
- The ITL would remain under control of the UNFCCC. Participating Annex I countries would maintain registries to UN specifications which are connected to the ITL. Non-participating Annex I countries, as well as some non-Annex I countries, may choose to establish domestic registries to handle domestic or bilateral units, and these registries may be connected to the ITL.
- International allowance units would be allocated to participating Annex I countries according to an assigned amount calculated from a reduction relative to a base year. These could be traded between registries (via the ITL) and national mechanisms could be introduced and backed-up by international allowances, as with the existing EU ETS¹. Establishing a link with any domestic

¹ Although existing EU allowances (EUAs) are converted directly from AAUs, EUAs issued from 1 January 2012 onwards will be decoupled from AAUs and held in a central Community registry, as described in the annex to this paper.

trading systems and offset mechanisms in non-participating Annex I countries could be challenging under this model, as the ITL is currently designed to handle only Kyoto-linked units passing between registries in Kyoto Annex B countries. To change this would require a provision to recognise non-Kyoto units based on common agreed criteria.

- All Parties would continue to report information under the UNFCCC as laid out in the Cancún Agreements. Non-Annex I countries with national or sectoral mitigation goals would submit any such goal according to their preferred calculation method, and report inventory and offset information to the UNFCCC at an appropriate level of detail. This information would form the basis for demonstrating progress towards implementing their goal.
- The UNFCCC would continue to act as the main regulator and issuer of the Clean Development Mechanism (CDM), with the UNFCCC Secretariat continuing to host the CDM Registry into which Certified Emission Reductions (CERs) from CDM projects are issued.

Figure 1: A spectrum of options for GHG accounting showing elements of each option



Under this scenario, new market mechanisms could be developed under the auspices of the UN, with issuance of credits for actions that exceed agreed baselines in participating programmes, sectors, etc. in

developing countries. Baselines could incorporate different levels of ambition relative to business as usual. Credits could be issued into a central unit registry, with transactions still tracked by the ITL².

Annex I countries not participating in the Kyoto Protocol system would demonstrate progress towards mitigation objectives through their inventory reporting, in addition to information on use of units from UN-based mechanisms and other types of mechanisms. Should these countries choose to develop new unit types, for example bilateral offset schemes based on common guiding principles and minimum standards, these would need to be tracked to ensure international visibility. As the ITL currently only handles Kyoto Protocol units, a substantial redesign of the ITL may be required to ensure accurate accounting under this scenario.

Scenario: ‘Pledge-and-review’

At the other end of the range of potentially feasible options for GHG accounting, a country-led system without any Kyoto-style allowance units would be based on country pledges defined with a level of international co-ordination. National mitigation objectives could still be met through market mechanisms in parallel with UN-based mechanisms. This model could be characterised by the following features:

- In the absence of Kyoto allowance units, reporting requirements would remain for Annex I and non-Annex I national communications, national inventory reports and biennial reports, according to the framework described in the COP 16 decisions. Countries would still be requested to submit reports to the UNFCCC with varying levels of detail depending on national capabilities. Annex I countries would be required to demonstrate which reduction units have been used to meet the national emissions commitment.
- Under this model, the ITL would cease to operate and the UNFCCC would no longer be responsible for the issuance and tracking of GHG units used by countries to meet mitigation targets or goals. With the exception of CERs issued through a continuation of the CDM process, all tradable units would be issued under agreements between selling and buying governments. A registry or tracking system would be needed to disclose unit transactions, in order to secure international transparency of the implementation of national mitigation pledges using multiple unit types. Therefore an independent transaction tracking system might be necessary.

Comparing scenarios

Table 1 compares pros and cons of an accounting system with or without universal common allowance units; a more comprehensive assessment is given in Table 4 in section 5.3. To ensure environmental integrity without a common allowance unit, some international co-ordination and transparency of accounting would be required. Without this co-ordination the benefits of using international tradable emissions units – both allowance units from national/sub-national trading schemes and offset credits – may be lost because of the need to ensure a level of equivalence and shared understanding of what those units represent. However, a more devolved system provides increased flexibility for countries to develop baselines and objectives that fit with their national circumstances, potentially making it easier for countries to increase participation and mitigation ambition over time.

An increase of GHG unit types after 2012 is likely under any scenario and evidence for this already exists. For example, some Annex I countries have started exploring offset schemes based on bilateral agreements which may qualify for use in sub-national cap-and-trade schemes in the US and Canada or to help with meeting national objectives. Legislation describing the EU ETS after 2012 allows for the potential use of

² Note that such a credit registry is distinct from the NAMA registry for international support described in the Cancún Agreements; see section 2 for elaboration of this distinction

credits generated from projects or other emission reducing activities implemented through direct agreements concluded with non-EU countries. The EU post-2012 legislation also provides an option to develop offsets within the EU but from sectors outside the EU ETS. In other countries, domestic policy mechanisms may generate unit types that contribute to GHG mitigation, but which are not measured in terms of GHG reduction; these may be linked to carbon markets in the future.

The ‘middle ground’ option

A ‘middle ground’ option combining elements of both of the scenarios presented above is also possible. Whilst this middle ground would not employ a single centrally-allocated international allowance unit, some common accounting rules would be agreed to ensure shared understanding of the content and scope of pledges in order to provide a stable platform for international use of offset units; experience from the Kyoto Protocol could serve this purpose. For example, the Protocol already allows some flexibility for activities that countries can choose to include in the baseline under specific conditions. The use of such opt-in clauses could help to encourage increased participation of a wider group of countries under a middle ground scenario, whilst maintaining a level of international co-ordination of accounting rules. The UNFCCC would continue to play an important role in international GHG unit accounting, albeit markedly different from its current role.

In addition to continuing to issue CERs from CDM projects, the UNFCCC institutions could play a further role in providing common guiding principles or minimum standards that Parties would adopt for country-led offset mechanisms. In such a role, the UNFCCC would be acting as a standard- or guideline-setting body rather than the sole authority on certification and approval. Under this scenario, important questions to address would include what, if any, common guiding principles or minimum standards for defining offsets are needed, how they can be agreed outside the framework of common allowance units and what elements such common guiding principles or minimum standards should cover.

A robust accounting system would need a reliable means to track the movement of GHG units between national accounts. The ITL could be modified to continue to serve this purpose outside of a Kyoto Protocol commitment period. In this case the ITL would continue to operate as a UN-managed log to track transactions, without maintaining its current additional verification role whereby it refuses any transaction that infringes Kyoto rules. The ITL would need to be adapted to handle an increased number of unit types and connections to new unit registries in countries that do not currently host Kyoto unit registries (both Annex I and non Annex I). Such new unit types could involve domestic units from sub-national schemes – both allowances and offsets – that, although issued under the authority of a national government, could be tracked by the ITL.

Learning from other experience

There is already experience with existing complex international accounting processes outside of the Kyoto Protocol framework, including regulation of transactions in financial markets and the development of a heterogeneous market for voluntary carbon offsets. Such accounting processes may provide constructive lessons for the post-2012 accounting framework; some are explored in the paper. Financial markets have developed systems for regulating transactions, including data standards for international communication of transactions and requirements for international transparency on transaction details. The existing market in voluntary emissions reduction credits (VERs) involves handling multiple unit types on a network of linked registries and has undergone gradual rationalisation to make this accounting more efficient.

This paper puts forward elements of a framework for unit accounting in an international policy framework that uses learning from past experience whilst embracing further use of market mechanisms over time. Further research will continue to explore elements of a plausible international unit accounting system.

Table 1: Unit accounting issues in systems with or without common allowance

	System based on common allowance unit	System with no common allowance unit
Pros	<ul style="list-style-type: none"> • Clear definition of commitments, process for demonstrating progress for participating Annex I countries. • Existing UN institutions and processes would form a solid basis for development of mechanisms, including tracking of units used by countries to help them meet mitigation pledges. • Enables comparisons between participating countries, including offsets and allowance units from domestic schemes, supporting the environmental integrity of different units and the whole system. • Allowance units from domestic or regional trading schemes could be backed up by international allowance units, as the EU ETS has been until 1 January 2012. This could simplify integration of new unit types and links to national policy mechanisms. • Allowance system suited to a small number of centrally-organised offset mechanisms, such as used under the KP, providing good assurance of environmental integrity. 	<ul style="list-style-type: none"> • Allows countries increased flexibility to develop baselines and objectives that fit with national development goals both for Annex I and non-Annex I countries, and the risk of banking excess allowance units into a future period is avoided in a system without allowance units. • The flexibility of a pledge-based system means that countries can develop policy tools involving emissions units – such as domestic trading schemes – to achieve pledges that suit each country’s situation. To benefit from international trading of these units by linking schemes, some level of international transparency and comparison would be required. • While the existence of various unit types and offset mechanisms may put an additional burden on investors and developers, it would generate additional investment opportunities in areas which the existing systems do not cover. The flexibility to develop country-specific mechanisms could increase innovation in mitigation projects and learning between different systems, without constraint of UN-regulated procedures.
Cons	<ul style="list-style-type: none"> • Allowance-based system limits flexibility for country-specific requirements and so some countries may be disinclined to participate; alternative procedures would still be needed to account for commitments made by non-participating countries. • Joining an allowance system may prove to be a barrier preventing developing countries from taking increased mitigation responsibility. Currently, the Kyoto Protocol does not account for aggregated actions in developing countries. • Countries not participating in the allowance system may introduce new country-organised bilateral mechanisms which could be difficult to integrate without substantial redesign of tracking system. 	<ul style="list-style-type: none"> • Without some degree of harmonisation and a transparent system for tracking units, international comparison of commitments or demonstration of progress could be difficult, including the 2013-15 review of action stipulated by the Cancún Agreements. In the absence of a common allowance unit, accounting rules for defining pledges and demonstrating achievement towards them may become increasingly important to avoid a reduction in transparency and a risk of lowered environmental integrity. • The effectiveness of offsets in a pledge-and-review system will depend on the level of harmonisation of offset standards and the ability to effectively track transactions.

1. Introduction

The purpose of this paper is to explore systems for tracking emissions units in a post-2012 international climate change policy framework, focusing on technical issues and how political decisions may have bearing upon them. The paper focuses on the quantification and accounting of transferable or tradable GHG units, rather than the measurement and reporting of emissions themselves. It presents scenarios to explore what systems might be put in place or modified for GHG unit accounting under possible future international climate frameworks. It considers options for a system similar to the Kyoto Protocol and for a more decentralised system, as well as elements that combine both models. The analysis covers accounting of units outside the Kyoto framework and the potential role of voluntary carbon market offsets, new market mechanisms, forestry and other accounting rules. It also considers the implications of these scenarios for international emissions trading.

Up until 2012, the international infrastructure for emissions accounting is relatively straightforward: Annex I Parties with Kyoto Protocol commitments (Annex B countries) are required to translate limitation or reduction commitments into an absolute quantity of allowed annual emissions, whereas other Parties are not. After 2012, a wider range of countries have pledged national or sectoral emissions goals under the Copenhagen Accord and the decisions adopted at COP 16 in Cancún.

Faced with uncertainty over the form of the future international framework, some countries are already proposing new types of GHG unit to use as offset mechanisms. Others are proposing domestic climate change policies such as cap-and-trade systems, which may also introduce new unit types. This increase in types of tradable emissions units as domestic emissions trading and offsetting schemes are established may complicate international GHG accounting, particularly if the accounting standards for these units diverge from standardised UNFCCC approaches.

Greenhouse gas accounting is inherently complicated because of the need to monitor, report on and even trade rights to an intangible invisible substance which in most cases has no intrinsic value other than that imposed by policy choices. Transparency and accountability of GHG units is one aspect of ensuring that global mitigation goals are quantified and achieved. Others include clarity on the interpretation of national emissions abatement pledges, procedures for accounting rules for setting baselines and goals, as well as economic projections for intensity metrics. These all add important elements of uncertainty but are not the focus of this paper.

GHG unit accounting is nevertheless important to the UNFCCC negotiation process because accurate accounting of unit flows is critical for tracking progress towards quantitative emissions pledges in a transparent and commensurate manner. Other key issues include how projects originating in the Kyoto flexible mechanisms are accounted for after 2012, and what role the UNFCCC may have in developing rules for, or administering, the GHG unit accounting system.

Clarity in how these issues will be managed is important to ensure that any future agreement on international mitigation has environmental credibility, and that the aggregate emissions pledges are sufficient to also achieve the international goal of maintaining global temperature rise to within 2°C. It is also important for minimising the cost of emissions reductions, by choosing arrangements that support international trading.

This paper is structured as follows. Section 2 reviews current international emissions accounting rules and describes existing GHG unit types. Section 3 outlines the range of possible scenarios for GHG accounting post-2012, and looks at two particular scenarios in more detail. Section 4 then considers how tradable offset units might develop and implications of this on the international GHG accounting framework. Section 5 returns to the two post-2012 scenarios proposed to examine how GHG unit transactions and flows might operate. Section 6 looks at how elements of these two scenarios might be combined into a 'middle ground' option, including aspects of international governance. Section 7 draws conclusions.

2. The existing international emissions accounting and units framework

2.1 Reporting on emissions and tradable units

Up until 2012, there have been three main channels through which countries have reported to the international community on the accounting of GHG emissions and the tradable units created to account for emissions and reductions:

- National communications (NCs) under the UNFCCC: all countries have a responsibility to prepare NCs, with more stringent requirements for developed countries included in Annex I to the Convention;
- Annual GHG inventories and national inventory reports (NIRs) detailing GHG emissions (for Annex I countries only);
- Kyoto Protocol (KP) annual reporting of supplementary information: countries included in Annex B to the Protocol report annually on the use of units created by the Protocol and its flexibility mechanisms, to demonstrate their progress towards compliance with emissions limitation or reduction commitments adopted under the Protocol.

To date, NCs and NIRs focus on reporting emissions sources and do not include information on the holding and transfer of tradable units. The decisions taken at COP 16 in Cancún request all Parties to submit biennial updates of NCs. The form of these reports is not yet clear, though developed countries are expected to include information on unit transfers, and possible formats have been proposed (Ellis *et al*, 2011). Up to 2012, the only international reporting of tradable GHG units is through Annex B Parties reporting on progress towards their Kyoto Protocol commitments, as described in the annex to this paper.

This section introduces the key GHG unit types already in existence and then focuses on the international systems developed to account for and allow transfer of Kyoto Protocol GHG units.

2.2 Existing variety in GHG units pre-2012

The international framework already comprises various types of GHG accounting units. These can be divided into those that can be used for compliance purposes under the Kyoto Protocol, and those outside of the Kyoto framework. Units can be further distinguished into allowances (permits) for cap-and-trade schemes and offsets (credits). Finally, non-Kyoto units can be divided into units specific to regional or national trading schemes, and those that operate internationally.

Table 2 gives examples of some of the more important unit types currently in use. This table is not exhaustive.

Table 2: Examples of existing unit types pre-2012

	Allowances		Credits	
Kyoto (International)	AAU, Assigned Amount Unit	International allowance unit for Kyoto compliance and international emissions trading	CER, Certified Emissions Reduction³	Offset unit for Kyoto compliance, generated through Clean Development Mechanism projects in non-Annex I countries
			ERU, Emissions Reduction Unit	Offset unit for Kyoto compliance, generated through Joint Implementation projects in Kyoto Annex B countries
Non-Kyoto Regional/National	EUA, European Union Allowance⁴	Allowance unit for European Emissions Trading System	CRT, Climate Registry Tonne	US offset unit developed under Climate Action Registry standards
	NZU, New Zealand Unit⁵	Allowance unit for New Zealand Emissions Trading System	CFI, Carbon Financial Instrument	Offsets used specifically for the Chicago Climate Exchange voluntary cap-and-trade scheme, disbanded in 2010
	RGGI Allowances	Allowances for the mandatory power sector trading system in US north-eastern states (Regional Greenhouse Gas Initiative)	RGGI Offsets	Offset for use in RGGI scheme, usually generated from projects in RGGI states (international offsets permitted only if allowance price passes certain threshold)
Non-Kyoto International	None	No fully international allowance system exists outside of the Kyoto Protocol	VCU, Voluntary Carbon Unit	Offset generated using Voluntary Carbon Standard methodologies (from offset projects in NAI countries) and issued into private sector registries
			Gold Standard VER	Offset generated from projects using Gold Standard methodologies and issued into Gold Standard specific registry

³ Variants of CERs known as long-term and temporary CERs (lCER and tCER) are issued for afforestation/reforestation CDM projects (see annex for details)

⁴ Although regional units, EUAs are currently converted directly from AAUs so are very closely linked to the Kyoto system (though this will change from 1 Jan 2012, see annex for details).

⁵ NZUs can also be converted to AAUs for export, so are linked to the AAU system.

‘Compliance’ versus ‘voluntary’ units

GHG units can also be categorised as either ‘compliance’ or ‘voluntary’ units, depending on whether they can be used to meet a legally-binding obligation. Kyoto units are compliance units because they can be used by countries to meet obligations under the Kyoto Protocol. Some allowance units from regional trading systems are also compliance units, because they can be used to meet legal obligations placed on capped entities by national or regional governments.

In countries with Kyoto Protocol obligations, domestic or regional trading systems are usually used as tools to meet national Kyoto commitments. Units traded within the domestic system do not affect the country’s national Kyoto compliance position because they are embedded into national Kyoto Protocol GHG accounting. The EU ETS is an example of this; it also permits the use of Kyoto Protocol offset units (CERs and ERUs) as compliance instruments within the scheme. CERs and ERUs used in this way are in turn retired by national governments as part of the Kyoto compliance procedure (see annex for details).

Some unit types are at present purely ‘voluntary’ because they cannot currently be used for compliance in any legally-binding GHG limitation scheme. There are a large number of such standards operating, most of which issue unique unit types. All have different project certification procedures and issuance procedures which have been reviewed elsewhere (Kollmuss *et al*, 2010; IETA, 2010a). The two largest international standards are the Voluntary Carbon Standard (VCS) and the Gold Standard (GS). The GS can also be used in conjunction with the CDM to generate GS-CERs, but in effect this is a CER with a small price premium and need not be considered as an independent unit.

In terms of voluntary offsets aimed for use in specific countries, the main examples are in North America. Until 2010, the Chicago Climate Exchange operated an offset system for its members, based on the CFI unit (Carbon Financial Instrument). The Climate Action Reserve (CAR) now operates a national voluntary offset system based on units called Climate Reserve Tonnes (CRT). CAR works alongside the California Registry, and now the national Climate Registry, which provide protocols for GHG reporting and databases for comparing performance data.

The notion of ‘compliance’ is dependent on what is eligible for compliance in a particular jurisdiction at a particular time. A unit that is ‘compliance grade’ in one system may be used as a voluntary credit to meet a company’s self-imposed abatement goals in another jurisdiction. Over time, national or regional legally-binding schemes may unilaterally change the rules of which units they accept for compliance; an example is the recent EU decision to no longer accept certain types of CERs (EC, 2011). The distinction between voluntary and compliance units is therefore complex and temporally dynamic.

For international GHG accounting up to 2012, the Kyoto Protocol only allows Kyoto units to be used for international compliance. Voluntary offsets do not currently have a significant effect on Kyoto accounting; nuances of this are discussed in Box 1.

Box 1: Impacts of voluntary offset retirement on international GHG accounting

With some exceptions, voluntary retirement of offsets to date can be split into three categories:

1. Voluntary offsets created and consumed within the same annex B country will normally have no impact on international GHG accounting. This is because the units are being transferred from one entity to another within the national inventory. Complications may occur where the offset is allowed for an emissions source or gas that is not covered under Kyoto. In this case, a real emissions reduction is made that is ‘invisible’ to the Kyoto inventory, because it is out of scope. The purchasing entity will not make an equivalent reduction of its contribution to Kyoto gases, because it has purchased the offset. Since voluntary offsets cannot be counted towards the accounting units that a country uses to comply under Kyoto, this situation should not compromise international GHG accounting. Its effect would be to make the country’s compliance policy less effective, and make the challenge for that country to meet its Kyoto target more difficult.

2. Voluntary retirement of offsets created outside an annex B country but consumed within one will also not affect Kyoto accounting. If the offsets are VERs they cannot be used in place of AAUs to aid a Party’s compliance under Kyoto. The effect may be, however, to weaken the Annex B country’s prospects of achieving its Kyoto target, because if entities are content to purchase offsets to account for their in-house emissions for reputational or other reasons, they may be less inclined to respond to Government incentives put in place to reduce domestic emissions in order to achieve the Kyoto target.

A subset of this type of offset occurs where an entity in an Annex B country decides to buy Kyoto compliant offsets such as CERs to meet its own voluntary corporate offset requirement (outside of any Kyoto-linked scheme such as the EU ETS). In this case, the CERs are NOT transferred to the national holding account of the country so they are NOT used for Kyoto compliance. To date this has been a small market (Ecosystem Marketplace, 2010). In future, this could in theory increase competition and therefore price of CERs, which could in turn make meeting national commitments more expensive as a whole. The increased cost of offsets would tend towards more domestic abatement in Annex I countries and fewer offsets used for national commitments. This could make achieving national goals more expensive, exacerbated by the tendency to inaction of a company that has voluntarily purchased offsets. A similar competition effect may occur if non-Annex I countries were to purchase CERs to meet their own mitigation pledges.

3. Voluntary offsets generated and consumed outside of Annex B countries clearly do not affect the Kyoto accounting system as it currently stands. However, were some non-Annex B countries to be brought into or linked to a UNFCCC allowance system in due course, there would be implications of such offsets on international unit accounting.

