

## ***The role of the Carbon Market in proposals for addressing climate change post-2012***

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**November 2005**



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## **GLOSSARY OF KEY TERMS**

AAU	Assigned Amount Unit, an emissions unit under the Kyoto Protocol
Annex B country	Annex B of the Kyoto Protocol is a list of industrialised countries; they must also then ratify the Kyoto Protocol
CDM	The Clean Development Mechanism, a provision described in Article 12 of the Kyoto Protocol that allows tradable credits to be generated through projects in developing countries that can be used by industrialised countries for compliance with their Kyoto commitments
CER	Certified Emission Reduction, an emissions unit under the Kyoto Protocol
cp1	First commitment period of the Kyoto Protocol, 2008-2012
EIT	Economies in transition countries in eastern Europe
Emissions trading	In its general usage a system where emissions units can be traded and ultimately used by some actor (government or private entity) to comply with a commitment in an emissions management programme
Emissions unit	A general term to describe the commodity of trade in an emissions trading system, normally 1 tonne of carbon dioxide equivalent but with names and attributes specific to the trading system in question
ERU	Emissions Reduction Unit, an emissions unit under the Kyoto Protocol
EUA	EU Allowance, an emissions unit under the EU ETS
EU ETS	The European Union Emissions Trading Scheme, a domestic entity-level cap and trade scheme implemented from 1 January 2005
GHGs	Greenhouse gases, in the context of climate change policy mostly meaning carbon dioxide (CO <sub>2</sub> ), methane (CH <sub>4</sub> ), nitrous oxide (N <sub>2</sub> O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF <sub>6</sub> )
Kyoto Protocol	A protocol under the UN Framework Convention on Climate Change where, inter alia, industrialised countries took on binding commitments to reduce emissions in a first commitment period, 2008-2012
LULUCF	Land use, land use change and forestry, often considered as a sector in emissions management programmes
NAP	National Allocation Plan, a feature of the EU ETS
P&Ms	Policies and measures, a term used generally at either international or domestic levels to describe elements of a management programme prescribed by governments
Carbon market	An emissions trading market for greenhouse gas (GHG) emissions, sometimes limited to just CO <sub>2</sub>



## **EXECUTIVE SUMMARY**

For many governments and firms worldwide, the carbon market and emissions trading have become a central means to manage the financial risks and opportunities in complying with greenhouse gas emissions obligations. For some countries these new mechanisms could provide opportunities to mobilise significant inward investment for ‘climate friendly’ actions. Carbon funds totalling over US\$3.7 billion have been assembled by governments and multilateral and private banks.

Statements from the G8 Gleneagles Summit and by the World Economic Forum’s G8 Climate Change Roundtable have clearly endorsed market based approaches and called for more work on emissions trading mechanisms. Given the expectations set out by these world political and business leaders, and the emergence of a major new financial market activity, it is therefore timely to review proposals from the ‘post-2012’ climate change policy community and ask: *How would these ideas work with the carbon market? How could the carbon market work for these ideas?*

In its generic usage, *emission trading* includes two main types of policy frameworks, ‘cap and trade’ and offsets (or credit) trading. These frameworks can exist at international, national and sub-national (regional) levels. The Kyoto Protocol includes both at the international level. Its Article 17 is an example of cap and trade established at a country level; Article 12, the Clean Development Mechanism (CDM), is a credit-based programme. There is also a range of examples of both types at national and sub-national levels.

The European Union Emissions Trading Scheme (EU ETS), a multi-nation, industry-based cap and trade programme, involves some 11,500 EU installations and dominates the international carbon market after barely one year in operation. But there are at least eight existing carbon markets (or programmes) internationally that can be seen as functionally different in one or more key ways. The underlying drivers for, and access to, the markets, and hence potential participation of buyers and sellers, are sufficiently discrete that the values for a tonne of carbon reduced or sequestered may be quite different. More programmes are imminent, including some state/region-level programmes in non-Kyoto countries.

Depending on the ‘actors’ in question, there is a range of reasons that carbon market emissions trading mechanisms are favoured over more prescriptive policies. The provision of *where* and *when* flexibility is key. Costs can be reduced and financial resources mobilised. Under some policy designs, it is possible to provide financial incentives that equalise the opportunity cost across emitters in different sectors and countries without necessarily imposing costs on emitters. This is important in establishing equitable policy frameworks. The flexibility provided by the range of tools in the carbon market mechanisms ‘toolkit’ available to international and domestic policymakers is probably the primary reason for the appeal of carbon market mechanisms.



A wide range of ideas for 'post-2012' climate change policy regimes has been proposed in informal think tanks, dialogues, workshops, conferences and general climate change literature, as described in recent summary pieces of literature. Working from these descriptions, this paper assesses the proposed policies by using a range of practical questions focusing on two key issues:

- (1) How might an international carbon market develop and function in practice?
- (2) Would this result in economically efficient outcomes, and be effective in mobilising investment in climate friendly actions and providing 'market pull' for development of new technologies?