2.3 Kyoto Protocol units accounting system

The Kyoto Protocol introduced quantified emissions units for Annex I Parties for two main reasons: (i) to ensure accurate tracking of emissions levels and therefore a clear means to demonstrate compliance with commitments and (ii) to allow countries to meet mitigation targets more cost-effectively through trading of units. To this end the Protocol introduced three flexibility mechanisms⁶. Without this units-based system, compliance with national mitigation targets could have been demonstrated through *ex-post* publication of National Inventory Reports⁷. Trading of units is therefore an integral part of the Kyoto system, including AAUs and the project-based credits (CERs and ERUs). The decisions adopted at Cancún contain references to a potential second commitment period of the Kyoto Protocol as well as to new market mechanisms. Any future international emissions limitation mechanism is therefore likely to maintain these provisions for trading and will require quantifiable, verifiable, traceable emissions units.

This section gives a brief overview of the processes in place to handle Kyoto Protocol units; further details of the system are described in the annex.

⁶ The three mechanisms are International Emissions Trading (IET), the Clean Development Mechanism (CDM) and Joint Implementation (JI), all described in the annex.

⁷ A unit system sets up the system needed for compliance *ex-ante*, by issuing a fixed pool of allowance units or permits in advance, whereas an inventory approach can only measure compliance *ex-post*.

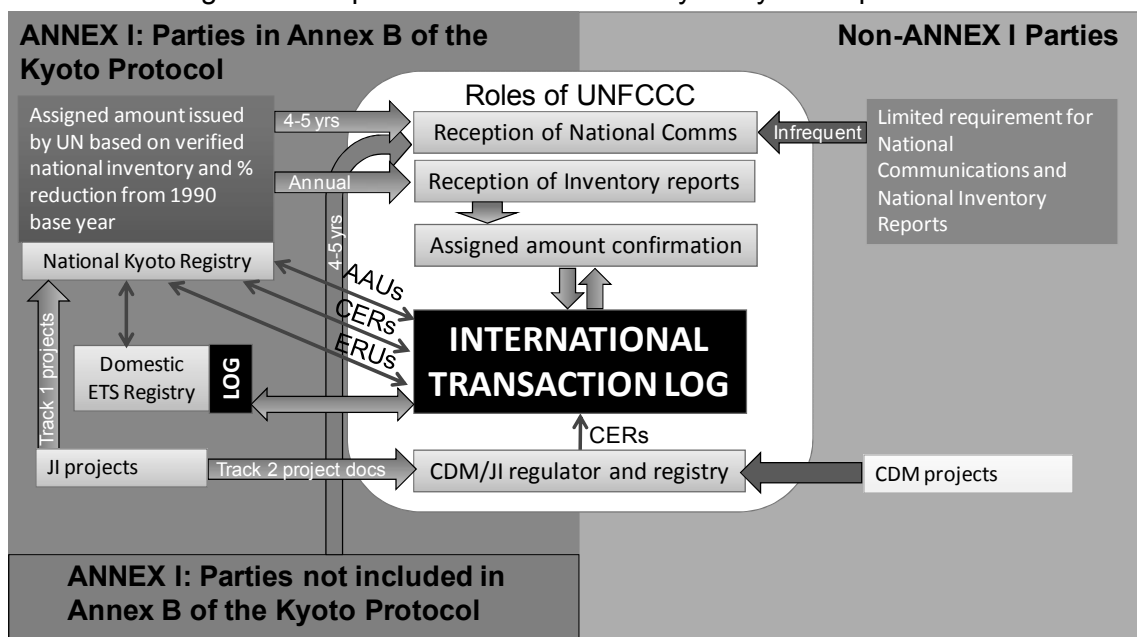
2.3.1 Institutions and structure

Figure 2 outlines the current Kyoto unit exchange system. At the heart of the system is the International Transaction Log (ITL), a database that both pre-approves and logs all transactions of Kyoto-compliant units. This includes initial issuance (creation) and trading of AAUs, issuance and trading of CERs, conversion and trading of ERUs and retirement of all unit types for compliance.

Units themselves are held in National Kyoto Registries, databases hosted by each Annex B Kyoto Party but conforming to standard specifications. These registries are linked to one another via the ITL. Non-Annex I Parties do not have Kyoto registries. The UNFCCC hosts the CDM Registry, also linked to the ITL, into which CERs are issued on behalf of successful CDM projects in non-Annex I countries. JI projects are different in that ERUs are converted from AAUs in the host country. JI projects can either be track 1, whereby the host country itself approves the project and converts AAUs to ERUs, or track 2, where the UN approves each project and authorises conversion to ERUs.

The system is designed to be able to interact with sub-national unit registry systems for domestic emissions trading schemes. The only active example of this is the EU's Community Independent Transaction Log (CITL), which serves to link the EU ETS to the Kyoto system (this is shown in figure 1 as a 'Domestic ETS Registry'). Currently, each European Allowance (EUA) has been converted from an AAU, so in fact both the CITL and ITL track all EUA movements. The EU Registry system is set to change substantially from 1 January 2012 and EUAs will no longer be directly coupled to AAUs; this is in part to facilitate the inclusion in the EU ETS of international aviation emissions which are not covered by the Kyoto Protocol. This is described in detail in the annex to this paper. Box 2 below also provides more information on registries and transaction logs.

Figure 2: Simplified schematic of the Kyoto system up to 2012



Notes:

Source: Authors

1. Broad arrows represent information flows, thin arrows represent unit flows.
2. Annex I Parties not in Annex B to the Kyoto Protocol do not receive AAUs and do not have a registry connected to the ITL. Malta (Annex I, not Annex B) and Cyprus (neither Annex I nor B) are nevertheless in the EU ETS, and a clearing system is required to ensure that EUAs remain backed up by AAUs.
3. In specific cases a Kyoto base year other than 1990 is used for certain Parties and for certain gases.
4. Transactions of non-Kyoto units (eg VERs) are not tracked by the ITL and are not shown for simplicity.

Box 2: What's in a name? Registries and transaction logs

The Oxford English Dictionary defines a registry as *a place where registers or records are kept; an official list or register*. Under the UNFCCC, there are two main uses of the term registry: existing GHG unit registries and the forthcoming registry for listing Nationally Appropriate Mitigation Actions (NAMAs).

Unit registries: Under the Kyoto Protocol, the term registry usually refers to a database used to list quantities of GHG units held by governments or entities. Each registry contains distinct accounts to hold quantities of units, similar to bank accounts. One entity can hold multiple accounts in the same registry. National registries are hosted by Annex I governments, whilst the CDM registry is hosted by the UNFCCC.

Under regional emissions trading schemes such as the EU ETS, unit registries serve a similar purpose for listing GHG units belonging to different entities. Currently EU ETS units are held in dedicated accounts within national Kyoto registries, but after 2011 the ETS registries will exist separately. Voluntary offset systems also operate registry systems with a similar account-based structure. These are usually hosted by independent registry companies.

NAMA registry: The COP 16 decisions outline a registry for NAMAs. As currently described, this would be very different to the existing Kyoto unit registries. It would not hold GHG units, but would act as a service to facilitate matching funding with recipients. The COP 16 decision invites Parties to submit information and the UNFCCC Secretariat to regularly update the registry, but modalities and procedures have not yet been defined.

The international transaction log (ITL) is an electronic system administered by the UNFCCC and hosted by independent contractors. The ITL acts as an electronic gateway for all transactions under the Kyoto system, first approving and then recording details of each transaction between registries. The Community Independent Transaction Log (CITL), which will become the EU Transaction Log (EUTL) in 2012, serves a similar function for the EU ETS.

2.3.2 Allocation of AAUs

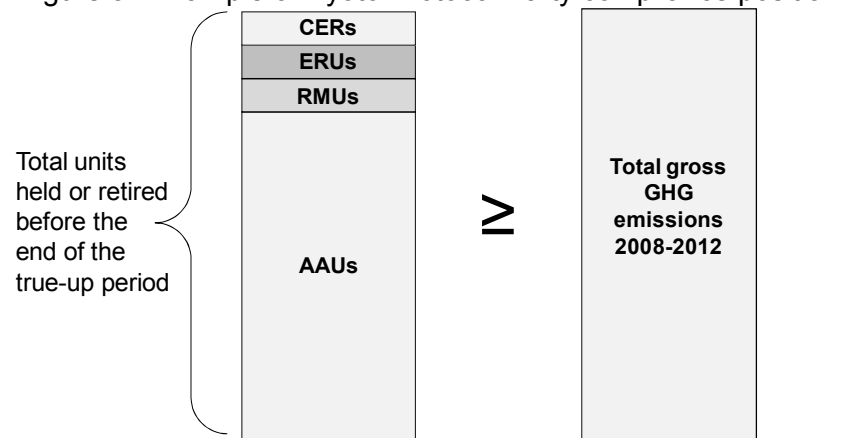
National allocation of AAUs for Annex B Parties is based on the National Inventory Reports for the specified base year. Countries multiply base year emissions by their reduction target in order to set a fixed quantity of AAUs for the Commitment Period, which are then issued into the national registry accounts. This transaction is logged by the ITL, which acts to both record and approve the transaction. This is a simplification of the reality, which also involves issuance of Removal Units (RMUs) for land-use based sequestration of emissions according to complex accounting rules. RMUs exist to account for forestry and land-use activities that sequester emissions in Annex B countries and therefore act to lower net national GHG emissions; see annex for details.

2.3.3 Trading of AAUs and credits

Transactions for units pertaining to each of the flexibility mechanisms can only occur if they are logged and approved by the ITL. If countries wish to exchange AAUs or ERUs from JI projects (which are effectively equivalent to AAUs), the relevant national registries will initiate the transaction but it cannot be completed until the ITL verifies the transaction and allows it to proceed. The same is true for transactions of CERs either between Parties or from the CDM Registry to a Party's registry. In this way the ITL is a safeguard against fraudulent exchange of official Kyoto units.

2.3.4 Compliance

Annex B Parties submit annual standard reporting forms (known as Standardised Electronic Format tables, SEF) which depict their holdings of all Kyoto unit types as well as transactions occurring during the year. In theory this could be at least partially validated using the transaction logs of the ITL. At the end of the true up period after the commitment period, Parties submit and retire a quantity of units equal to the total of their verified emissions for the years of the commitment period, by transferring units to retirement accounts. This can also be done during the commitment period, and of course each movement is approved and logged by the ITL. Figure 3 shows an example of how units may be submitted for the entire commitment period.

Figure 3 : Example of Kyoto Protocol Party compliance position⁸

2.4 Strengths and weaknesses of the Kyoto framework

In summary, the Kyoto Protocol framework described above provides a number of attributes for GHG unit accounting:

- A means for countries to demonstrate progress against mitigation commitments;
- A transparent way to translate an overall environmental objective into country commitments;
- Common accounting rules for calculating and comparing commitments and for using flexible market mechanisms;
- A standard accounting unit allowing countries to trade over- or under-achievement of pledges directly, through international emissions trading;
- Equivalence of offset units through the existing flexibility mechanisms.

However, the existing framework is rigid in the way that it defines commitments by Annex B Parties and this has prompted a number of countries to look for more flexible ways of approaching commitments in future periods. Furthermore, the flexibility mechanisms are tightly defined and require specific procedures that have contributed to their limited effectiveness at addressing mitigation in sectors such as transport and household emissions (Ellis and Kamel, 2007).

The following sections consider how a revised Kyoto system may compare to other frameworks to deliver these positive attributes for unit accounting, whilst also seeking to provide greater flexibility for achieving country objectives.

3. Scenarios for a post-2012 accounting framework

Irrespective of whether the Kyoto Protocol enters a second commitment period, the post-2012 framework is likely to be more complex than the existing system due to two key factors. Firstly, the introduction of national mitigation goals and pledges from some non-Annex I countries may complicate the international accounting of GHG units. Secondly, there is likely to be an increase of GHG unit types being created and traded internationally. In addition, some existing domestic and regional emissions policy tools have already begun to stretch the boundaries of the Kyoto accounting system; for example, the EU ETS will include international aviation emissions from 2012, which are not accounted for under Kyoto.

⁸ This is a simplification and does not address complexity in the calculation of land-use emissions

This section puts forward an illustrative framework for grouping countries based on pledge type. It goes on to suggest a range of scenarios for the basic structure of international GHG accounting after 2012 and presents two options in more detail. The two scenarios have two fundamental differences: firstly, whether or not Annex I countries agree to continue to participate in a compliance regime based on international tradable emissions allowance units; secondly, whether or not the UNFCCC continues to manage a centralised tracking and approval gateway for exchange of GHG units. These two models represent scenarios of centralised and decentralised options for managing GHG units after 2012. The final outcome may be a ‘middle ground’ situation that involves elements of both models, and possibilities for this are discussed in section 6.

3.1 Three groups of country mitigation pledges or commitments

Many countries put forward inscriptions to the Copenhagen Accord containing mitigation goals or pledged actions, which were formalised after COP16 in Cancún in UNFCCC ‘INF’ documents (UNFCCC 2011a, UNFCCC 2011b). Most Annex I Parties put forward quantified economy-wide absolute emission reduction targets. Goals put forward by non-Annex I Parties are very diverse in nature. Some countries have stated goals to reduce emissions intensity over all or part of the economy (e.g. China, India). Other countries have listed goals to limit emissions to a quantified deviation from expected business-as-usual emissions growth (e.g. Brazil, Indonesia). Many countries have stated discrete voluntary actions that may or may not have a direct effect on emissions abatement. Costa Rica and the Maldives have put forward a goal to become ‘carbon neutral’ by a certain date. A number of analyses have looked at the implications of pledges made by non-Annex I countries (Dellink *et al*, 2010; Project Catalyst, 2010; Casella *et al*, 2010).

This paper therefore considers three different groups of countries based on their national mitigation commitments, goals or pledged actions. This is not intended to replace the current Annex I / non Annex I distinction, but is proposed for illustrative purposes to aid analysis.

- Annex I countries: absolute economy-wide reduction or limitation targets, which may or may not be translated into quantified amounts for allocation of international allowance units;
- ‘Group A’ Non-Annex I: Parties with quantified mitigation goals, either economy-wide or for stated sectors: could be calculated as a goal for reduction in intensity relative to a base-year, as deviation from a pre-established business-as-usual trajectory or as an intention to become ‘carbon neutral’;
- ‘Group B’ Non-Annex I: Parties with discrete pledged actions: could involve actions with direct measureable GHG impacts (either autonomous or through international finance, or directly financed through carbon credits) or more general policy changes with environmental benefits including emissions.

In the scenarios put forward in this paper, procedures for measurement, reporting and verification (MRV) of emissions, both domestically and internationally, follow the framework laid out in the decision adopted at COP 16 in Cancún. Annex I Parties currently deliver regular national communications and annual national inventory reports, and this system is assumed to continue. In addition, the COP 16 decisions stipulate that all Parties should prepare biennial reports, that international assessment and review (IAR) will be conducted of emissions and removals related to emission reduction targets for developed countries, and that international consultations and analysis (ICA) will be conducted of biennial reports from developing countries.

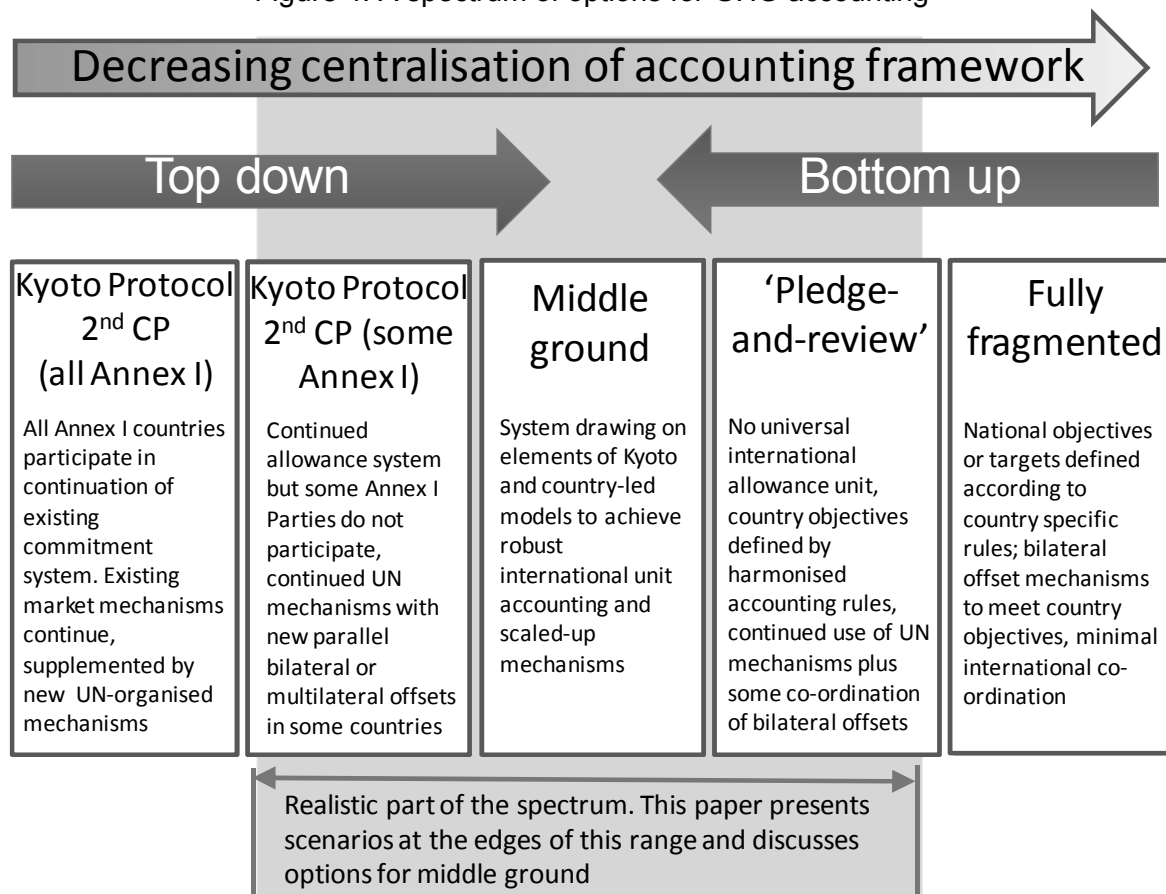
3.2 The range of possibilities for unit accounting post-2012

Under this model of three country groups, the requirements for international accounting of GHG units can be broken down into a number of building blocks as follows:

- The system used for monitoring and demonstrating achievement of Annex I commitments;
- The system used to track international movement of GHG units used for meeting commitments;
- The flexibility mechanisms used to generate GHG credits internationally;
- The accounting system used for non-Annex I countries in ‘group A’.

From these building blocks, a range of models for GHG unit accounting are possible, ranging from highly centralised top-down models, to country-led, fully bottom-up approaches (Figure 4). Given the current state of UNFCCC negotiations the options at either extreme of the spectrum are not considered to be likely outcomes. Two scenarios for a post-2012 unit accounting framework are therefore explored, at the edges of what is likely to be the feasible range of the spectrum. One scenario is a continuation of the Kyoto Protocol for some Annex I countries, with international allowance units and continuation of the ITL; this is described in section 3.2.1. The second scenario has no common allowance units for Annex I countries and achievement of objectives is demonstrated in a ‘pledge and review’ system, described in section 3.2.2. The details of how GHG unit flows would occur are considered in Section 5 of the paper. An initial exploration of options for accounting in the middle ground between these scenarios is presented in Section 6.

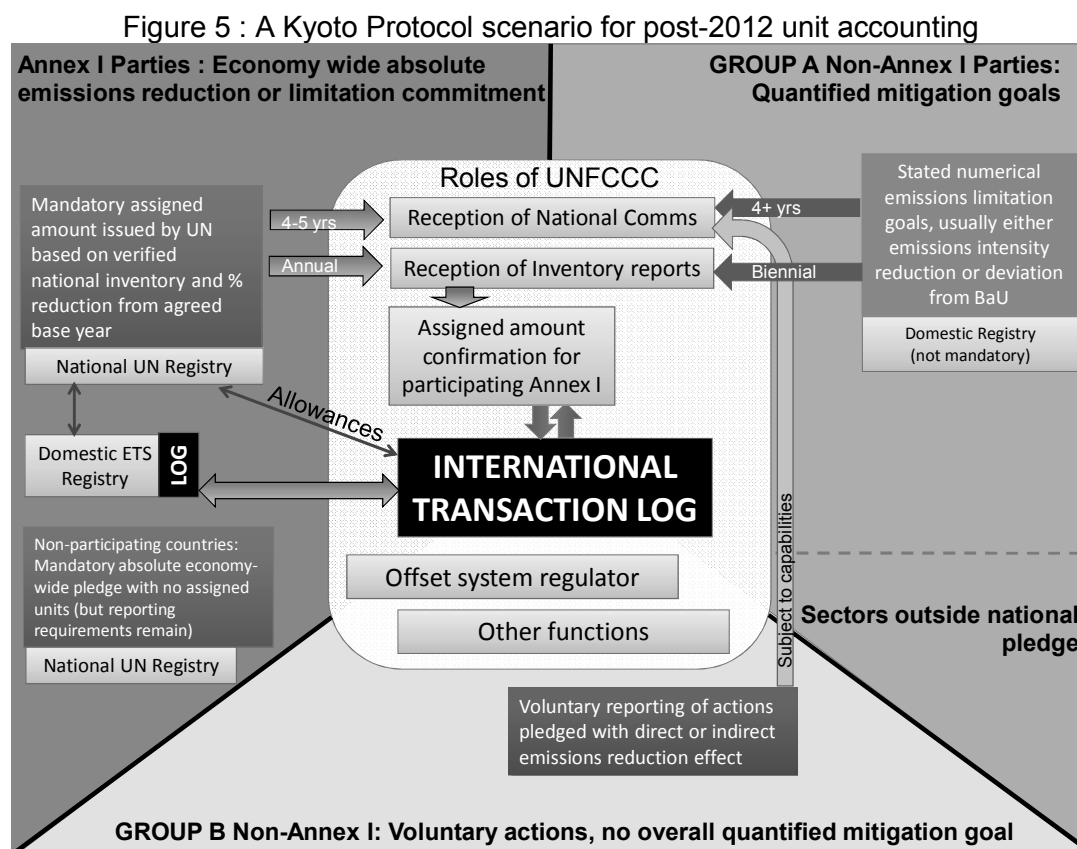
Figure 4: A spectrum of options for GHG accounting



3.2.1 An allowance-based world – Kyoto Protocol for some Annex I

This model assumes a continuation of the Kyoto Protocol into a new commitment period, but with some Annex I Parties choosing to not participate in the allowance system. These countries would nevertheless remain in Annex I, and options for how they might connect to the unit system are discussed in section 5.