This assessment shows that most proposals could line up behind one or other of two general international policy models that would involve a carbon market and potentially aim for similar outcomes:

- (A) a quantitative, international emissions trading-based model; and
- (B) a 'policies and measures (P&Ms) plus market' and international fund model.

Much more literature exists on the 'A type' model. Indeed, P&Ms proposals do not typically add the 'plus market' elements – essentially offsets/credit-based schemes. But they could do so.

An 'A type' policy framework would represent an evolution of the current international framework established by the Kyoto Protocol mechanisms. A 'B type' policy framework would represent a major transformation. The approach seeking to coordinate or agree on mandatory P&Ms at an international level was essentially rejected during the Kyoto negotiations, and there has been very little effort since to explore such an approach. However, the 'plus market' elements have been a common feature of environmental management programmes in some countries for decades.

An 'A type' policy framework does not need to be as constrained as the Kyoto Protocol in terms of how emissions commitments are framed. It could be much more flexible, with a mix of the following:

- binding fixed emission limits for industrialised countries, potentially combined with price caps
- for industrialised countries not able to agree to the above, binding fixed or dynamic emission limits for some sectors in some regional groupings – or possibly economy-wide binding dynamic emission limits
- binding transnational sectoral emission limits (fixed or dynamic) for some key sectors represented by multinational 'operators' such as cement, steel and aluminium (with these sources excluded from any national or regional emission limits)
- for developing countries, individually customised voluntary 'no lose' sectoral crediting baselines in sectors for which these countries seek to attract major investment in clean



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technology consistent with national sustainable development priorities, and for which the scope of a project-based mechanism is inadequate

- a project-based crediting mechanism to provide coverage of emission reduction/sink enhancement activities otherwise not covered.

This diverse mix is assembled (for illustrative purposes) because it responds to many of the concerns raised about the existing Kyoto framework – in particular, around wider participation through greater flexibility of commitment forms, and getting beyond the CDM project-based model for developing countries.

The other key finding of the assessment is that domestic policies play an equal, or even greater, role as an international enabling framework in the creation and functioning of a carbon market. This is because the engagement of private entities in the market and their exposure to a carbon price emerging from international transactions will mostly depend on the policies of national governments. This engagement is key. Private actors, not governments, generally know best what opportunities exist to most cost effectively reduce emissions, or enhance sequestration by sinks. This involves both location and timing. It depends on where individual firms, sectors and countries are in terms of their capital investment cycle, the market penetration of energy efficiency technologies, and natural resource endowments. It also depends on the nature of countries’ economies, state of development and emission profiles.

The theoretical least cost outcome for a given amount of emission reductions from global aggregate emissions would occur if all emitters (individuals, firms, sectors and countries) were exposed to the same mitigation abatement cost curve together. This is what ‘equalising marginal costs’ is all about. Of course, practical considerations such as transaction costs and other socio-economic (and political) factors cloud this ‘pure’ theoretical vision. But this does not detract from the overall point that the more individual emitters’ decisions can be influenced by a common international price of carbon, the more the theoretical, cost-effective ideal will be approached, and the more easily the international community will move towards more significant reductions of greenhouse gas emissions. A range of market-based policies can be implemented within countries to do this.

An additional consideration on the role of national policies is what might be termed ‘the division of responsibility’ between the public and private sectors. Very different policy outcomes can be envisaged in terms of the distribution of costs in mobilising investment in climate friendly technology in major capital investments occurring worldwide. This is likely to be a key issue in the ongoing development of international and domestic climate change policy.



## **SECTION 1: INTRODUCTION AND CONTEXT**

Between 2002 and 2005, the emissions trading market for greenhouse gas (GHG) emissions – known as the **carbon market** – has moved from being a small ‘speculative Kyoto’ or ‘non-Kyoto’ market to a market where trades are now monitored on a daily basis by a large international emissions trading business sector. The advent of the EU ETS potentially means that for some 11,500 installations in Europe, emissions trading has become a central means to manage the financial risks and opportunities in complying with GHG emissions obligations.

Governments in Europe and elsewhere in the world are actively turning to the carbon market to begin to manage their Kyoto compliance risks and avail themselves of opportunities to mobilise inward investment for ‘climate friendly’ actions. Carbon funds totalling over US\$3.7 billion have been assembled by governments and multilateral and private banks.

In the US and Australia, state governments are heralding emissions trading initiatives independent of their central governments’ policies and Kyoto. There are also discussions about possible linkages of such markets with the Kyoto market.

The May 2005 *CarbonExpo* organised by the International Emissions Trading Association (IETA) had over 1500 carbon market professionals discussing the current state of affairs and where policy is headed, and doing financing deals for emission reduction activities worldwide.