Figure 5 shows the main structural elements of this scenario; a more detailed discussion of this accounting framework, including the types of units and their movements units is included in section 5 (the only unit movement shown in figure 5 is that of allowance units, as they are central to the model).



Source: Authors

Under this scenario, Annex I countries would continue to provide national communications and national inventory reports under the UNFCCC, as well as biennial reports as described in the COP 16 decisions. In addition, Annex I countries participating in the Kyoto system would be required to submit annual reports on their holdings and transactions of GHG units, similar to the existing Kyoto Protocol reporting requirements (see annex). Annex I countries not participating in the allowance system would have responsibility for demonstrating progress towards meeting their national objective through their inventory reporting, with supplementary information on holdings and net transfers of units. Developing countries would continue to provide NCs and, according to capabilities, biennial reports including information on progress on implementation of stated mitigation goals.

The ITL would remain under control of the UNFCCC. Annex I Parties would maintain registries to UN specifications, connected to the ITL. Annex I countries participating in the allowance system would continue to issue allowances into their registry based on an assigned amount calculated from a reduction relative to a base year. The assigned amount would be reviewed by international reviewers. Allowances could then be traded between registries (via the ITL), and sub-national mechanisms can be introduced and could potentially be backed-up by international allowances.

Developing countries in 'group A' would submit any national goal according to their preferred calculation method. They would present inventory and unit information to the UNFCCC at an appropriate level of detail, and this would form the basis for demonstrating progress towards

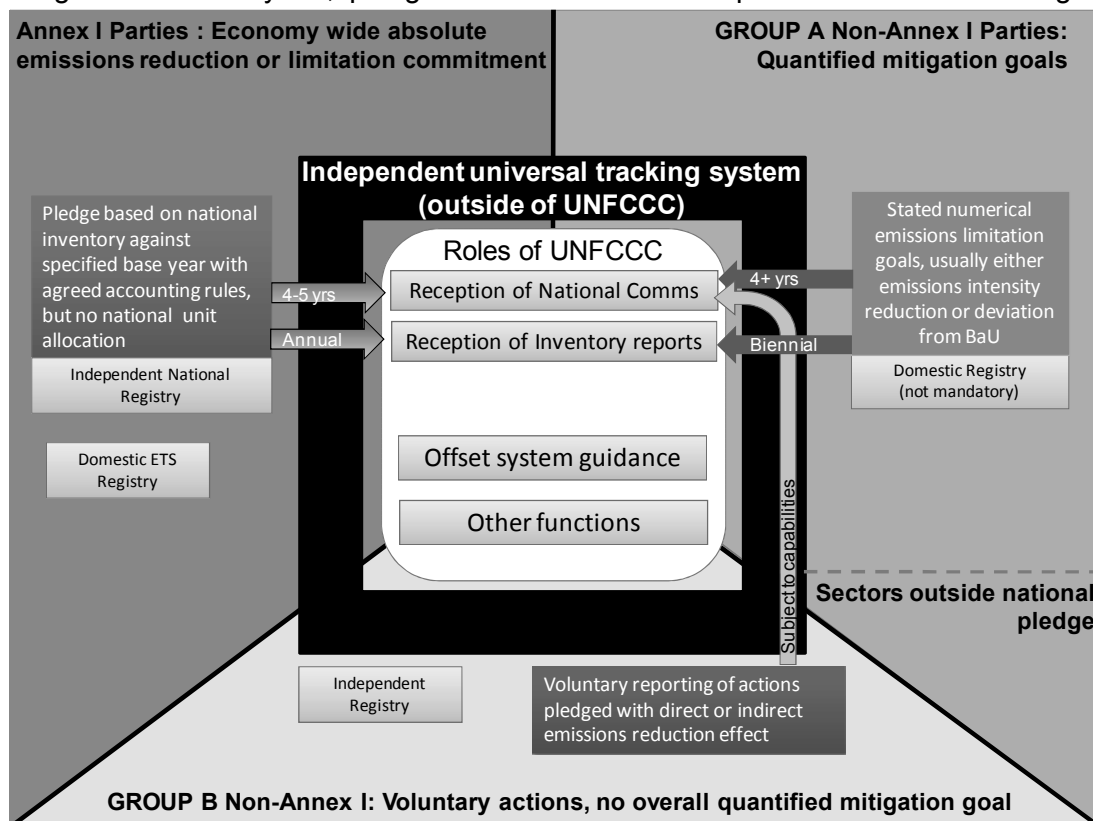
implementation of mitigation goals. In some cases, distinct sectors will be excluded from the international mitigation goal⁹, and these are depicted as a triangle in this diagram.

Under this scenario, UNFCCC institutions would continue to act as the main regulator and issuer of offset credits, under CDM and new mechanisms, as well as being the central point of reference for other national creditable actions, for example under a Reduced Emissions from Deforestation and Degradation (REDD) or REDD+¹⁰ programme. However, some countries may nevertheless initiate bilateral offset agreements in addition to the UNFCCC, and options for how this could be integrated are discussed further in section 5.

3.2.2 A country-led world: 'pledge and review'

This model involves no common allowance units for Annex I countries. Although some countries may continue to operate regional trading schemes with allowance units, these would not be common to all Annex I Parties. The basic structure of such a system is shown in figure 6; the model contains elements of commonality between Parties and so is not the fully fragmented scenario at the far right of figure 4. Section 5 describes the system in more detail, including the types of units and their flows.

Figure 6: A country-led, 'pledge-and-review' model for post-2012 unit accounting



Under this scenario, commitments from Annex I countries would be based on pledges inscribed under UNFCCC, and Annex I Parties would be requested to demonstrate progress towards and achievement of their pledges through reporting of actions. Requirements for Annex I and non-Annex I Party reporting to the UNFCCC would also remain broadly as described in the Cancún decisions, although extra provision for reporting of unit movements would be required (Ellis *et al.*, 2011).

⁹ For example, India's mitigation goals inscribed under the Copenhagen Accord specifically exclude emissions from agriculture from the overall intensity reduction goal

¹⁰ REDD+ projects also involve measures for conservation, sustainable management of forests and enhancement of forest carbon stocks. REDD(+) is used in this paper as shorthand for "REDD or REDD+"

Without common allowance units, UNFCCC institutions would take a less central role in administering GHG units. Under this scenario the ITL would cease to operate and the UNFCCC is no longer responsible for the recording and overall control of GHG units. However, a GHG unit offset and trading system can only reliably operate if all unit transfers are traceable in some capacity. Therefore an independent tracking system might be necessary; this is depicted as the black frame, outside of the UNFCCC. This would be a means of recording transaction details, but is not a registry where units would be held; nor is it a gateway for approval of all transactions in the way that the ITL currently operates. Elements of how this could function are discussed in section 5.

4. Accounting for tradable offset and credit units after 2012

Under both scenarios put forward above, it is likely that crediting mechanisms – existing or new – will continue to provide a cost effective means for Annex I countries to supplement domestic mitigation with purchase of international units, as well as providing developing countries with a revenue source and access to low emission technology. International credit or offset units could provide a link between countries with the different types of pledge described above, even in the absence of a common international allowance unit. This section explores what form these mechanisms might take and what international units they might generate.

4.1 Evidence for increasing divergence of credit types

The existing international climate change policy framework contains examples of bilateral or unilateral domestic credit types already in operation, in pending legislation or at the planning stage. Some of these are presented here as examples of how unit types might develop after 2012.

Bilateral units for offsets set up between specific countries

As there is still uncertainty around the post-2012 accounting framework for offsets, some countries have indicated that they may pursue bilaterally-agreed offset mechanisms to help in meeting national mitigation pledges. Such bilateral offset mechanisms would most likely operate in parallel with the Kyoto mechanisms. To date, Japan has been most explicit about their intentions to develop bilateral offset projects, with both the Ministry of Environment and Ministry of Economy, Trade and Industry actively pursuing feasibility studies for potential projects in a number of countries¹¹. The revised EU ETS Directive allows for the use of credits generated from projects or other emission reducing activities implemented through direct agreements concluded with third countries (Article 11(a)5 of Directive 2009/29/EC). However, depending on the extent of restrictions on certain categories of offsets in the third phase of the EU ETS and whether the EU agrees to move to a 30% reduction target, demand for such bilateral agreements from EU installations may be limited.

Establishing bilateral offset mechanisms could be motivated by *inter alia*: (i) the need to put in place alternative mechanisms in case existing mechanisms are discontinued (and associated first-mover advantages of doing so early); (ii) lower transaction costs of generating and trading offsets (as bilateral offset mechanisms would not necessarily follow the same processes as UNFCCC mechanisms); (iii) the possibility of developing offsets from sectors or project types currently not eligible under existing mechanisms, e.g. nuclear power and (iv) the need for increased supply of offset credits to meet ambitious mitigation commitments.

US sub-national offsets for regional cap and trade schemes

While US federal legislation on cap and trade is currently on hold, regional initiatives continue. The Regional Greenhouse Gas Initiative (RGGI) in the north-eastern states has been operating since 2009 and is currently the only functioning GHG trading scheme in the US. It allows for international offsets only once a ‘trigger price’ of \$10/ton has been reached; this has not yet occurred. The Western Climate Initiative (WCI) covers potential trading schemes in a number of US states and Canadian

¹¹ Japanese Ministry of Environment (MOEJ) feasibility studies can be found at <http://gec.jp/>

provinces. By far the largest is in California, where the Global Warming Solutions Act of 2006 (AB32) describes a cap and trade scheme. This overcame legislative challenges in 2011 and is due to start in 2012¹². Should it go ahead, this scheme would allow for using non-UNFCCC-certified international offsets to supplement US domestic offsets. Other sub-national or state-level policies that allow for offsets include the Oregon CO₂ law (with a possibility for international offsets) and the Alberta GHG Reduction Programme (with offsets from within the province only).

The AB32 in California has established protocols to allow for the use of offsets from REDD, and bilateral cooperation with states in other countries has been initiated for that purpose. It is also possible that new regional or federal emissions trading systems in the US could include greenhouse gases not included in the existing Kyoto basket of gases. This may include black carbon aerosols, and inclusion of such gases may complicate overall pledge accounting. The implications of offsets designed specifically for sub-national compliance schemes operating outside of an international units system are discussed in section 4.4.

EU Domestic offsets (under Art.24a of the EU ETS directive)

The EU ETS allows for putting in place a Community offset mechanism that may result in the generation of allowances for EU ETS compliance or credits for compliance under the Effort Sharing Decision (decision No 406/2009/EC). This has not yet become operational in the EU ETS as it requires development of harmonised EU-wide rules. Article 24a of the ETS Directive states that *measures for issuing allowances or credits in respect of projects administered by Member States that reduce greenhouse gas emissions not covered by the Community scheme may be adopted* (EU, 2009). If these units are developed and used in the same country, in order to maximise mitigation in the non-traded sectors, then they are unlikely to have any bearing on international unit accounting because both the offset provider and buyer fall under the same emissions inventory scope. However, if in a bottom-up world these domestic offsets are developed and are tradable between EU countries or with other schemes in non-European countries, then this could have an important effect on comparison and effectiveness of national pledges. In this case the monitoring of transactions outside of the UN becomes increasingly critical.

Unit types based on metrics other than GHG

There are an increasing number of policy mechanisms around the world that contribute to climate change mitigation but are not measured directly in terms of GHG reduction or avoidance. Some of these mechanisms create tradable units in other metrics, and it is possible that countries may in future want to link these to international GHG unit mechanisms. Examples of units currently under development that could fall into this category are the Perform Achieve and Trade (PAT) scheme in India, which will trade certificates in energy efficiency, and renewable energy obligation certificates in a number of countries. The Tokyo cap and trade scheme, in particular, allows renewable energy certificates to be used as offsets in a GHG trading scheme (Tokyo Municipal Government, 2010).

The key inter-related issues in each case will be conversion factors and environmental integrity. For conversion, an algorithm must be developed and, to allow the mechanism to link, be agreed internationally. In the case of renewable energy, CDM procedures for calculating the emissions factor for an electricity grid could be used and then updated dynamically. In Tokyo, a standard conversion factor for quantifying GHG reductions from renewable energy has been published (personal communication with Yuko Nishida, Tokyo Metropolitan Government; publication in Japanese only). For energy efficiency the case is more complex, because the efficiency certificates are likely to be fungible across all energy use types, with no link to any particular GHG emitting sources¹³ (contrary to renewable electricity, which is linked to conventional power generation). A decision would have to be made to use either the average GHG intensity of energy across the entire economy, or across the

¹² At the time of going to press, implementation was on hold due to a legal challenge

¹³ In the India case, efficiency certificates will be measured in metric tonnes-of-oil-equivalent (Mtoe), as a convenient measure of energy (approximately 42GJ), with no obvious conversion factor to carbon

industrial sectors covered by PAT. In either case, the decision would be rather arbitrary and may cause concern for the environmental integrity of any scheme that it may link to.

4.2 Offsets for meeting national commitments after 2012

Potential offset types to be used for meeting national commitments under the two scenarios described in section 3 vary according to their governance structure, the type of unit and the implication for GHG accounting in ‘group A’ developing countries. Some of these unit types already exist, such as the Kyoto Protocol project mechanisms. Others are new concepts without direct precedents, such as sectoral crediting mechanisms.

These offset credits could range from continued UN regulation of CDM credits as in the pre-2012 system, to decentralised options with countries bilaterally agreeing and regulating offset and crediting systems. For the former, the CDM could continue even in the absence of a Kyoto Protocol commitment period. Such a credit system operated by the UN has the advantage of building on experience gained with the flexible mechanisms to date, and maintaining an already-established and valued emissions ‘currency’. Pursuing an international standard such as CDM would help to avoid the build-up of a large dominance in the market by a standard pertaining to one particular country, and could help to stabilise GHG markets by smoothing the linking of domestic trading schemes.

CDM is predominantly a project-based mechanism with each project requiring individual approval by the UN-elected Executive Board¹⁴. Although important efficiency improvements have been made in this process, including introducing elements of standardisation, some practitioners suggest that significant and challenging reform is still required (IETA, 2010b). This regulatory structure may prevent expansion of CDM to become the major international credit mechanism after 2012. New market mechanisms with a regulatory structure more directed towards large-scale mitigation, with the possibility to include host country mitigation efforts through the use of ambitious crediting baselines, may become the prevalent credit mechanism after 2012. An example could be sector-wide crediting approaches in specific industry sectors, which could still function under UN authority (Baron *et al*, 2009).

A fully fragmented system would involve each country or region establishing its own system and rules for receiving credits or offsets from other countries. Each “demand centre” would need to find agreement on procedures and protocols with each “supply centre”. This multiplication of systems would likely raise transaction costs and limit economies of scale in the offset market. There may of course be a hybrid situation whereby the CDM continues to operate in certain sectors and countries, whilst other offset or credit standards develop alongside it.

Table 3 presents key features of these different credit types and compares the potential role of each type in both the Kyoto Protocol and pledge-and-review models.

¹⁴ Since 2007 CDM has also recognised Programmes of Activities (PoA) which is a departure from the project-by-project approach and can allow for a number of similar projects to be registered under a single framework. After a slow start, there are now 80 PoAs submitted to the UN, of which 13 were registered as of 1 March 2011 (UNEP/RISOE 2011)

Table 3: Offset and credit units in the two post-2012 models

OFFSET AND CREDIT UNITS	Characteristics of mechanism		Role in different post-2012 scenarios	
	Principal expected regulator	Challenges for implementation	Role in <u>Kyoto system for some Annex I post-2012</u>	Role in <u>pledge and review system post-2012</u>
Existing or modified UN-certified CDM and JI. Significant process reforms to allow for greater volumes and increased emphasis on programme of activities.	UN continues to regulate through elected panels (CDM EB and JISC). UNFCCC continues to operate CDM registry and issues credits.	Mechanisms are already operating with significant experience. Reforms would be required to increase overall volume of mitigation under CDM. JI can only continue in a system with common allowance units.	Likely to continue to provide source of offsets for Annex I, although CDM may not be pursued in some sectors in 'group A' countries, depending on pledge conditions	Could continue to provide international offsets as CDM institutions can continue to operate in absence of a KP CP, unless dismantled by COP decision.
UN-certified sector crediting system in some 'group A' Non-Annex I countries with ambitious baseline for credits.	UNFCCC could oversee implementation and regulate issuance of credits, delivered either directly to the host country Government or to participating entities.	Requires large investment to develop centralised processes. Unlikely to be operational at the start of 2013. Baseline setting and crediting procedures would be challenging due to political and technical issues.	Over time, may become major source of credits for Annex I and both a revenue source and means of showing mitigation contribution for certain sectors in 'group B' non-Annex I countries.	Could be developed if Parties request UN to develop and regulate a crediting system, even without an international allowance system.
Bilateral international sector crediting system in some 'group A' countries with ambitious baseline for credits.	Participating countries responsible for management and issuance. Unclear what level of international verification would be achievable.	Same challenges as for UN scheme, plus complications of how to ensure transparency of bilateral decision-making on level of ambition of sector crediting baseline for each sector.	Unlikely to play a role as preferred option under this scenario would be UN-managed scheme.	Could become key source of credits, subject to bilateral negotiation between countries on level of ambition and means of crediting.
Bilateral international or unilateral domestic credits. Could be established of new standards through bilateral agreement or agreement to accept another country's domestic offset.	Participating countries responsible for management and issuance. Unclear what level of international verification would be achievable.	May be challenging to maintain comparability of project and credit quality without central certification system. Challenge to develop unified transaction monitoring system to improve accountability.	Annex I countries not participating in Kyoto system would likely develop bilateral offsets; tracking these in parallel to Kyoto system would be important.	Likely to be key category of international units, with diverse standards in different countries; international tracking remains important.
Independent offset standards. Could be based on existing VER standards, countries agreeing to adopt certain project types as eligible offsets for national commitments (eg REDD).	Independent organisations could manage and issue credits; participating countries would ensure adequate verification.	Standards may have been implemented independently with advantage of being already operational. Challenge may be to ensure sufficient quality for meeting national targets.	Highly unlikely to play a role in international GHG accounting.	May be accepted by some countries as eligible to offsets for meeting national commitments.

4.3 Emissions accounting in developing countries

As described in section 3, a number of non-Annex I countries have stated mitigation goals in a variety of different ways. These pledges are understood to be put forward autonomously without intention for them to be quantified and compared internationally. Accounting rules do not currently exist for such comparison of non Annex I emissions, and no non-Annex I country has proposed its inclusion in a common allowance system after 2012. Furthermore, many such mitigation actions are defined as being dependent on provision of support and resources from developed countries.

This does not mean that a common allowance unit system is incompatible with developing country pledges, as described in the Kyoto Protocol model put forward above. However, the voluntary and non-binding nature of the non-Annex I pledges means that there is potential for misunderstanding and possible double counting of emissions reductions achieved through offset mechanisms hosted in those countries, if they are subsequently used to help meet developed country objectives.

4.3.1 Double counting of reductions from offset mechanisms

There are two ways that offset mechanisms could lead to double counting. The first is if a single emissions reduction action is credited by two or more different offset or other mechanisms. This can be avoided through ensuring rigorous standards for all mechanisms that could be used to help meet a national objective, and by employing an international tracking system for unit transactions. The second way is if an emissions reduction is counted towards the emissions pledges of both host and buyer countries. This latter issue is the focus of this section and has also been analysed in other recent studies (Levin *et al.*, 2010; Erickson and Lazarus, 2011).

Up until 2012, national accounting of GHG units is only mandatory for Annex I countries and this means that CDM projects can be assessed for the key criteria of baseline and additionality on a project-by-project basis, without need to reference the impact of the project on wider sectoral and national emissions in the developing country hosting the project. The emergence of emissions limitation pledges by some developing countries, and their subsequent formalisation at COP16, means that this project-by-project isolation may no longer be appropriate because of a risk of double counting of emissions reductions.

The possibility of double counting arises because of different interpretations of two main factors: (i) how non-Annex I emissions mitigation pledges are to be accounted for internationally and (ii) the conditionality of these pledges on international finance and other support. Communications delivered to the UNFCCC and published after COP16 reveal that most developing countries see these pledges as goals based on economic output that are dependent on financial and technological support from developed countries (UNFCCC, 2011). The eventual achievement of the goal is usually seen as non-binding internationally. Therefore, countries may see incoming financial flows for emissions reduction activities, such as those used to purchase CERs from CDM projects, as helping them to meet this goal regardless of the subsequent use of the emissions reductions credits pertaining to those projects to meet Annex I reduction targets. Annex I countries, however, may see non-Annex I commitments to be more similar in nature to their own future commitments, whether or not there is renewal of the Kyoto Protocol's commitment period.

Under the Kyoto Protocol, Annex I country commitments are binding and, crucially, each tonne of GHG emitted must be accounted for with an AAU or other unit. By this logic, if an emissions reduction credit from a non-Annex I country is used to help meet an Annex I target, then that credit should not be available for the non-Annex I host country to count towards its abatement. The same can be argued for a system without a common allowance unit for developed countries; even under such a system developed countries may still have an international obligation to demonstrate both that their emissions reduction target has been met and what proportion of international credits were used to achieve it. On the other hand, a developing country may argue that their pledge is based on macroeconomic outputs and achievement of the overall emissions goal is not dependent on any mechanisms used to achieve it. This would mean that any emissions reductions that occur in the

country would count towards achievement of the developing country's pledge, no matter if the 'rights' to the unit attached to the action have been sold as an offset.

Relevance of finance to double counting of offset emissions

There are many forms of public and private sector financial flows originating in developed countries and aimed at stimulating climate change mitigation in developing countries (Corfee-Morlot *et al.*, 2009). Only part of this financial support is likely to come from carbon market mechanisms, of which a small subset is direct purchase of offsets¹⁵ (AGF, 2010).

This carbon offset revenue is used to purchase GHG units that are relevant to international GHG accounting, and for this reason it can be considered distinct from other financial support and investment. Blurring the distinction between these sources of finance is partly what leads to the disagreements about alleged double counting of CERs. If revenue received from CER purchase is considered part of committed Annex I country financial support on which 'group A' developing country pledges are conditional, there would not be an argument for double counting of the emissions reductions.

The complexity of this distinction is highlighted by the financing of projects and readiness programmes in land-use and forestry, and in particular REDD and REDD+, especially in the absence of an international allowance unit. Some initiatives underway are clearly intended to entail only climate finance without exchange of GHG units – such as the US commitment to “fast-start” finance for REDD+ schemes¹⁶ (USAID, 2010). Other initiatives under early stages of planning may involve financing by developed country governments of REDD+ programmes in developing countries, with the resulting avoided emissions expected to be considered as part of the donor country's mitigation effort. Whilst this is not an offset mechanism in the conventional sense of the word, this type of aggregate offsetting, without any distinct transfer of units, may cause considerable challenges for international GHG accounting in the absence of an international GHG allowance unit system.

The issue of distinguishing offset markets from climate financing is further highlighted in policy statements made by Indonesia in relation to its mitigation pledge of a 26% reduction from business as usual emissions through unilateral action, rising to 41% with international financial support¹⁷. REDD(+) initiatives are expected to contribute significantly to this mitigation effort, but the pledge is clear that this support does not include financing through carbon credit sales, thereby retaining the distinction between financing and offset crediting. Other mitigation pledges are not clear about this distinction.

Options to address double counting of emissions reductions

International double counting of offsets towards both host and buyer country pledges would mean that global mitigation would be less than that implied by adding up national pledges at face value. Quantitative modelling suggests that this effect could be significant (Erickson and Lazarus, 2011). However, the nature of emissions intensity pledges made by developing countries means that the final environmental result is dependent on economic performance and is anyway uncertain; the double counting or not of project-based emissions credits in developing countries is another element of uncertainty in an already uncertain calculation. How this issue is resolved and how overall mitigation is determined is a matter of political negotiation and is not the focus of this paper.

¹⁵ Other forms of carbon market finance include investment in underlying assets of offset projects, creation of funds through levies on offset transactions and government-to-government support using revenue raised from auctioning domestic emissions allowances in Annex I countries.

¹⁶ Although earmarked for the period 2010-2012, this sets a precedent for future financing of REDD+ readiness and implementation

¹⁷ President Susilo Bambang Yudhoyono's speech can be found at http://forestclimatecenter.org/document_hit.php?cnt=International&lang=English&dID=151

If developing countries are clear about whether their stated pledge includes emissions reductions achieved through international offset mechanisms, then emissions accounting can still be carried out. Countries could also specify which particular offset mechanisms are assumed to be included in the pledge, operating in certain economic sectors. That the resulting environmental outcome will likely be less satisfactory is a serious matter and one that should be debated publicly, but it is one for political negotiation rather than technical unit accounting. Furthermore, as Box 3 below highlights, the magnitude of this effect arising from double counting of ongoing CDM credits issued after 2012 is also dependent on clarification of developing country pledges; double counting from new mechanisms is more uncertain.

Furthermore, the impact of double counting of CDM or other credits would also be dependent on demand for the units. Demand for credits comprises not only the volumetric requirement implied by the ambition of Annex I pledges and therefore of their underlying policy mechanisms such as the EU ETS, but also of the type of credit that may be permitted for use within such schemes. In a Kyoto world, all credits produced under the official mechanisms can be used to meet national compliance targets, even if underlying compliance regimes like the EU ETS are restrictive. Under a less centralised framework, Annex I countries could in theory specify in advance which credit types will be sufficient to meet their pledge. Should some countries unilaterally decide to exclude offsets that could be deemed to suffer from double counting in this way, demand for such credits may be weakened to the point that developing countries have incentive to no longer apply for offset credits in implicated sectors.

Box 3: Potential double counting of CDM emissions reductions: the case of China

China's inscription to the Copenhagen Accord states that: "*China will endeavour to lower its carbon dioxide emissions per unit of GDP by 40-45% by 2020 compared to the 2005 level, increase the share of non-fossil fuels in primary energy consumption to around 15% by 2020 and increase forest coverage by 40 million hectares and forest stock volume by 1.3 billion cubic meters by 2020 from the 2005 levels.*"

This wording implies that the mitigation goal is for CO₂ only (rather than all GHGs or the Kyoto Protocol gases), although this has not been confirmed by the Chinese government. The intensity metric, calculated relative to economy-wide GDP, is based on a single year, 2005. Since 2005 China has had a domestic goal to reduce energy intensity by 20-25% by 2010, described in the 2005-2010 '11th Five Year Plan'. It is not yet clear how the new emissions intensity goal will add to this existing energy intensity initiative combined with the non-fossil fuel and forestry goals mentioned above (Project Catalyst 2010).

The scope of the pledge could have implications on CDM projects in China. If the goal is clarified as being only based on CO₂, this will have a bearing on the possibility of CDM double counting. 33% of expected CERs up to 2020 from China are from predominantly non-CO₂ sources (of projects already in the CDM pipeline, including HFCs, N₂O, coal mine methane and landfill gas) (UNEP Risoe 2011). These projects therefore would not be subject to double counting should the pledge cover only CO₂ (ignoring any other concerns over environmental integrity). Of the remaining CDM projects, renewable energy projects cover c.47% of CERs expected to 2020. These have already faced additionality challenges over tariff setting, particularly for wind and hydro projects. China's parallel renewable energy target may add to this concern. The final 20% of CERs are expected from predominantly (about 90% of remainder) fossil fuel switch and power generation using industrial waste energy.

As well as the possible double counting of emissions reductions, the nature of China's pledge highlights a second issue for CDM: complications on assessing additionality when the project is assessed in context of a package of national goals, particularly energy efficiency goals and renewable energy targets. However, the energy efficiency goal has been in place since 2005 and, perhaps because it is measured in energy intensity terms rather than carbon, has not caused any significant conflict with CDM to date. Furthermore the 12th Five Year Plan, adopted in March 2011, suggests that cap-and-trade schemes may be initiated in some provinces, which may also have an impact on the viability of CDM projects in covered sectors.

This example highlights many uncertainties, including uncertainty in the ambition of national pledges relative to business-as-usual, and uncertainty in the interpretation of additionality for CDM in the context of national pledges. Whilst GHG unit accounting is a technical issue addressed in this paper, the interpretation and assessment of ambition within pledges is mostly a political issue.

4.3.2 CDM host country decisions on offset production and domestic use

If developing countries with mitigation goals – those in ‘group A’ in the above classification – consider over time that their pledges are politically binding in their own countries, it is conceivable that such countries may decide to purchase credits – either CERs or otherwise – from developing countries in ‘group B’. The aim would be to help the ‘group A’ countries achieve their stated pledges if domestic abatement has been less than anticipated. This raises several issues:

- It would require ‘group A’ developing countries to set up unit registries capable of receiving the offsets concerned, or for registries to be established in other countries on their behalf;
- It would further highlight the double counting issue described above, in that countries could be both generating and using the same type of offset;
- The multi-directional flow of offsets complicates the global picture, where flows to date have been mostly unidirectional from non-Annex I to Annex I countries¹⁸. If credits used originate exclusively from ‘group B’ countries then there would be not be an issue with global GHG accounting, because countries in ‘group B’ do not have any quantified emissions goal. However the situation is more complex if credits are exchanged between two ‘group A’ countries. For example, if a country that is confident of exceeding its pledge agrees to sell offsets to a second ‘group A’ country concerned with a likely failure to meet its goal. This could be challenging for maintaining international integrity of unit accounting. To ensure that transactions are as transparent as possible, it would be desirable that any such unit movements are recorded under an international system.

These elements of uncertainty and political negotiation highlight further that whatever system is adopted, it must include a reliable means to track the movement of GHG units between national accounts. Within a Kyoto framework this can occur within national Kyoto registries tracked by the ITL, but outside the Kyoto infrastructure and in the absence of the ITL this would be a key challenge of maintaining a credible emissions accounting system, as described in section 5. The possibility of the ITL servicing this purpose under a non-Kyoto system is discussed in section 6.

4.4 Impact of sub-national trading scheme offsets on global unit accounting

Whether or not international obligations are managed by a system of common allowance units, domestic emissions trading schemes are likely to be implemented in some regions covering some economic sectors. Regardless of the form of the wider international unit accounting framework after 2012, such sub-national trading schemes will be relevant to global accounting in two separate ways: (i) the impact on national pledges from allowance units from sub-national schemes and (ii) offset units created specifically for use in those trading schemes, domestic or international.

Emissions trading is designed to direct mitigation to occur where it is most cost effective and international linking of domestic or regional trading schemes will further enhance the economic efficiency of this policy response (Ellis and Tirpak 2006). The standardisation of unit accounting and offset protocols is expected to be a critical component in allowing schemes to link¹⁹ (Hood 2010). For example, regions that have set strict standards would be unlikely to allow these to be undermined by importing less stringent units from other schemes. Greater co-ordination of international standards would therefore not only simplify the accounting of emissions, it could lower costs by allowing trading schemes to link more easily.

Offset units developed for sub-national schemes may become eligible for helping developed countries to achieve their national mitigation targets, as indicated in section 4.1. A useful example to consider is the forthcoming cap and trade scheme to be developed in California under the AB32 regulation. REDD and other sector-based offset credits in foreign jurisdictions may be eligible for compliance by

¹⁸ With some secondary trading between entities in Annex I countries

¹⁹ Other critical elements will be aligning cap and floor prices, banking and borrowing provisions, and the general stringency of schemes.

entities within the scheme. In November 2010, an agreement was announced between the Governor of California and Governors of two sub-national states in Brazil and Mexico (Point Carbon, 2010) to supply REDD-based offsets to the Californian emissions trading scheme. REDD credits generated and used in this way could therefore have an impact on both the interpretation of the host country national mitigation pledges and on demonstrating achievement of the US abatement target, assuming that it is not part of any future international allowance unit system.

The host country governments will decide whether the credits sold from the provincial agreements will be deducted from the national mitigation achievements or not, and that is a political issue. On the technical side, it is important for overall global accounting that such credit sales should be recorded and traceable in an international tracking system. For the US, these credits will have been purchased by capped entities in the Californian scheme and submitted to the state regulator for compliance under that scheme. Whatever position the US may take in a future international agreement, the developing MRV regime is likely to increase pressure on all countries to demonstrate their achievement with their targets or pledges. Even if outside of an international allowance trading regime, this requirement for transparency will likely require some level of visibility on the credit units used.

Further research will investigate how allowances and offsets from sub-national schemes can be reliably integrated into international GHG accounting after 2012.

5. Integrating unit accounting into post-2012 scenarios

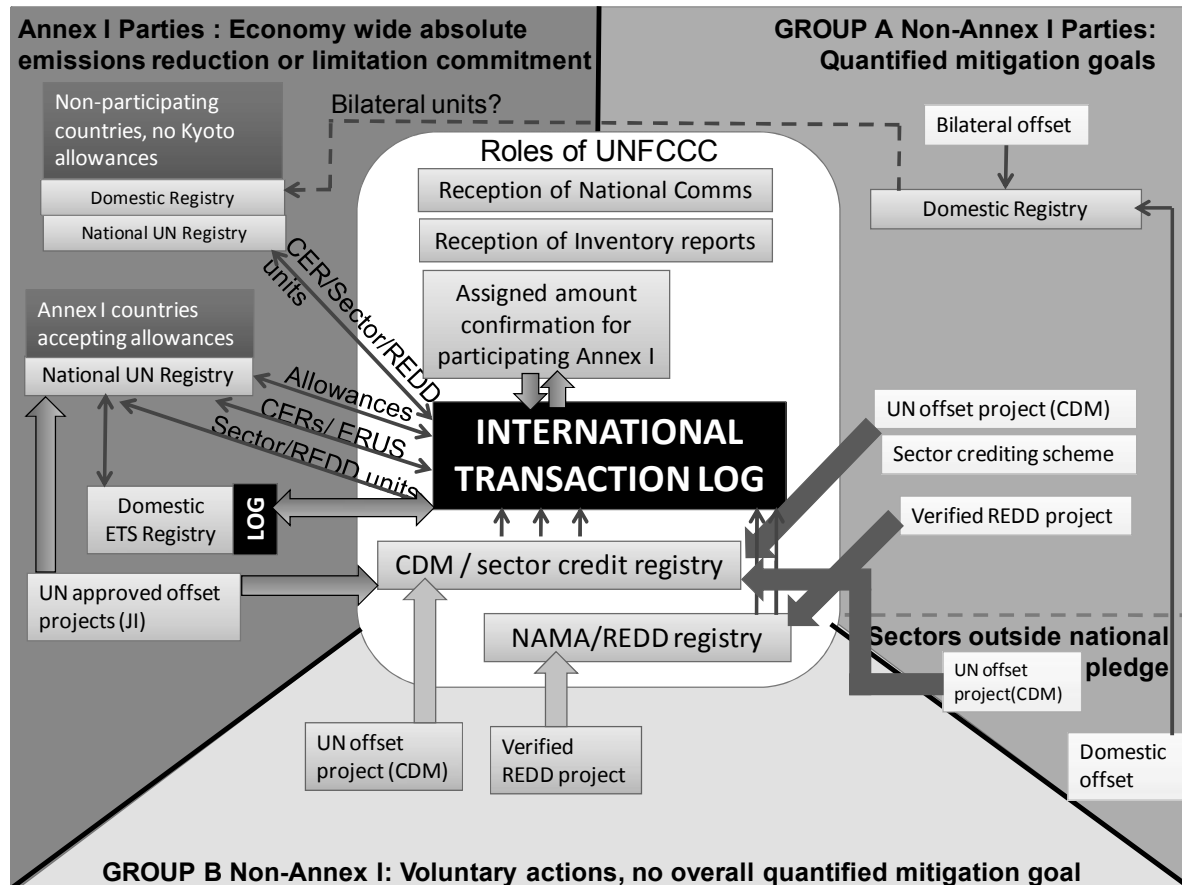
The above analysis of divergent unit types highlights that whatever international emissions accounting infrastructure prevails, maintaining the ability to track movements of emissions units after 2012 is key to maintaining the environmental integrity of the system. This section builds on the scenarios presented in section 3 to suggest structural options for how unit movements could be tracked both with a common allowance system and in a pledge-and-review world. An initial exploration of the middle ground between these two scenarios is presented in Section 6.

5.1 Unit accounting in a continued Kyoto Protocol system

Figure 7 builds on figure 5 to demonstrate how unit transactions might occur in a post-2012 world based on common international allowances for some Annex I Parties under the Kyoto Protocol.

The basic structure for this model was described in section 3.2.1. In terms of unit transactions, the key feature is the continuation of the ITL as a UN-controlled gateway, through which all UN-related unit transactions must pass. Under this model, Annex I countries would only issue international allowance units under UN supervision through the ITL, as is the case with Kyoto. Also, the continuation of the ITL means that the CDM and JI mechanisms can effectively continue as they are, although they might benefit from reforms to scale up and broaden the mechanisms, including increased standardisation and use of programmatic frameworks. However, in figure 7, two types of CDM project are shown in the example 'group A' country: one from sectors included inside the national pledge, one from a sector outside of the pledge. In time, CDM may only be pursued in the latter type of sector, because of concerns over double counting of reductions. The ITL could also be used for a new UN-controlled mechanism to issue credits for action beyond business-as-usual in certain key sectors in 'group A' countries (Baron *et al* 2009).

Figure 7 : Schematic for unit transactions in a Kyoto Protocol scenario for some Annex I



Source: Authors

The UNFCCC will also operate a registry for nationally-approved mitigation actions (NAMAs) as specified in the COP 16 decisions. The NAMA registry is not intended to be a unit registry. However, the database could also in time develop to handle units – or be linked to the existing CDM unit registry – should a system for issuing credits for emissions reductions from NAMAs be agreed, for example credits from REDD(+) actions. Whether these projects would be subject to full UN approval, with credits issued from a CDM-style central registry linked to the ITL, would be subject to negotiation; ignoring political sensitivities, this model may provide a robust means of international unit accounting of REDD projects.

Annex I countries would maintain registries to UN specifications, similar to existing registries in Kyoto Parties. Under this post-2012 model, Annex I countries not participating in the common allowance units system could also operate a UN-specified registry into which UN-managed units can be purchased and stored for retirement²⁰; this would allow the UN-based offset mechanisms to be more international and to have more liquidity, thereby encouraging economies of scale and greater levels of mitigation. This registry could be used to make use of CDM and/or new REDD or other credits to help achieve the national target, depending on the domestic policy choices of the country involved. All UN registries would have live link-ups to the ITL for all Kyoto unit transactions, as in the current system.

Under this scenario non-Annex I countries are not required to maintain UN unit registries, as is currently the case. Some 'group A' countries may choose to establish domestic registries to handle domestic offsets developed and used within the country to stimulate mitigation in new sectors. These would probably not be tracked by the ITL. All other UN-managed units generated in 'group A'

²⁰ If the allowance system were a direct continuation of the Kyoto Protocol, this would require modification of the Kyoto modalities by CMP decision

countries, including both CDM and potential future sectoral credits, would be issued into registries hosted by the UN rather than the host country, as with current CDM. In time, domestic registries in ‘group A’ countries could be modified to serve to retire international offset units, for example from ‘group B’ countries, should those governments decide to use offsets to meet mitigation goals.

As described in section 4, Annex I countries not participating in the common allowance unit system may choose to develop new specific unit types to help achieve their objectives. To ensure integrity of the overall system these would need to be accounted for internationally even under this model. An example might be provincial-level REDD credits as described in section 4.4, or independent national-level bilateral offset schemes developed regardless of the continuing UNFCCC unit system; these are shown by the dashed arrow in figure 7. It may be impossible to link these to a UN-controlled ITL, and as a result there would be an onus on governments of the countries involved to ensure that non-UN unit registries are developed that are transparent and can show aggregate unit use on a national level. One solution may be for these countries to operate in effect two registries, or one registry with two functions. This would complicate and possibly weaken the transparency of the overall system under this model.

The only other units not being tracked and verified by the ITL under this model would be voluntary credits purchased by private entities outside of the international system (these are not shown for clarity). Box 1 in section 2 shows that under a central allowance system, such voluntary credits do not affect global GHG accounting.

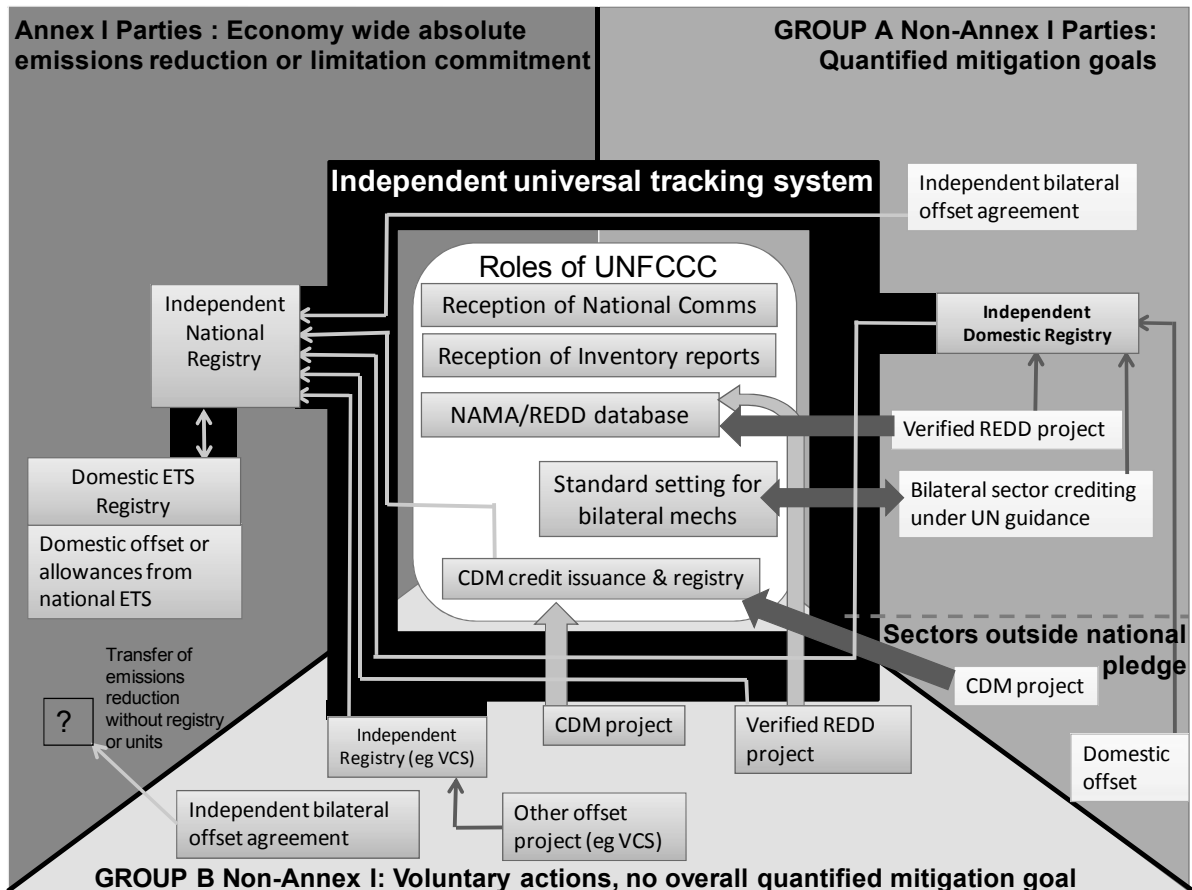
5.2 Unit accounting in a pledge-and-review world

Figure 8 builds on figure 6 to show how unit transactions may be followed in a pledge and review system without a common international allowance unit. The complexity inherent in maintaining robust unit accounting in this scenario is one of the reasons why the middle ground option described in section 6 may be a more likely outcome.

Unit types

The basic structure of this scenario was described in section 3.2.2. The lack of a common international allowance unit would result in a much less prominent role for the UNFCCC in unit issuance and control. CDM may continue to operate in ‘group B’ countries and in certain sectors in ‘group A’ countries, and this would operate through the existing process with the CDM Registry still operating. All other offsets would be bilateral and issued under the authority of agreements between selling and buying country governments, and these may or may not follow established international standards. The UNFCCC could still play a critical role in defining minimum offset standards or common principles, but acting as a guideline- or standard-setting body rather than a certification and approval body. This is shown in figure 8 and discussed further in section 6.

Figure 8: Schematic for unit transactions in a post-2012 pledge-and-review system



Source: Authors

Note: The diagram shows a schematic of a black frame with units movements passing through it, but in reality the movements would pass directly between registries with a notification sent to the tracking system.

Registries

Annex I countries would maintain unit registries which may or may not be based on common UN specifications (as their existing Kyoto registries are) to aid communication. ‘Group A’ (non-Annex I) countries could develop domestic registries from which to issue bilateral offsets or sector credits. Without such a registry in the host ‘group A’ country, unit movements would only be recorded as issuances in the buyer country registry and may make accurate emissions accounting difficult. Given that these countries have quantified mitigation goals, it may be considered important for registries to be developed for these mechanisms.

Group B’ countries (also non-Annex I) would not be expected to develop national registries. Figure 8 also shows an example whereby offsets may be generated in ‘group B’ countries outside of the CDM to pre-existing offset standards, such as existing voluntary standards. If Annex I countries agree to use the credits from such projects to meet their target, an independent private-sector registry – such as those currently used in the voluntary offset market – could be used as the intermediary to issue and transfer the units, in place of a national registry.

One further example is illustrated by a question mark in the figure, whereby a bilateral agreement is arranged between an Annex I and a ‘group B’ country for an emissions reduction activity that will not issue any precise units. For example, this could be a REDD+ project financed by an Annex I country, with a certain quantity of emissions reductions measured, which would be used towards the Annex I country pledge, without any units being created or passing through any registry. This is likely to weaken overall transparency and may damage international trust in the integrity of the system.

Transaction tracking system

Under this scenario an independent transaction unit tracking system may need to be developed. Countries would need to agree, perhaps through UNFCCC COP decision, that any unit transaction involving creation or international transfer of a unit that will be used to help meet a national pledge should be recorded internationally. This could be through connection to a single central tracking system, or through definition of a standard data format for registries with obligations to make data available internationally; some potential examples from the financial sector are considered in section 6 below.

Transactions would not be pre-approved in the way that the ITL currently operates and for this reason the tracking system is shown to be independent and operating outside of the UN. It is conceivable that the ITL could continue to operate under a non-Kyoto scenario to fulfil only this tracking function, and this is examined in section 6. However it is clear that, regardless of how the tracking system is managed or operated, the governance concept is very different from the existing ITL with its role as a gateway and approver (albeit automatically) of transactions. For the tracking to be done independently, when countries demonstrate achievement of their stated pledges during and at the end of a pledge period, a system could be developed for countries to submit a transaction report comparing emissions data from the National Inventory Report with units held for retirement in each country's specific registry; data can be checked against reports from the tracking system if necessary.

This model would be more flexible to individual requirements of Annex I countries so would probably not suffer from the "two-speed" nature of a partial Kyoto Protocol system with some countries not participating. However, it may pose a greater risk of fraudulent market behaviour due to the decentralised nature of the accounting framework and tracking system.

5.3 Ensuring a functional unit accounting system

Section 2.4 considered what functions are required of a reliable unit accounting system, including those provided by the existing system, and those which are currently lacking or do not function well. Table 4 compares a system based on a single common allowance unit to a system without such a unit, for a range of desirable attributes of a functional accounting system.

Both types of system have advantages and disadvantages, and may be more or less attractive to different countries. The most likely outcome may combine elements of both of these types of system, and this is explored in section 6.

Table 4: Comparison with or without common allowances units

	System based on common allowance unit	System with no common allowance unit
Defining national pledges or commitments	Kyoto Protocol rules would be used to assign international allowance units corresponding to participating Annex I countries' quantified emission reduction targets. This system provides a clear definition of commitments, but does not allow much flexibility for country-specific requirements ²¹ . Pledges from other countries would be accounted for separately.	A more decentralised system allows countries increased flexibility to develop baselines and objectives that fit with national development goals, both for Annex I and non-Annex I countries. However, without some degree of harmonisation international comparison could be difficult.
Demonstrating progress towards mitigation objectives	Annex I participating countries would demonstrate progress through use of international allowance units. Units created in domestic or regional trading schemes in these countries can be 'backed up' by international units (as per EU ETS). As other countries (non-participating Annex I and non-Annex I) would not be allocated international allowances, a partial Kyoto system does not in itself provide means to demonstrate universal progress towards implementation of pledges.	For Annex I, emissions data from National Inventory Reports need to be combined with domestic or offset units held in each country's specific registry. This process could become part of International Assessment and Review (IAR), as initiated in the Cancún Agreements. Clear information on progress towards implementation of non-Annex I goals may need a transparent system for tracking unit movements.
Recognition of increased mitigation action from developing countries	Currently, the Kyoto Protocol only allocates allowances to countries with binding targets. This system does not allow for a quantified recognition of the actions of developing countries. This would be overcome if common allowance units were used by both developed and developing countries, but this is not likely to be acceptable in the time-frame of a possible 2 nd commitment period of the Kyoto Protocol.	A system without a common allowance system may make it easier for developing countries to increase their contribution to global mitigation over time, without the step change of joining an allowance scheme. The lack of a strong distinction between countries with allowance unit and those without, may make it feasible for a larger number of countries to adopt mitigation objectives with similar terms.
Role of the UNFCCC and international institutional requirements	The UNFCCC could continue in its pre-2012 role plus operating both the NAMA registry and a unit registry to administer units from new UN-operated crediting mechanisms. Existing UN institutions and processes would form a solid basis for development, including potentially to track new units used by countries to help them meet mitigation pledges.	A diminished role for UNFCCC in regulating and issuing units, but Secretariat may still play key role in defining minimum standards for offsets for adoption by Parties. Although UNFCCC may no longer control the ITL in its current form, there may be a role for the UNFCCC to continue administering an independent tracking system, as a means of recording transactions (but not as a registry for holding units).
Transparency of unit accounting	A common allowance unit enables comparisons between participating countries, including offsets and allowance units from domestic schemes. A common international allowance unit would help to prevent the differentiation of standards, which could lead to different GHG units holding widely different monetary value. Such discrepancy in financial value of units which are all intended to represent one tonne of CO ₂ -equivalent may raise questions about	In the absence of a common allowance unit, accounting rules for defining pledges and demonstrating achievement towards them may become increasingly important to avoid a reduction in transparency and a risk of lowered environmental integrity. To maintain comparability of divergent unit types, robust tracking and reporting of unit transactions is essential. The risk of banking excess allowance units into a future period could weaken environmental ambition and

²¹ Note that negotiation of Kyoto Protocol accounting rules for LULUCF emissions allowed for some flexibility based on country circumstances

	the environmental integrity of different unit ²² . However, the allowance system itself does not guarantee a high level of transparency as this is dependent on accounting rules for defining baselines and targets/pledges.	this risk is avoided in a system without allowance units.
Ability to track unit transactions	Allows all movements of international allowance units, credit or offset units to be approved and recorded by the ITL; participating Annex I performance against targets can be shown by submitting allowances and credits for retirement in one place. Use of the ITL as a single tracking device may also reduce the risk of fraud in international unit transactions. For countries not participating in the international allowance system, tracking of credit or offset unit transactions would still be required.	To ensure the integrity of a system with multiple unit types created and regulated by specific countries and not backed up by or linked to international units, international disclosure and recording of transactions would be required. However, there are examples from financial markets of systems that make international transactions possible and traceable without any central ITL-type gateway. The SWIFT network for interbank financial movements is one such example. Furthermore, the ITL could still be employed as a tracking device, without its transaction approval function.
Integration of national policy mechanisms and new unit types	Under this model, allowance units from domestic or regional trading schemes could be backed up by international allowance units, in the way that EU ETS units are currently linked to AAUs. This would simplify integration of new unit types and a direct link to national policy mechanisms. Units not based on CO ₂ which may be introduced through developing country policies – such as energy efficiency or renewable energy credits – could be integrated to the allowance system via agreement of conversion factors.	The flexibility of a pledge-based system means that countries can develop policy tools involving emissions units – such as domestic trading scheme – to achieve pledges that suit each country’s situation, without having to ensure that domestic allowances are backed up by international allowance units. Nevertheless, to benefit from international trading of these units by linking schemes, some level of international transparency and comparison would be required.
Use of offset and credit mechanisms	An allowance unit system is suited to a small number of centrally-organised offset mechanisms, such as used under the KP. A continued KP or partial KP would therefore be most suited to continuation of existing mechanisms plus new UN-organised crediting systems. Experience with the Kyoto mechanisms to date has shown that, although providing good assurance of environmental integrity, the scope of mitigation has been restrained by complex procedures. For countries not participating in the allowance system, new country-organised bilateral or multilateral mechanisms could be feasible under this model with some level of UN oversight or guidance to ensure minimum standards.	The effectiveness of offsets in a pledge and review system will depend on the level of standardisation between offsets and the ability to effectively track transactions. A fully decentralised system would involve each country or region establishing its own rules for receiving offsets from other countries. The flexibility to develop country specific mechanisms could increase innovation in mitigation projects and learning between different systems. While existence of various unit mechanisms may put an additional burden on investors and developers, it would generate additional investment opportunity in areas which the existing systems do not cover. In addition, the CDM could continue to operate, with other mechanisms operating alongside it.

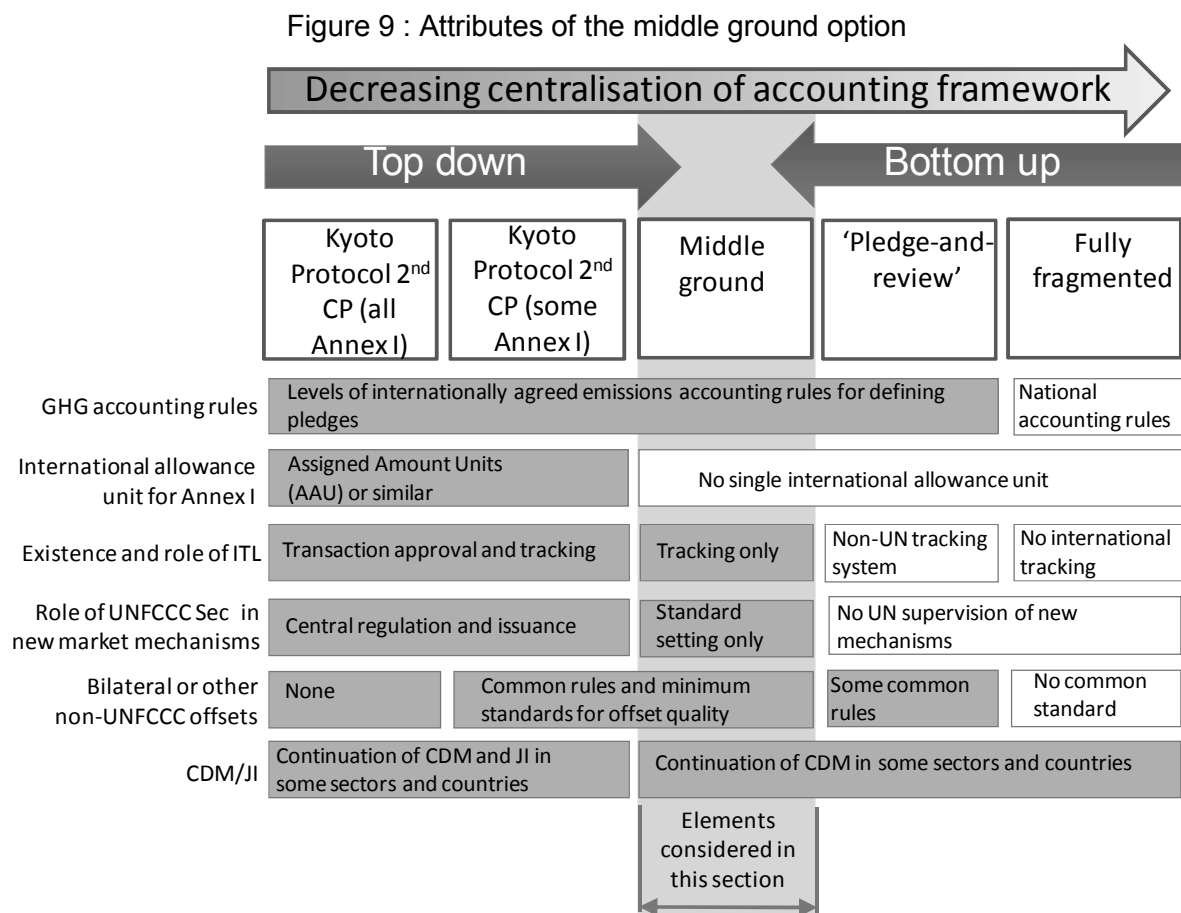
²² The existing market for Kyoto units is not uniform, but the discrepancy is mostly confined to primary CERs (which may not yet be issued and so carry delivery risk) and forestry CERs with specific time limitations (tCERs and ICERs, see Annex). In addition, The introduction of quality restrictions on the use of CERs from 2012 in the EU ETS, to date the largest demand centre, may lead to further price discrepancy.

6. Exploring the ‘middle ground’ option

International negotiations are not yet conclusive on the framework for emissions accounting after 2012. The future system is however likely to combine elements of the two models put forward in Section 5. This section examines some elements that may form the basis of an accounting system that falls in the middle ground between these two models.

6.1 The nature of the ‘middle ground’

Figure 4 in section 3 highlighted the range of potential options for the accounting framework, indicating that the two models elaborated in Section 5 are towards the edges of the range of what is likely to be feasible. Figure 9 below expands this figure to include more detail on how each building block could vary across the spectrum.



6.1.1 Demonstrating progress towards objectives

International demonstration of progress towards mitigation objectives depends on shared understanding of the content and ambition of pledges, and for this reason the ‘pledge-and-review’ model proposed above already assumed that objectives are agreed based on a degree of common accounting rules. This is a complex area and there is significant scope for rules to be standardised to varying degrees for different sectors and gases (Levin *et al*, 2010). Comparison and agreement of country pledges is a political issue and is not the focus of this paper; it is discussed here only for its relevance to unit accounting.

Most Annex I countries have submitted quantified emissions reduction targets for 2020 as a percentage reduction from a certain base year. To convert this into an absolute quantity of emissions for a certain year is not a simple process. There has been extensive debate over the complications of

comparing stated national mitigation pledges for the 2012-2020 period (Levin and Bradley, 2010; Project Catalyst, 2010).

The concept of assigned amounts in the Kyoto Protocol provides a means to rationalise the percentage reduction pledges made by Parties, in addition to providing the basis of a tradable GHG allowance unit. This rationalisation hides many complications in the calculation of base year emissions. Accounting rules are particularly complex in the area of land use, land use change and forestry (LULUCF), and this highlights the very political nature of defining an emissions allowance total (Baker *et al*, 2010). In addition to being described in terms of percentage reductions from base years, most targets submitted by Annex I countries for the post-2012 era do not specify the LULUCF accounting rules that are to be used.

The middle ground option described here would not involve a Kyoto-style common allowance unit. The resultant need for comparable reporting of absolute percentage emissions reductions goals may mean that procedure for accounting rules could be borrowed from the Kyoto Protocol. For example, the Kyoto Protocol already allows some flexibility for activities that countries can choose to include in the baseline under specific conditions²³. The use of such opt-in clauses could help to encourage increased participation of a wider group of countries under a middle ground scenario, whilst maintaining a level of international co-ordination of accounting rules. The current work of the Ad-hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) on clarifying LULUCF rules for a possible second commitment period could therefore be useful for that purpose, even in the absence of a new commitment period.

6.1.2 Role of UNFCCC bodies in GHG unit management after 2012

Under this middle ground option, the UNFCCC and its Secretariat could be mandated by the Parties to play an important yet markedly different role from the existing system. The UNFCCC Secretariat currently fulfils a number of functions relevant to GHG unit management, including:

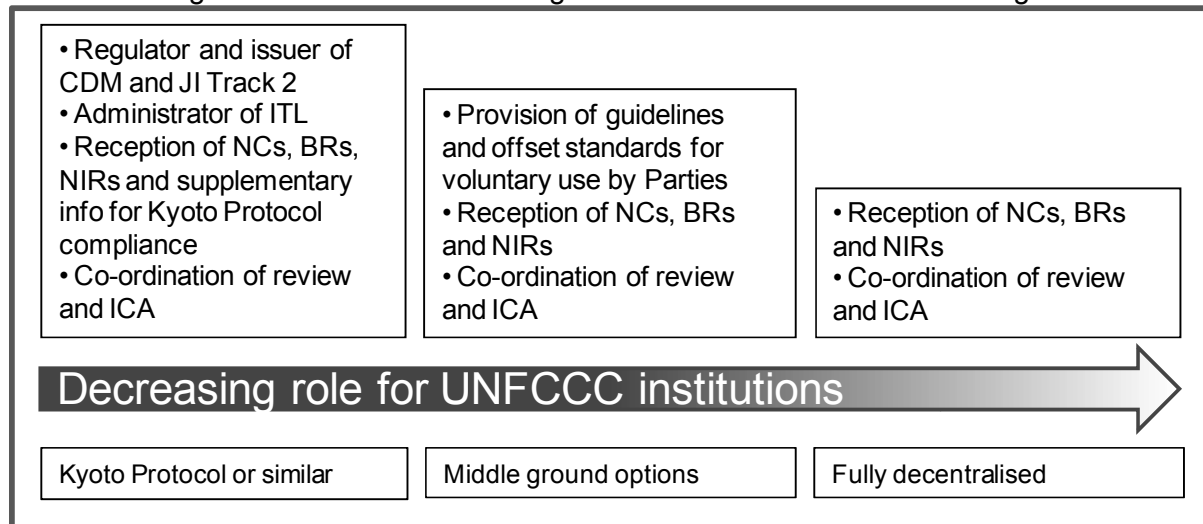
- Receiver of national inventory reports and national communications and co-ordination of Expert Review Teams (ERTs)
- Approver of subsequent issuance through the ITL of AAUs for Kyoto Protocol countries
- Administrator of the ITL
- Administrator of the CDM, including overseeing issuance of CERs (via the CDM Executive Board mandated by the Kyoto Parties under the CMP)
- Approving countries to issue Emission Reduction Units (ERUs) for Track 2 JI projects through the work of the JI Supervisory Committee.

In the hybrid model discussed here, the UNFCCC bodies could still have a vital role to play in a number of these aspects. This could include: a continued role in co-ordination of reviews of Annex I national communications and international consultations and analysis (ICA) of non-Annex I biennial reports (including Biennial Reports (BR)); a continuation of some aspects of the ITL; and a level of oversight in new, less centralised market mechanisms. These elements are summarised in figure 10.

For co-ordinating national reporting, the role of the UNFCCC Secretariat in co-ordinating this reporting and organising review teams where appropriate is likely to remain broadly the same in light of the Cancún Agreements. The UNFCCC role in governing market mechanisms and tracking transactions is discussed in sections 6.1.3 and 6.1.4 respectively.

²³ An example is article 3.4 and 3.4 of the Kyoto Protocol relating to specific forestry and other land-use activities

Figure 10 : Schematic showing different levels of UNFCCC oversight



6.1.3 Governance of international market mechanisms

In addition to continuing its role as the key CDM regulator (for those sectors in which CDM would continue to operate), the UNFCCC could be instructed by the COP to maintain a level of oversight of new mechanisms, even if the units generated by these mechanisms are not regulated and issued by the UNFCCC. For example, the Secretariat could be mandated by the COP to develop international offset protocols, or minimum standards to act as a resource that countries are encouraged to use when introducing bilateral agreements on offsets. This could either build on CDM documents or involve working with individual countries to meet specific requirements in those countries. Either way, it is a very different role to the regulatory responsibility of the CDM Executive Board, with sole authority for issuance of credits.

Bilateral or multilateral offset mechanisms not directly regulated by the UN – whether established due to a lack of internationally-agreed mechanisms or in parallel with UN-operated mechanisms – may lead to an increased number of unit types, as discussed in section 4. To facilitate international exchange of these units and their use to meet national or sub-national mitigation goals, a robust assessment protocol could be developed for international recognition of offset units. The financial value that is generated by the unit could then vary based on the buyer confidence of how closely that particular unit adheres to the international standard. This would raise a number of issues that are political as well as technical, for example concerning the ambition of the crediting baseline used for particular sectors or countries. However, such a system may allow countries to benefit from the flexibility of exploring new, nationally relevant market mechanisms, whilst maintaining a level of international environmental integrity.

Private sector actors play a critical role in the current CDM market, both as project developers, brokers and purchasers. With the desire to scale-up financial flows for developing country mitigation, including from the private sector, the impact of unit diversification on investor confidence should be considered. Agreed international offset standards would create significant advantages for investors over a fully fragmented approach, including:

- A larger, more liquid international market to purchase the units;
- Much greater simplicity for investors due to standardised rules, lowering barriers to entry for potential project investors;
- Potentially greater political certainty around crediting duration.

While it could be argued that private sector financial institutions would thrive in a world of fragmented trading systems, as they would be well placed to provide the arbitrage services needed to connect and compare various systems, market commentators indicate that such advantages would be

outweighed by the high barriers to entry posed by a proliferation of schemes. A stable, simple, common international framework for offsets would be desirable to significantly accelerate private sector investment²⁴.

The UNFCCC may therefore be well-placed to take on a guidance-setting role for offset standards. It is useful here to draw on the analogy of the existing JI system. Although countries which have met the requirements to operate Track 1 JI have no need to follow UN-administrated procedures, many of those countries have voluntarily used a close parallel to the UN-managed Track 2 process²⁵. This is presumably because if comprehensive, relevant and legal documentation and procedures already exist, there is little point in each country committing its own resources to recreate such a system. There is a difference between being mandated to use a certain procedure in order to receive credits, such as with the development and issuance of CDM projects, and having the option of developing a unilateral sovereign procedure, but nevertheless choosing to use a centralised system. In the post-2012 climate negotiations, this seemingly subtle distinction could be important for finding politically-acceptable ways to maintain offset standards.

For the UNFCCC to play this role, important issues to clarify include what, if any, minimum standards for defining offsets are needed, how they can be agreed outside the framework of international allowance units and also what elements such standards should cover. For the first question, the extent to which the experience gained with CDM methodologies and standards would be recognised could play an important part. In terms of what elements would be included, key proposals would be methods for setting a baseline and the monitoring, reporting and verification procedures. These are all elements that are linked to the environmental credibility of offsets and credits, and are aspects that would be scrutinised by the international community when assessing new offset and crediting mechanisms being put forward. Again CDM experience may be valuable.

Possible new market mechanisms such as sectoral crediting mechanisms or NAMA crediting involve agreeing on the environmental ambition of the baseline. This would pose additional challenges in terms of minimum requirements for international recognition of such credits as the baseline level would be not only a technical question but also a political one subject to negotiations. Bilateral REDD or REDD+ offsets, should they be developed, may require special attention given the potential scale of such offsets and that there is limited experience due to the current ineligibility of REDD in CDM. REDD offsets also involve particular challenges in terms of monitoring of leakage and permanence of forests which point to a need for a special focus on the standards and tracking of such offsets and maintenance of environmental safeguards. The UNFCCC and associated bodies could continue to play a role in developing such aspects of international standards for bilateral mechanisms. For example, the Cancún decisions lay out expected safeguards for REDD projects and further request the Subsidiary Body for Scientific and Technological advice (SBSTA) to develop modalities for MRV of REDD+ activities (UNFCCC, 2010a).

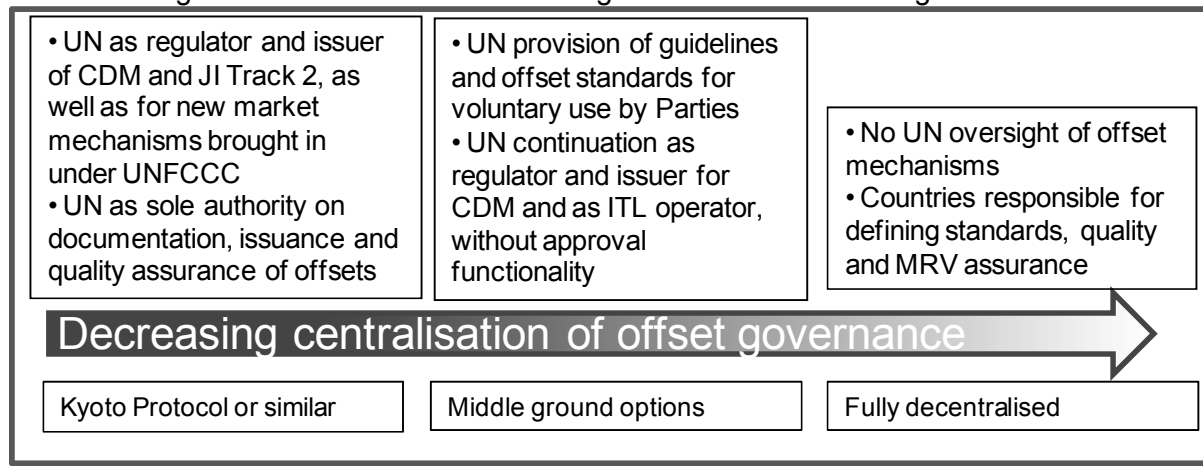
Another option for developing and maintaining international offset standards would be to have the UNFCCC keep an international database of offsets generated based on international standards agreed elsewhere. Other organisations like the International Organization for Standardization (ISO) could be responsible for developing and reaching agreement on international standards; the Alberta emissions trading scheme in Canada uses ISO measurement standards for offsets. However, this could be limited to only certain aspects of offset standards; concepts such as baseline setting and additionality may be difficult to define under ISO. Furthermore, there may be financial challenges due to ISO charging arrangements which may be seen as disadvantageous for allowing equal access to project mechanisms.

²⁴ Prevailing view at the 10th annual IEA-IETA-EPRI emissions trading workshop, Sep 2010, http://www.iea.org/work/workshopdetail.asp?WS_ID=463

²⁵ Under JI, credits are always issued by the host country government for each project. If a host country has been approved to follow Track 1, the government can approve projects without UN intervention. Projects in other countries must follow Track 2 where projects require approval by a UN committee before host countries are permitted to issue credits. Countries eligible for track 1 can choose to operate either track.

In relating these possible roles to the international negotiations, it may be useful to look at the differences in how international emissions trading and CDM were included in the Kyoto Protocol and later developed. The text included in the Kyoto Protocol on both emissions trading (Article 17) and CDM (Article 12) was rather basic. For CDM, however, a much more detailed framework, including on MRV, was later established internationally through the Marrakesh Accords. In the case of international emissions trading, on the other hand, guiding rules were developed directly by EU countries in the process of transferring AAUs in the form of EUAs to industrial entities for intra-EU trading. These two different approaches could both be applicable in trying to outline the post-2012 framework for offset and crediting mechanisms. Should international agreement on comprehensive rules and modalities for new market mechanisms or the continuation of existing ones prove difficult, an elementary agreement on guiding principles for developing international standards and defining institutions responsible could be an important first step (Aasrud *et al*, 2010).

Figure 11: Schematic of decreasing centralisation of offset governance



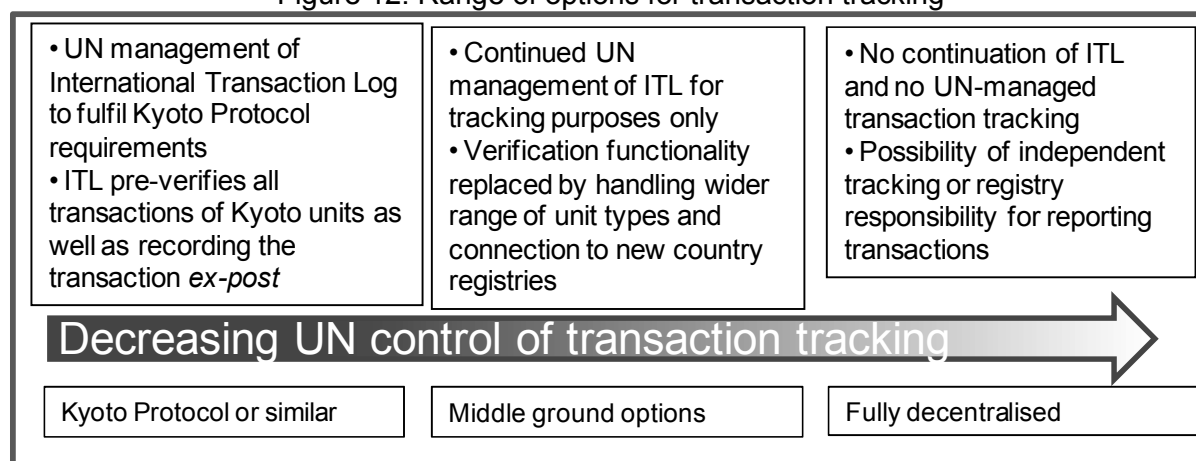
6.1.4 Tracking international unit transactions

In the pledge-and-review world proposed above, the ITL would be replaced by an independent tracking system based on reporting from linked registries. As part of a middle ground option, the ITL could be developed to continue to serve this function outside of a Kyoto Protocol commitment period. In this situation the existing pre-approval validation role of the ITL would no longer be needed. However the transaction recording function could continue to operate under the auspices of the UNFCCC.

The functionality of the ITL may need to be broadened in this case to handle an increased number of unit types and connections to new unit registries in countries that do not currently host Kyoto unit registries (both Annex I and non Annex I). As well as continuing to track transactions of existing UN-managed offsets such as CERs, new unit types could involve domestic units from sub-national schemes – both allowances and offsets – that, although generated, issued and regulated under the authority of a national government, could be tracked by the ITL.

A schematic of these options is shown in figure 12.

Figure 12: Range of options for transaction tracking



6.2 Potential lessons from outside of the Kyoto system

6.2.1 Tracking transactions in international financial markets

The tracking of GHG units in a non-Kyoto system could bear some resemblance to the regulation of international financial markets. In financial markets, there is no UNFCCC equivalent, no central ITL-type central gateway to verify and approve all international transactions. Nevertheless, some mechanisms and processes have been put in place to assure that international transactions are both possible – through common software and reporting formats – and traceable.

A specific example is the reporting of financial transactions as imposed by the Markets in Financial Instruments Directive (MiFID) in the European Union (directive 2004/39/CE). MiFID has widespread implications for the behaviour of firms operating in member states, but of interest here is the requirement that competent authorities enforce mandatory reporting of financial transactions in a common format. Furthermore, MiFID requires the competent authorities to exchange information with their counterparts in different member states, in order to improve traceability and transparency of transactions across the EU. This communication is facilitated by the Transaction Reporting Exchange Mechanism (TREM) of the Committee of European Securities Regulators (CESR), which provides a standard specification for communication and means that each national supervisory authority can access to data on all transactions carried out in their domestic market by foreign market participants.

A different example is the Society for Worldwide Interbank Financial Telecommunications (SWIFT) network for interbank financial movements. SWIFT provides a secure messaging service and a common language for the transmission of financial information. It does not handle or transfer funds, but provides the platform for common communication. Although it does not regularly store or log the data it transmits, the model demonstrates the feasibility of voluntary international communication standards that, though voluntary, become highly prevalent due to the utility that they provide for international communication.

6.2.2 Lessons from aggregation in the voluntary carbon market

The voluntary carbon market provides a useful model for how transactions of disparate units in a fragmented policy structure could be gradually standardised and monitored in a non-Kyoto world. As described in section 2.2, the term ‘voluntary carbon market’ comprises a large number of different voluntary carbon offset standards, different certification, issuance and registry systems and a large number of diverse organisation types amongst buyers, all operating without centralised UN or government-level oversight or control (Guigon, 2010).

Nevertheless, the voluntary market is notable in several ways. Firstly it has developed into a substantial international market; in 2008 market volume was estimated at 126.6 MtCO₂e, though this has since declined for a number of reasons (Ecosystem Marketplace, 2010). This market volume

demonstrates confidence of market participants in the delivery of products through reliable registry systems. The voluntary market is also notable for the wide range of standards and therefore varying quality of offsets, and a corresponding wide range of prices per tonne. More than half of the volume is conducted 'over the counter' which implies that delivery of credits and technical operation by registries and intermediaries is reliable.

The large number of standards and their inherent complexity has led to progressive market aggregation by which some private sector registry operators now offer aggregated registries that can 'list' more than one VER type and therefore offer buyers a one-stop-shop for supply of different carbon standards. Some voluntary carbon standards have outsourced the full credit cycle to registry companies, whereas others have retained in-house control over the issuance registry, but still allow the units to be listed and sold through the aggregated registry. This model for accounting for multiple unit types within a functional registry held independently of governments or the UNFCCC could provide a useful example for dealing with multiple units in a less centralised system.

However, the voluntary market also highlights some of the dangers of a complex unit system with no central tracking system and no standard compliance requirement. There is no guarantee of transparency and information on market volumes and prices is gathered through voluntary interviews with market participants (Ecosystem Marketplace, 2010); although the EU ETS also has no mandatory price disclosure, the standardised nature of EUAs as legal compliance units leads to a uniform price. The large price differences in the voluntary market suggest widely differing levels of offset quality and environmental integrity, though it could be argued that this price discovery is itself a degree of visibility of offset quality. There is no means in such a diverse market to fully track how many units have been created and where they have been consumed. Whilst this is not required for a market servicing voluntary participants, it would not suffice for a system used for meeting legal mitigation objectives. This lack of transparency further highlights the need for comprehensive tracking in international GHG accounting.

7. Conclusions

Market mechanisms are likely to continue to play a role in international climate policy in the future, helping countries to meet climate change mitigation objectives through cost effective international co-operation. Internationally-recognisable tradable units will therefore be required and this paper explores the implications of different post-2012 frameworks on GHG accounting and transfer of units between systems and countries. International emissions trading over as wide a geographic and sectoral range as possible would ensure the pursuit of cost-effective means to achieve necessary emissions abatement after 2012. Further, in order to promote environmental integrity, systems for tracking and accounting for exchange of GHG units must be as robust and transparent as possible.

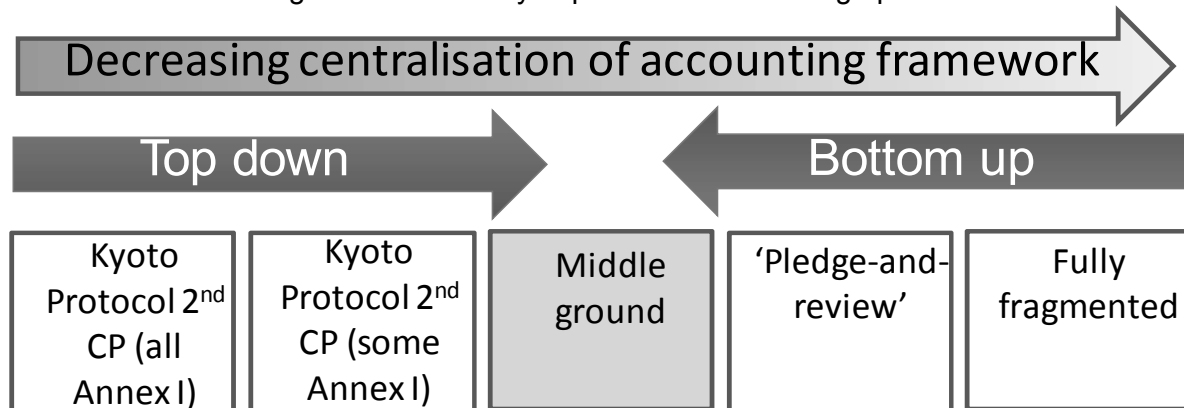
Any post-2012 GHG accounting framework is likely to be more complex than the existing system, as there will be a larger number of GHG unit “currencies” in circulation. This framework will need to accommodate the quantified mitigation goals that have been proposed and adopted by some non-Annex I countries and be able to interact with new GHG unit types that may be introduced both under the UN and directly between Parties, such as bilaterally-agreed offset projects. The country grouping proposed in this paper maintains the distinction between Annex I and non-Annex I countries, on the assumption that only Annex I countries may accept internationally binding national emissions reduction targets. Non-Annex I countries are split into two groups, distinguished as those with quantified mitigation goals, and those without.

A range of options for international regulatory oversight and GHG unit accounting after 2012 is possible, ranging from a continued Kyoto Protocol system to a completely decentralised approach with little international coordination. However, these extremes are unlikely to be viable and the completely decentralised approach in particular is undesirable because it would bring into question comparison of mitigation efforts and raise questions about the environmental and economic integrity of carbon markets themselves. To allow for tracking of emissions reductions with high integrity, the system needs to:

- Be politically acceptable for all Parties;
- Allow for an effective and timely transition from the current system;
- Allow countries to clearly and easily demonstrate achievement of goals and targets;
- Allow Parties to develop their own domestic or regional emissions reduction instruments that could be backed up by or interact with the international system;
- Allow for multiple unit types to be regulated, issued and tracked in a way that is transparent and retains clear environmental integrity;
- Be flexible to accommodate specific needs of individual Parties and to be able to account for future mitigation goals of non-Annex I countries should that become appropriate;

The paper elaborates two options for GHG accounting - a partial Kyoto Protocol system and a country-led pledge-and-review system with common accounting rules – and concludes that the most likely viable option may be the ‘middle ground’ containing elements of both of these models (summarised in figure 13).

Figure 13: Summary of post-2012 accounting options



A scenario involving a Kyoto Protocol commitment period for a limited number of Annex I Parties would provide for a smooth transition from the current system because it would be a simple extension of the Protocol's commitment period. The existing processes for allocation of allowance units could be continued and the ITL could continue to operate to keep track of all international unit transactions relevant to international accounting for both existing and new UN-managed market mechanisms. The UN would maintain control over existing offset mechanisms and could be mandated to develop new mechanisms such as sector crediting with ambitious baselines in certain sectors in key Non-Annex I countries. Maintaining the UN as sole regulator of these mechanisms could allow for a strong guarantee of environmental integrity and, therefore, clearer indication of mitigation achievements.

However, such a system is relatively rigid and inflexible to country requirements, meaning that some Annex I countries would be likely to not participate in the allowance unit system. Assuming such countries retain responsibility to report on progress towards implementation of goals, the process of demonstrating achievement of pledges may become split, with a confusing mixture of some countries using a Kyoto-style reporting of units holdings, whereas non-participating countries would not. Furthermore, a system based on allowance units may prove to be inflexible to recognising mitigation commitments from non-Annex I countries.

A scenario based on pledge-and-review without a common allowance unit would allow countries more flexibility to develop their own strategies for meeting their pledges, specific to individual needs. The bilateral nature of developing offset standards potentially allows for more innovation and dynamism in the use of mechanisms to stimulate increased emissions reduction activity. This model would be more flexible to individual requirements of Annex I countries so would probably not suffer from the heterogeneous nature of a Kyoto system where some Annex I Parties choose not to participate.

Under this model, countries would be responsible for implementing and operating offset and crediting systems on a bilateral basis. Annex I countries would need to demonstrate achievement of pledges through inventory reporting with supplementary information on unit holdings, which would require a high level of transparency of unit transactions even in the absence of a centrally-administered UN transaction log. The environmental integrity of this system would be dependent on both a shared understanding of the scope and content of national pledges, and the tracking system for identifying the nature and volume of emissions unit transactions.

A 'middle ground' option, containing elements of both of these models, may prove to be the likely outcome for a reliable system for GHG accounting. Some suggested building blocks for this model are that:

- Common accounting rules would be agreed to ensure common understanding of the content and scope of pledges, in order to provide a stable platform for international use of offset units.

Experience from the Kyoto Protocol, for example in LULUCF accounting, could inform this process and allow flexibility to encourage participation of a wider group of countries;

- No single common international allowance unit would be used, but that allowance units from domestic or regional trading schemes may be tracked internationally in some cases;
- That the UNFCCC Secretariat would be mandated by the Parties to play an important role in international GHG unit accounting, albeit markedly different from its current role. This could involve defining offset standards or principles for countries to adopt when defining bilateral offset agreements
- That the ITL may continue to operate as a UN-managed system to track transactions, without continuing its Kyoto Protocol role as a verifier of all unit transactions;
- That CDM would continue to operate, but may not be pursued in certain sectors in some countries depending on the conditions of mitigation goals put forward by non-Annex I countries.

Under this ‘middle ground’ system, the UNFCCC institutions could retain important oversight functions. The CDM approval and issuance process would likely continue, albeit restricted to certain sectors and countries. The UNFCCC could also develop an important function as a standard-setting body for international offset standards that countries would be encouraged to adopt for their own offset mechanisms. In this way countries could choose whether to use the standard, but experience with Joint Implementation has shown that if UN procedures are available, it may be in countries’ interest to use them rather than develop their own system from scratch. For the UNFCCC to play this role would maintain the possibility of returning to an allowance-based system in the future.

In such a system, the eligibility of which offset units can be used to meet mitigation objectives in developed countries, as well as whether they can also count towards meeting the host developing country’s emissions goals (including CDM) are essentially matters for political negotiation and interpretation. However, the ability to track all movements of units is crucial, to ensure that no single emission reduction is credited under more than one offset standard, that no double counting of emissions reductions between countries and to maintain transparency over the generation and use of offsets. The quality or environmental standard of the units themselves is linked inherently to the scope, content and ambition of country pledges, and is not the concern of this paper. The quality of units may vary over time through negotiation, but the ability to track transactions is crucial from the outset.

Recent developments in the voluntary carbon market, in particular registry aggregation to allow multiple unit types to be listed and traded through the same registry, might provide useful elements of how increasingly complex unit systems could maintain traceability without UN control. Examples from the financial sector of transaction tracking and data sharing could provide useful precedence. However, safeguards must be put in place to ensure that such a system is not less transparent than the automatic tracking and pre-approval of transactions through the ITL under Kyoto.

In summary, this paper highlights a number of unit accounting issues relevant to the ongoing UNFCCC negotiations. The paper considers elements of what would constitute a functional unit accounting framework, and further work will explore some of these issues in more detail.

ANNEX: Background on GHG accounting in the UNFCCC, Kyoto Protocol, EU ETS and others

Accounting for national emissions under the UNFCCC

All UNFCCC Parties are required to submit national communications to the UNFCCC; the frequency and content of the reports varies significantly between Annex I and Non-Annex I Parties. A detailed analysis of the current and potential future reporting framework has been carried out in Ellis, *et al* (2010). In brief, Annex I Parties currently submit national communications every 3-5 years and annual national inventory reports of anthropogenic emissions. For non-Annex I Parties there is no specified submission timetable after the initial national communication and they are not currently required to provide national inventory reports or projections of future emissions, although some have included elements of both topics in their most recent national communications.

The Cancún Agreements introduced biennial reports for all countries (which, for developing countries, are to include national inventory reports) and specified that non-Annex I Parties should submit national communications every four years (subject to the provision of finance and with additional flexibility for least developed countries and small island developing states).

Kyoto Protocol accounting

Annex I national inventory reports also provide the backbone for establishing compliance of Annex I countries under their Kyoto Protocol commitments, combined with information provided on use of emissions units under the flexibility mechanisms, as described below.

Parties with a commitment under Annex B of the Kyoto Protocol can submit a single inventory report to serve for both the Convention and the Protocol. Furthermore, Annex B Parties are required to demonstrate that they have national systems in place for reliable reporting of emissions estimation, as well as processes for improving estimations where necessary (under Article 5 of the KP).

Much of the detail for the accounting for and transfer of units under the Kyoto Protocol is contained in decisions adopted at CMP 1 in Montreal in 2005 (UNFCCC 2005).

In addition to the national inventory report and information on emissions units, the Kyoto Protocol specifies that Annex B Parties shall submit supplementary information detailing how they are striving to meet their commitments in a way that minimises adverse social, environmental and economic impacts, including impacts on developing countries. Annex B Parties shall also provide information on how each Party's use of the flexibility mechanisms is supplemental to domestic action and on how their policies and measures implemented, including in collaboration with other Parties, to achieve Kyoto Protocol obligations. Parties must also demonstrate steps they have taken to implement any decisions or recommendations on bunker fuel emissions management adopted by IMO or ICAO, should any be relevant; to date, only emissions from domestic aviation are included in the inventory. All other aviation and maritime emissions are not currently counted towards national emissions.

Issuance of Assigned Amount Units (AAUs) and Removal Units (RMUs)

Under the Kyoto Protocol, the National Inventory Report is used to calculate the annual level of emissions for which a Party must submit allowance units and offset credits at the end of a Commitment Period. This Assigned Amount is based on the Party's emissions commitment under Kyoto and their pre-established emissions inventory from a base year (usually 1990), multiplied by the number of years in the Commitment Period (five for the first period).

Once a Party's assigned amount has been reviewed by an expert review team, the Party may issue an equivalent quantity of AAUs into its national registry (registries are described below). The AAU is

the core currency of the Kyoto Protocol and allows for the exchange of emissions units via the Kyoto Flexibility Mechanisms. Each AAU is given a serial number comprising CP number, Party identifier,

The Party may also issue RMUs into its national registry to account for net removals of anthropogenic emissions sequestered by changes in forestry and land-use since 1990. The rules for this are complex and stem from paragraphs 3 and 4 of Article 3 of the KP, which describe how Parties may decide to account for direct human-induced land-use change in both forestry (paragraph 3) and other land-use (paragraph 4). Each Party decides in advance whether to issue RMUs annually during the commitment period or once at the start of the period. RMUs also have a serial number which also includes a reference to the type of activity to which the RMu relates. RMUs issued cannot total more than 1% of annual base year emissions (for the first CP).

Transfer of units under the Flexibility Mechanisms

The Kyoto Protocol allows for exchange of emissions units between Parties under three flexibility mechanisms:

- International Emissions Trading (IET), comprising direct exchange of AAUs between national registries;
- Joint Implementation (JI), exchange of Emission Reduction Units (ERUs) arising from specific project-based emissions reductions within a Kyoto Annex B country; ERUs are converted from existing AAUs so do not lead to any increase in allowance units within the international system;
- Clean Development Mechanism (CDM), import of Certified Emission Reductions (CERs) from specific project-based actions in Kyoto Parties that are not in Annex I; CERs are created in addition to existing AAUs so represent an increase of allowance units in the international system.

To be eligible to transfer units under the mechanisms, Parties must fulfil certain requirements (as listed in Decision 11/CMP1). Each Party must ensure that it:-

- is a Party to the KP;
- has calculated and recorded an Assigned Amount;
- has in place national systems for emissions estimation, according to Art 5 paragraph 1 of KP;
- has a national registry as described below;
- has submitted its most recent required inventory, with quality assessment carried out on those gases and sectors specified in Annex A of the KP; and
- submits all necessary additional information on assigned amounts required to calculate additions and subtractions from the assigned amount (Article 3, mostly concerning LULUCF emissions).

Transfers between national registries are under the responsibility of both Parties (13/CMP1). If a Party authorises other legal entities to transfer or acquire units, such as occurs under the European Emissions Trading Scheme (EU ETS) then the Party still remains responsible for fulfilling its KP obligations.

Each Party with an emissions commitment must at all times retain a commitment period reserve of emissions units, set at 90% of its Assigned Amount as or five times its most recent inventory total, whichever is lower – i.e. if its emissions have dropped below 90% of its original Assigned Amount total then it must have AAUs or other units equivalent to at least the recent emissions level.

Table 5: Detail of Kyoto Protocol unit types

Unit	Name	Description
AAU	Assigned Amount Unit	Allowance unit that is the core currency of the Kyoto Protocol, may be traded directly by International Emissions Trading (IET)
RMU	Removal Unit	A unit representing a tonne of sequestered CO ₂ -equivalent that is subsequently removed from a country's total emissions
ERU	Emissions Reduction Unit	Issued for reductions resulting from Joint Implementation Projects. ERUs are converted directly from AAUs by the Party hosting the project by changing the 'type' in the serial number and adding an identifier for the particular JI project that generated the ERU. Conversions therefore happen directly, rather than one AAU being cancelled and an ERU being created.
CER	Certified Emission Reduction	Issued for reductions resulting from Clean Development Mechanisms projects in non-Annex I countries (excluding forestry projects)
tCER	Temporary Certified Emission Reduction	Issued for all emissions removals occurring from forestry CDM projects <i>since the start of the project</i> . tCERs expire at the <i>end of the Kyoto commitment period following the one in which it was issued</i> . An expired tCER must be replaced by another Kyoto unit. Project developers can choose tCERs or ICERs as a means to reduce risk of non-permanence of forestry projects.
ICER	Long-term Certified Emission Reduction	Issued for emissions removals occurring from forestry CDM projects <i>since the last verification report</i> . ICERs expire at the <i>end of the project crediting period</i> . An expired ICER must be replaced by another Kyoto unit. Project developers can choose ICERs or tCERs as a means to reduce risk of non-permanence of forestry projects.

Functioning of Kyoto registries and the International Transaction Log

Each Party must establish a standardised electronic database known as a registry to ensure the accurate accounting of the issuance, holding, transfer, acquisition, cancellation and retirement of ERUs, CERs, AAUs and RMUs and the carry-over of ERUs, CERs and AAUs. Each Party designates an organisation to administrate its registry and registries can be consolidated, provided that each national account is distinct.

Each registry must hold a number of mandatory accounts:

- Holding accounts for the Party and for all entities authorised to hold units on its behalf;
- At least three cancellation accounts, one for actions concerning LULUCF, one for inconsistencies and one for any other cancellations;
- A retirement account for compliance at the end of the Commitment Period.

Registries are connected to each other via the International Transaction Log, hosted by the UNFCCC Secretariat. The ITL acts to validate that transactions have not infringed Kyoto Protocol accounting rules, as well as recording all transactions.

Transfers are initiated by Parties, or in the case of CDM issuance by the EB, who instruct their registries to move units from one account to another either in the same registry or that of another Party. For a transfer to another registry, the registry initiating the transfer creates a unique transaction

that identifies the transaction as well as the initiating Party and the CP for which the transfer will be relevant to. A record of this is sent to the ITL which forwards it to the receiving registry. The ITL is crucial to the exchange of units between registries and is operated with support from the UNFCCC Trust Fund for Supplementary Activities. The ITL performs an automatic check on the validity of the units, the eligibility of the registries and whether CERs from LULUCF are within the prescribed limits.

If no discrepancy is found, the two registries must notify the ITL and each other of the completion of the transaction. The ITL makes this information publicly available.

Compilation and accounting at the end of a Commitment Period

At the end of the CP, Parties must transfer the correct quantity of mixed units to the retirement account, and may carry-over any remaining units to the following commitment period up to certain limits as follows: ERUs (up to 2.5% of assigned amount, provided they are not converted from RMUs), CERs (up to 2.5%), AAUs (unlimited), but no RMUs may be carried over. Cancellations must be made for alterations to LULUCF emissions subject to the outcome of a formal review process. Voluntary cancellations can also be made by the Party or its authorised entities using the cancellation accounts, but these cannot be used for retirement.

Once the additional time for fulfilling commitments is passed (the true-up period), the Secretariat will launch a database to compile the emissions and the units held by Annex B Parties in order to assess their compliance with the Kyoto Protocol obligations. This will be used to compare the total of AAUs, ERUs, CERs and RMUs (issued by the Party itself) to the Party's reported GHG emissions from relevant sources in Annex A.

Parties will then declare the number of units that it wishes to retire, and the number to carry-over, according to the quantities held in its registry holding account. The database shall record which Parties are eligible to use RMUs, CERs and ERUs and will establish the limits for each type of unit in the database. The Secretariat will separately record the total annual emissions for each Party for each year of the Commitment Period, taking into account amendments arising from the national inventory review process.

The database will also include annual totals for transactions completed by each Party, including acquisitions, issuances, cancellations and retirements. The Secretariat compiles this information into annual reports during the CP and also into a final report at the end of the additional period for fulfilling commitments.

Party reporting of emissions units

In addition to their requirements for emissions reporting through the Inventory Reports, Annex B Parties must also report their use of emissions units annually using an electronic reporting format known as the Standard Electronic Format (SEF) tables. The tables include all types of units held in the Party's registry accounts, including information on tCERs and ICERs prior to their expiry and required replacement. The tables are also used to record conversions of AAUs into ERUs for JI projects (indicating ERUs as 'additions' and AAUs as 'subtractions'). The tables also require significant detail on LULUCF and issuance of RMUs.

The EU ETS and interface with the Kyoto Protocol system

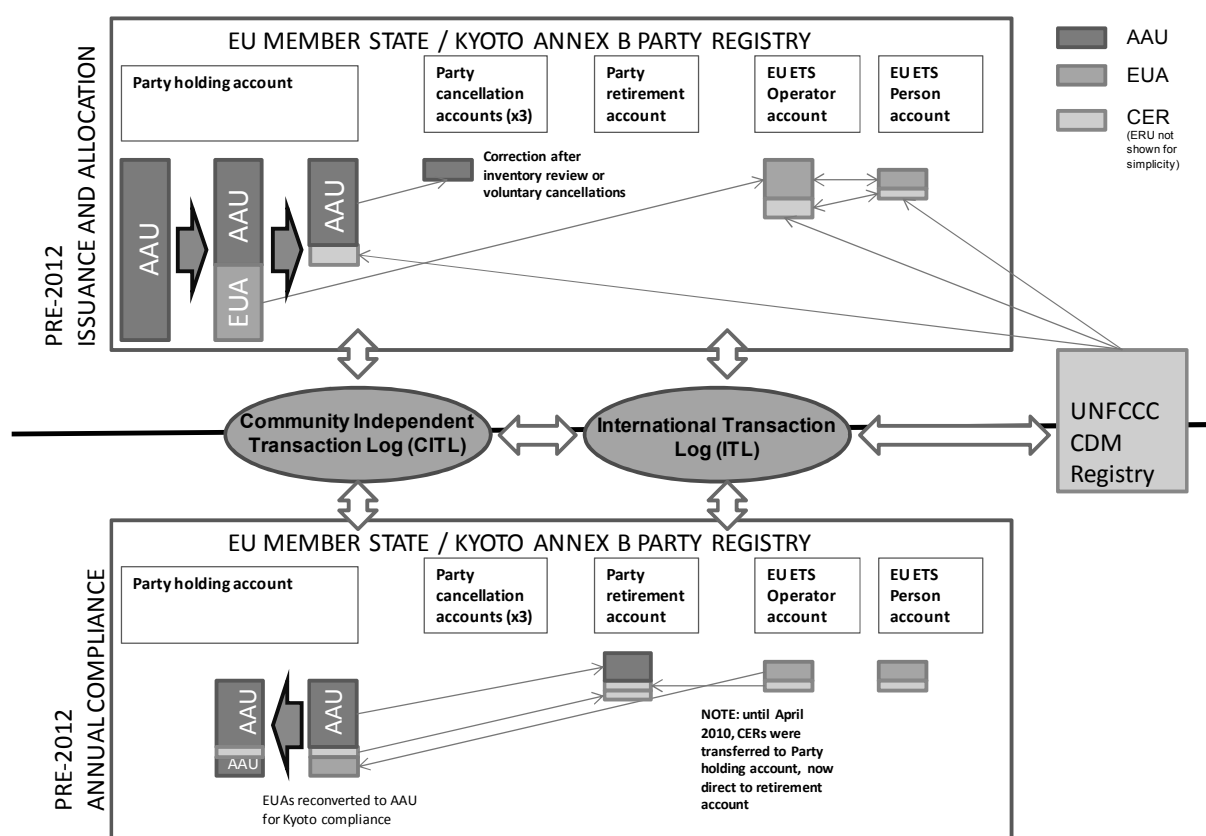
The EU ETS, as the flagship policy for EU Kyoto Parties to meet their international obligations, is integrally linked to the international Kyoto accounting framework. Although it is a mandatory cap-and-trade scheme using its own allowance unit as a trading currency, each European Allowance Unit (EUA) is currently directly converted from a Member State's stock of AAUs (until 2012). Therefore trade of EUAs around Europe is in fact equivalent to trade of AAUs between private entities holding registry accounts in European Party Kyoto Protocol registries, and each of these transactions is

verified by the ITL in the normal way. The Community Independent Transaction Log (CITL), which was set up to handle EU ETS trades before the Kyoto first Commitment Period began (and in fact due to delays in the launch of the ITL, continued to be the principal trading hub until late 2008) is still operational and acts as a back-up system to the ITL, double-checking EU-specific transactions. The European registry system was described in detail in the 'Registries Regulation' agreed in 2004 and modified in 2008 and 2010 (European Commission, 2010). The EU registry system is set to change substantially on 1 January 2012, as described below.

Up to 2012, Parties participating in the EU ETS use their Kyoto Protocol registry for accounting for EUA units. The Registries Regulation instructs each Member State, having had its National Allocation Plan approved by the Commission and entered into the CITL, to convert the equivalent number of AAUs in the Party holding account into EUAs by adding an identifier to the serial number of the AAU. These EUAs are then transferred by the national administrator into operator holding accounts held in the national registry for all relevant installations. EUAs can then be traded between operators, with any transfer between accounts verified and recorded by both the CITL and (since October 2008) the ITL.

Operators can of course comply with annual EU ETS obligations by surrendering either EUAs equivalent to their verified emissions, or a mixture of EUAs and CERs/ERUs with the latter constituting no more than a maximum proportion of emissions as stipulated by each Member State. To demonstrate compliance, operators request the administrator of the national registry of where the installation is located to transfer a specified number of allowances from the operator's holding account to the Party holding account in the same registry. For CERs/ERUs, the operator can request that a specified number of credits be transferred to the Party *retirement* account directly. Prior to 2010, CERs could be transferred to the Party *holding* account in the registry. However, after it emerged in March 2010 that some EU Member States were reselling such CERs to non-European buyers, and that these 'used' CERs were being sold back into the EU-ETS via brokers, the Commission made amendments to the Registries Regulation to prevent this occurring. It is now stipulated that when a CER is transferred from the commercial operator to the Member State, it must pass directly into the retirement account in the Party registry, therefore being only eligible for use as part of the national Party's Kyoto compliance strategy and not for re-export out of Europe.

Figure 14: Unit movements in the EU-ETS before 2012



Source: Authors, based on information from European Commission, 2010

EU ETS Registries after 1 January 2012

After 1 January 2012, for the last year of the current phase of the ETS and for the subsequent phase, the EU ETS registry system will be designed differently, as detailed in European Commission, 2010. The change is required for the start of 2012, rather than 2013, to accommodate the introduction of aviation operators into the EU-ETS from 1 January 2012. As only emissions from domestic aviation emissions are covered by Kyoto commitments, the majority of allowances for aircraft operators' emissions in Europe cannot be linked to national Kyoto Protocol AAUs in the way that EUAs have been to date. This means that EUAs issued to aircraft operators (known as Chapter II allowances after their position in the revised ETS directive) must be kept distinct from regular EUAs for stationary installations (Chapter III allowances). Whilst aviation operators can use both types of EUA for compliance, regular stationary operators can ONLY use Type III allowances.

To accommodate this change, EUAs will now be held in a central Union registry with accounts nominated for each relevant Party and for each operator, individual and verifier active in the scheme. Member States will continue to operate their own Kyoto Protocol registries to account for AAUs and other Kyoto units, and the Union will also have its own KP registry for handling Kyoto units.

National Allocation Plans will now be held centrally by the EU Transaction Log (EUTL), the new name for the CITL. Once the NAPs are finalised, Member States will be obliged to place a number of AAUs equivalent to their total EU ETS allocation into a designated "ETS AAU Deposit Account" held in the Member State KP registry. They will then issue the same quantity of EUAs into their National Allowance Holding Account in the Union registry. In this way, although EUAs are no longer directly converted from AAUs as they are before 2012, they are still in effect backed-up by the AAUs placed into the deposit account. Once in the National Allowance Holding Account, the Member State can then transfer allowances to installations via their operator holding accounts also in the Union registry; these can also be delivered by auction for certain sectors from 2013. The aviation sector will

have its allocation plan held centrally in the Union account for the entire European sector. Once finalised, each Member State will be responsible for issuing specific Chapter II allowances into holding accounts for aircraft operators held in the Union registry. Operators and other entities are then free to trade both types of allowances, as well as to purchase CERs via the CDM registry, with all transactions being recorded in both the EUTL and the ITL.

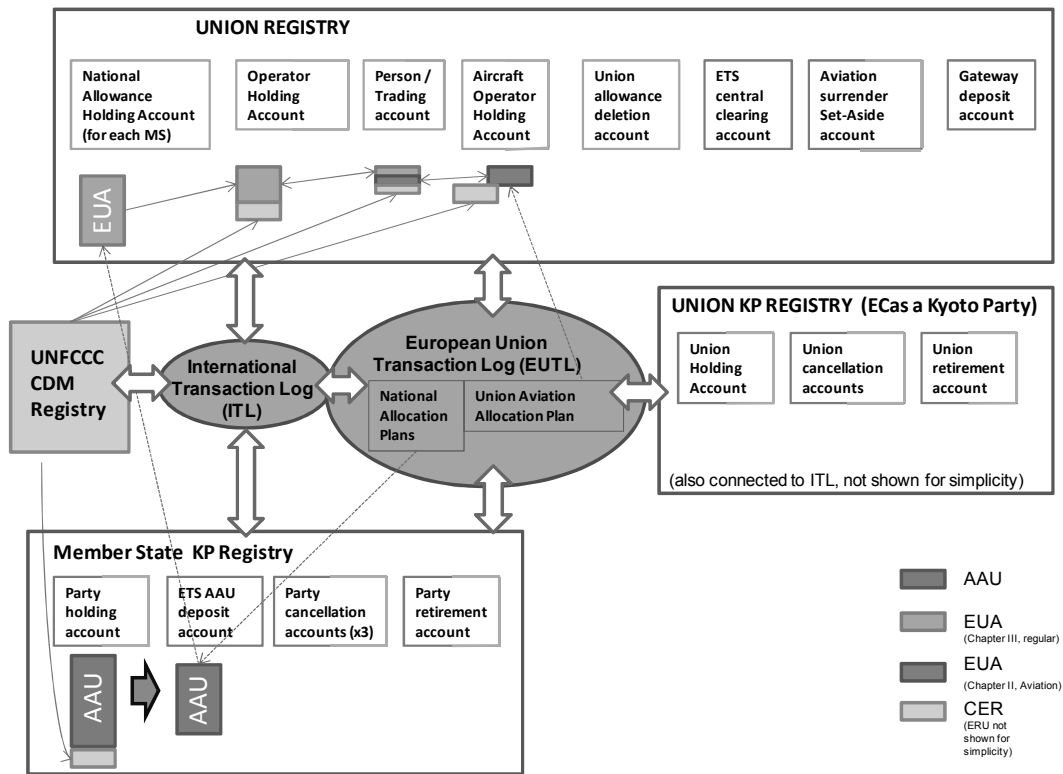
The need to keep aviation allowances distinct means that the compliance process is much more complex than the existing system. For stationary operators, allowances are surrendered by requesting that EUAs be transferred from the operator holding account into the Union Allowance Deletion account, both within the Union registry. At the same time, if the operator wishes to use CERs or ERUs for compliance then these are transferred from the operator holding account in the Union registry to the Party's holding account in the Member State's own KP registry. For operators within countries that have not made Kyoto Protocol commitments and therefore do not have KP registries – currently Malta and Cyprus – the CERs or ERUs are instead transferred from the operator holding account to the Union cancellation account in the Union's KP Registry (which is distinct from the main Union registry for allowance trading). If aviation operators wish to use CERs or ERUs for compliance, these units are transferred not to the KP registry of the Party, but instead to the Aviation Set-Aside account in the Union registry.

The fact that EUAs are no longer created directly by converting AAUs means that safeguards must be put in place to ensure that the number of units in each Member State's AAU deposit account matches the number of EUAs held by operators under its jurisdiction. This will be done by a clearing system whereby on 1 June each year, after EU ETS operators have surrendered necessary allowances for the year, any country that has operators still with EUAs in their accounts, should transfer the equivalent number of AAUs from the Member State AAU deposit account into a central Union clearing account in the Union registry. These allowances will then be transferred to the AAU Deposit Accounts of countries whose operators have surrendered more allowances than were issued to them at the start of the year.

Furthermore, if aviation operators have in part used Chapter III EUAs to meet their compliance obligations, each Member State must transfer the equivalent number of AAUs from its holding account into the Aviation Set-Aside account. This is to maintain the integrity of the system given that most aviation emissions are not covered by Kyoto. The Set-Aside account is then used to transfer AAUs BACK to member states to account for domestic aircraft operation emissions because these are covered by the Kyoto Protocol. If there is a shortfall of AAUs in the set-aside account, CERs will also be used for this purpose, and if there is still a shortfall then the overall quantity returned to Member States will be reduced. The complexity of this process highlights the difficulty of maintaining a close link between a sub-national trading scheme and an international UN allowance unit when the sectoral scope of the two is not the same.

Figure 15: Allocation and issuance unit movements in the EU-ETS from 1 Jan 2012

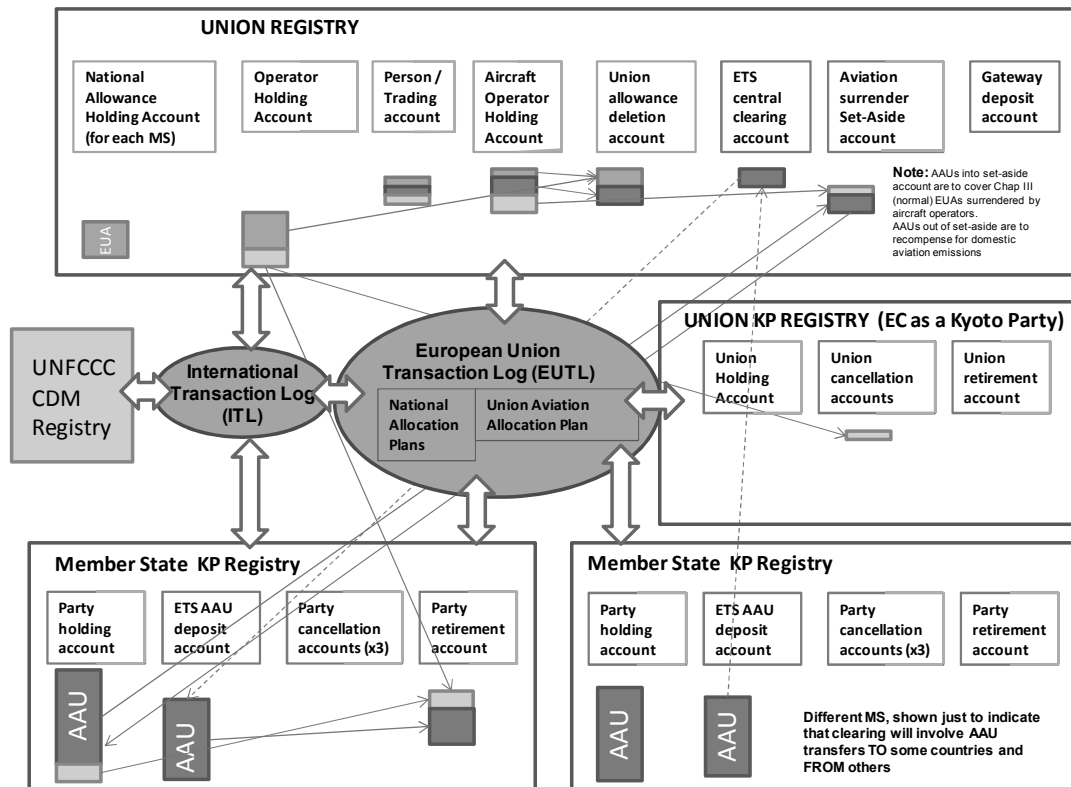
Allocation and issuance process from 1 Jan 2012



Source: Authors, based on information from European Commission, 2010

Figure 16: Compliance unit movements in the EU-ETS from 1 Jan 2012

Compliance process from 1 Jan 2012



Source: Authors, based on information from European Commission, 2010

Role of Project-based Mechanisms in GHG accounting

Although superficially similar, the two Kyoto Protocol project mechanisms, CDM and JI, present very different implications for GHG accounting.

Both mechanisms require individual projects to calculate their impact on emissions levels against a baseline that represents the emissions situation that would have occurred in the absence of the project. Project proponents must also demonstrate that the project would not or could not have occurred without revenue from the carbon credits earned.

Thereafter, the accounting procedures differ greatly. Each CDM project is overseen by a UN-appointed Executive Board that approves the registration of the project. Once an approved project is constructed and operating it can apply *ex-post* for issuance of CERs equal to its emissions reductions. Should the CDM EB approve the application, the CERs are issued in a special CDM registry 'pending' account, prior to being transferred to the holding account of the project participant, who will have a registry account hosted within one of the national Party registries. In this way the CDM EB creates units that are supplemental to AAUs already in circulation, so its role is not unlike that of a central bank creating money.

JI projects can either be managed entirely by the host country government (track 1), should the government have UN approval to do so, or be overseen by another UN panel, the Joint Implementation Supervisory Committee (JISC), track 2. The JISC functions in a similar fashion to the EB, with the crucial difference that it does not itself issue carbon credits – it simply authorises host country governments to do so. Once this authorisation is given (or, in Track 1, when the host country is satisfied that the emissions reductions have been verified), the host country converts existing AAUs into ERUs according to the procedure described above. There is therefore no net increase in the number of emissions allowance units circulating in the international system.

These differences are particularly marked from the point of view of the host country. For JI, by issuing ERUs to a project a host country is effectively reducing its available stock of AAUs, therefore even though the project has acted to reduce host country emissions, the Party is no closer to meeting its Kyoto commitment. Nevertheless, the emissions reduction will be reflected in the next National Inventory Report. In CDM, the issuance of credits has no impact at all on the host country's emissions accounting profile; non-Annex I countries are not required to compile a detailed national inventory report. CDM therefore relies on its 'additionality' test to ensure that global emissions have not in effect increased due to the issuance of CERs that are supplemental to existing AAUs.

Non-Kyoto Units

As described in the main text there are a number of carbon credit and allowance units issued by independent bodies that are outside the UNFCCC system. These include:

- voluntary verified emissions reductions (VERs) sold internationally and used generally for voluntary offsetting of emissions by private sector bodies;
- voluntary or mandatory sub-national cap and trade schemes in countries that are not, or were not until recently, Annex B Parties in the Kyoto Protocol.

There are a number of certification standards for verifying and assuring the quality of VERs. The two most important internationally are the Gold Standard and the Voluntary Carbon Standard (VCS), and both have operational registry systems. The Gold Standard Registry is operated by the data company APX and, although it is primarily designed to track the life cycle of individual Gold Standard VERs, it also contains information on CERs that have been certified by the UN CDM EB but which also bear the Gold Standard kite mark for quality. The VCS registry system is split between independent operating companies, all connected to a central VCS project database, which allows for buyers to choose which company to open an account with. Both Gold Standard VERs and Voluntary Carbon Units (VCUs) are similar in format to CERs, in that they represent an emissions reduction of 1 tonne

of CO₂ equivalent with assurance that this reduction would not have occurred in the absence of the project. In this way the project databases and registries are analogous to the CDM Registry and Party Kyoto Protocol registries used under the UNFCCC.

In the US, the Climate Action Registry, American Carbon Registry and CCX dominate the market. CCX is no longer operating as an active market, but previously its basic unit was a Carbon Financial Instrument (CFI), equivalent to 100tCO₂, and contracts for CFIs could contain both allowances and offsets. Participation in the scheme was voluntary but legally binding for those involved. Allowances were allocated for free via a 'grandfathering' procedure and an agreed emissions reduction trajectory. Offsets were determined according to CCX-specific rules and could comprise both US and international projects, though most have been US-based projects. The CCX ran its own registry to oversee all trading of CFIs, and this was integrated with an electronic trading platform to allow participants to trade in both allowances and offsets. All allowances and offsets are serialised to ensure that units cannot be used twice or double-counted.

Although non-Kyoto units do not affect current Kyoto Protocol accounting, such schemes could become have a bearing on post-2012 international accounting in two ways, as discussed in the main text. Tradable units from sub-national schemes may become an important tool for countries to meet post-2012 mitigation objectives, and the voluntary market system may provide useful lessons for a less centralised market after 2012.

Glossary

AAU	Assigned Amount Unit
AB32	California Global Warming Solutions Act of 2006
ACR	American Carbon Registry
AGF	UN Secretary General High-level Advisory Group on Finance
AI	Developed countries listed in Annex I of the UNFCCC
Annex B	Annex to the Kyoto Protocol listing countries with binding commitments
Annex I	Annex to the UNFCCC listing developed countries
AWG-KP	Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol
AWG-LCA	Ad Hoc Working Group on Long-term Cooperative Action under the UNFCCC
BAU	Business As Usual
CAR	Climate Action Registry
CCX	Chicago Climate Exchange
CCXG	OECD/IEA Climate Change Expert Group
CDM	Clean Development Mechanism
CER	Certified Emission Reduction from CDM (also ICER - long-term CER, tCER - temporary CER)
CESR	Committee of European Securities Regulators
CFI	Carbon Financial Instrument
CITL	Community Independent Transaction Log (for EU ETS)
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
COP	Conference of the Parties to the UNFCCC
CP	Commitment Period (of the Kyoto Protocol)
CRT	Climate Registry Tonnes
EB	Executive Board (of the CDM)
EC	European Commission
ERT	Expert Review Team
ERU	Emission Reduction Unit (from JI projects)
EU ETS	European Union Emissions Trading System
EUA	EU Allowance Unit
EUTL	European Union Transaction Log (new name for CITL from 2012)
GDP	Gross Domestic Product
GHG	Greenhouse Gas
Group A	In this paper, non-Annex I countries who have put forward quantified national mitigation goals
Group B	In this paper, non-Annex I countries who have not put forward quantified national mitigation goals
GS	Gold Standard
HFC	Hydro fluorocarbon
ICA	International Consultation and Analysis
ICAO	International Civil Aviation Organization
IET	International Emissions Trading

IETA	International Emissions Trading Association
IMO	International Maritime Organization
ISO	International Organisation for Standardisation
ITL	International Transaction Log
JI	Joint Implementation
JISC	Joint Implementation Supervisory Committee
KP	Kyoto Protocol
LDC	Least Developed Country
LULUCF	Land Use, Land Use Change and Forestry
MiFID	Markets in Financial Instruments Directive (EU)
MRV	Measurable, Reportable and Verifiable
MW	Mega-watt (1 MW = 10 ⁶ J s ⁻¹)
N ₂ O	Nitrous Oxide
NAI	Developing countries that are not listed in Annex I of the UNFCCC
NAMA	Nationally Appropriate Mitigation Action
NAP	National Allocation Plan (for EU ETS allocation)
NC	National Communication
NIR	National Inventory Report
NZU	New Zealand Unit
PAT	Perform, Achieve and Trade (India)
PoA	Programme of Activities (under the CDM)
QELRO	Quantified Emission Limitation or Reduction Objective
REDD	Reducing Emissions from Deforestation and Forest Degradation
REDD+	REDD projects including measures for conservation, sustainable management of forests and enhancement of forest carbon stocks
GGI	Regional Greenhouse Gas Initiative (ETS in the north-eastern US states)
RMU	Removal Unit
SBSTA	Subsidiary Body for Scientific and Technological Advice
SEF	Standard Electronic Format
SWIFT	Society for Worldwide Interbank Financial Telecommunications
TREM	Transaction Reporting Exchange Mechanism
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard
VCU	Voluntary Carbon Unit (from VCS)
VER	Verified Emissions Reduction
WBCSD	World Business Council for Sustainable Development
WCI	Western Climate Initiative

References

- Aasrud, A., R. Baron and K. Karousakis (2010), *Market Readiness: Building blocks for market approaches*. OECD/IEA project for the Climate Change Experts Group on the UNFCCC <http://oecd.org/dataoecd/30/14/46563135.pdf>
- AGF (2010) *Report of the Secretary-General's High-level Advisory Group on Climate Change Financing*. United Nations. http://www.un.org/wcm/webdav/site/climatechange/shared/Documents/AGF_reports/AGF%20Report.pdf
- Baker A. *et al* (numerous contributors, 2010). *Interpreting emissions pledges: the need for a common accounting framework*. Climate Strategies Working Paper <http://www.climatestrategies.org/research/our-reports/category/59/237.html>
- Baron, R. and J. Pershing (2002), "Trading Greenhouse Gases Outside Kyoto", IEA Information Paper, <http://www.iea.org/papers/2002/partynonparty.pdf>
- Baron R., B. Buchner and J. Ellis (2009) *Sectoral Approaches and the Carbon Market*. OECD/IEA information paper. COM/ENV/EPOC/IEA/SLT(2009)3 <http://www.oecd.org/dataoecd/8/7/42875080.pdf>
- Baron R., I. Barnsley and J. Ellis (2008): *Options for integrating sectoral approaches into the UNFCCC*. OECD/IEA information paper. COM/ENV/EPOC/IEA/SLT(2008)3. <http://www.oecd.org/dataoecd/53/15/41762381.pdf>
- Casella H., A. Delbosch and C. de Perthuis (2010): *Cancún: year one of the post-Copenhagen era*. CDC Climat Research, Climate report no.24 http://www.cdcclimat.com/IMG/pdf/10-10-20_Climat_Report_no24_Cancun_year_one_of_the_post-Copenhagen_era.pdf
- Corfee-Morlot, J., B. Guay and K.M. Larsen (2009), *Financing for Climate Change Mitigation: Towards a Framework for Measurement, Reporting and Verification*, OECD/IEA Information Paper, <http://www.oecd.org/dataoecd/0/60/44019962.pdf>
- Dellink, R.B. *et al* (2010), "Towards Global Carbon Pricing : Direct and Indirect Linking of Carbon Markets", *OECD Environmental Working Paper No.20*, 2010. <http://www.oecd-ilibrary.org/docserver/download/fulltext/5km975t0cfr8.pdf?expires=1298914840&id=0000&accname=guest&checksum=28B537B0F965820FB8CFE1CE43C46609>
- Ecosystem Marketplace (2010), *Building Bridges: State of the Voluntary Carbon Markets 2010* http://moderncms.ecosystemmarketplace.com/repository/moderncms_documents/vcarbon_2010.2.pdf
- Ellis, J., G. Briner, S. Moarif and B. Buchner (2011), *Frequent and Flexible: Options for Reporting Guidelines for Biennial Reports*, OECD Publishing/IEA, DRAFT.
- Ellis, J. and S. Kamel (2007), *Overcoming Barriers to Clean Development Mechanism Projects*, OECD/IEA Information Paper <http://oecd.org/dataoecd/51/14/38684304.pdf>
- Ellis, J., S. Moarif and G. Briner (2010), *Core Elements of National Reports*, OECD/IEA Information Paper <http://oecd.org/dataoecd/28/32/45409866.pdf>
- Ellis J. and D. Tirpak (2006), *Linking GHG emission trading schemes and markets*, OECD/IEA Information Paper. COM/ENV/EPOC/IEA/SLT(2006)6 <http://www.oecd.org/dataoecd/45/35/37672298.pdf>
- EC (European Commission) (2010), *Commission Regulation (EU) No 920/2010 for a standardised and secured system of registries pursuant to Directive 2003/87/EC(...)*, Official Journal of the European Union 270/1, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:270:0001:0052:EN:PDF>
- EC (2011), *Emissions trading: Commission welcomes vote to ban certain industrial gas credits*, Press Release <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/56>
- Erickson P. and M. Lazarus (2011), *The Implications of International Greenhouse Gas Offsets on Global Climate Mitigation*. Stockholm Environment Institute, Working Paper WP-US-1106 http://sei-us.org/Publications_PDF/SEI-WorkingPaperUS-1106.pdf

- EU (European Union) (2009), *Directive 2009/29/ec of the European Parliament and of the Council*, Official Journal of the European Union L.140/63. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:en:PDF>
- Guigon, P. (2010) *Voluntary carbon markets: how can they serve climate change policies*. OECD Environmental Working Paper no.19, OECD publishing.
- Hood C. (2010) *Reviewing existing and proposed emissions trading systems*. IEA Information Paper http://www.iea.org/papers/2010/ets_paper2010.pdf
- IETA (2010a) *MRV considerations for offset projects*. <http://www.ieta.org/assets/Reports/mrv%20considerations%20for%20offset%20projects-web.pdf>
- IETA (2010b) *The state of the CDM 2010: Focusing on efficiency*. <http://www.ieta.org/assets/Reports/ieta-the-state-of-the-cdm-2010.pdf>
- Kollmuss A., M. Lazarus, C. Lee, M. LeFranc and C. Polycarp (2010) *Handbook of Carbon Offset Programs: Trading Systems, Funds, Protocols and Standards*. Earthscan publishing. ISBN 9781844079292
- Levin K. and R. Bradley (2010) *Comparability of Annex I Emission Reduction Pledges*. World Resources Institute working paper. http://pdf.wri.org/working_papers/comparability_of_annex1_emission_reduction_pledges_2010-02-01.pdf
- Levin, K., Tirpak, D., Daviet, F. and Morgan, J. (2010). *Remedying Discord in the Accord: Accounting Rules for Annex I Pledges in a Post-2012 Climate Agreement*. Working Paper. Washington, D.C. World Resources Institute. http://pdf.wri.org/working_papers/remedying_discord_in_the_accord.pdf
- Point Carbon (2010) *Brazilian, Mexican Redd projects to supply California*. News article <http://www.pointcarbon.com/news/1.1486265>
- Project Catalyst (2010) *Taking stock – the emission levels implied by the pledges to the Copenhagen Accord* http://www.project-catalyst.info/images/publications/project_catalyst_taking_stock_february22_2010.pdf
- Tokyo Municipal Government (2010), *Tokyo Cap-and-Trade Program* http://www.kankyo.metro.tokyo.jp/en/attachement/Tokyo-cap_and_trade_program-march_2010_TMG.pdf
- UNEP/RISOE (2011) *CDM/JI Pipeline Analysis and Database, March 1st 2011*, available at <http://www.cdmpipeline.org>
- UNFCCC (2010a), *Outcome of the work of the Ad Hoc Working Group on long-term Cooperative Action under the Convention*. Draft Decision -/CP16. Advance unedited version. Available at http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_lca.pdf
- UNFCCC (2010b), *Annual report of the Joint Implementation Supervisory Committee to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol*, Presented to the 6th Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol <http://unfccc.int/resource/docs/2010/cmp6/eng/09.pdf>
- UNFCCC (2011a), *Compilation of information on nationally appropriate mitigation actions to be implemented by Parties not included in Annex I to the Convention*, FCCC/AWGLCA/2011/INF.1, <http://unfccc.int/resource/docs/2011/awglca14/eng/inf01.pdf>
- UNFCCC (2011b) *Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention*, FCCC/SB/2011/INF.1, <http://unfccc.int/resource/docs/2011/sb/eng/inf01.pdf>
- USAID (2010), *US REDD+ Programmes: Addressing Climate Change by Conserving and Restoring the World's Forests*, Strategy Brochure http://www.usaid.gov/our_work/environment/climate/docs/UnitedStatesREDD+Brochure.pdf