So it is not surprising that in the statement of the **World Economic Forum’s G8 Climate Change Roundtable** just prior to the G8 Gleneagles summit, one of the key principles proposed to guide future strategy for climate mitigation was

*Policy frameworks that use market-based mechanisms to set clear, transparent and consistent price signals over the long term offer the best hope for unleashing needed innovation and competition.*

The small list of what the WEF Roundtable urged the G8 governments to do included:

- *Establish a long term, market-based policy framework extending out to 2030...*
- *Define greenhouse gas emissions rights through a cap and trade system or other market-based mechanisms...*

In turn, G8 leaders in their **Gleneagles Plan of Action on climate change, clean energy and sustainable development** supported a market-based approach to finance the transition to cleaner energy. The policy approach for reductions in greenhouse gas emissions specifically flagged for further attention was “*tradable certificates and trading of credits*”. Also given special mention was “*project-based and voluntary offset mechanisms*”.

Other parts of the G8 Plan of Action noted the opportunity afforded by the estimated \$16 trillion needing to be invested in the world’s energy systems in the next 25 years. As the WEF G8 Roundtable noted, “*We*



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*must adjust our thinking about actions to reduce emissions of greenhouse gases – to see them as adding real, long term value, not simply imposing costs.”*

Formal multilateral negotiations on addressing the risks of climate change post-2012 are expected to begin in 2005. The eleventh Conference of the Parties to the UNFCCC (COP11) will be held in Montreal, Canada on 28 Nov-9 Dec 2005. It is noteworthy that another outcome of the Gleneagles G8 meeting was the acknowledgement that *“the UNFCCC is the appropriate forum for negotiating future action on climate change”*.

In addition, the companion statement by five major developing countries<sup>1</sup> who participated in the Gleneagles G8 summit *“urged G8 leaders and the international community to devise innovative mechanisms for the transfer of technology and to provide new and additional financial resources to developing countries under the UNFCCC and Kyoto Protocol”*.

Given the expectations set out by these world political and business leaders and the emergence of a major new financial market activity, it is therefore timely to see how proposals from the ‘post-2012’ policy community connect or fail to connect with the carbon market.

The primary purpose of this study is to analyse the now wide array of proposals included in reports of post-2012 initiatives and literature through the lens of two key questions: *How would these ideas work with the carbon market? How could the carbon market work for these ideas?*

This report is organised as follows:

- **Section 2** starts with a general discussion about emission trading and how this relates to the carbon market. It then explores why carbon market mechanisms are favoured by a range of ‘actors’. Finally it describes the carbon market and its prospects to 2012. An understanding of these issues and ‘base’ settings help to assess and consider issues for the post-2012 period.
- **Section 3** summarizes the proposals for a post-2012 international climate change regime that are assessed.
- **Section 4** outlines a number of key assessment criteria that have been chosen to elucidate the issues that arise in responding to the study’s two key questions.
- **Section 5** provides a discussion on a number of key themes, issues and insights that emerged from the assessments that are detailed in **Appendix A**.
- **Appendix B** provides a list of key references that have informed this work.

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<sup>1</sup> Brazil, China, India, Mexico and South Africa



## **SECTION 2: THE CARBON MARKET – NOW AND PROSPECTS TO 2012**

### **2.1 Emissions trading and the carbon market**

Later sections of this paper generally assume some knowledge of market fundamentals. But some concepts are key to understanding how emissions trading and the carbon market relate to each other.

‘Emissions trading’ can be used in a very specific ‘technical’ sense, or a more generic sense. In the specific sense, it means **cap and trade**. Here a group of emitters (or countries) have a quantitative limit placed on their aggregate emissions over a set period of time. This overall *cap* prescribes the environmental objective that is being sought by the programme. It is normally thought of in a *fixed* sense, where an absolute amount of tonnes of emissions is set at the outset. But it could also apply in a *dynamic* sense, where there is an indexed variable (e.g. emissions per GDP). In this case the total amount of the tonnes of the cap will not finally be known until the end of the period when the performance of the variable is also known.

Once the overall cap is prescribed, the second step is allocating the cap in the form of tradable emission units (often called ‘allowances’) among the group of emitters. Because this allocation represents the starting amount of emissions that an individual emitter is allowed to emit over the period, or is held responsible for, this is often described as the emission target for the emitter. In practice, it can occur that the overall cap is built up from the ‘bottom’ through a negotiation of individual emitter targets.

The term ‘emitter’ is used here in a general sense. An emitter could be a country or firm with many sources of emissions, or an individual source. In an emissions trading context it usually means the country or ‘entity’ that is held legally responsible for emissions from a prescribed set of sources. The technical term *point of obligation* is sometimes used, as this entity will have the obligation to match the emissions of the sources it is responsible for with emission units. In practice an emitter who is a point of obligation must hold and retire a number of emission units equal to their emissions over the period. This is how they comply with their obligation. Units are held and retired in a secure electronic registry. Once retired, the units cannot be used again.

In the case of a firm it could also be that they are not a direct emitter per se, but that the use of a product they sell gives rise to emissions (e.g. an oil or coal importer/wholesaler). In a domestic cap and trade programme it is also possible that the allocation of emission units is made not to the entity that is the point of obligation, but to others. The points of obligation need to acquire units through the market, or possibly at a government run auction.

Importantly, **an emitter’s target is not an individual cap**. This is where *trading* comes in. In its simplest sense, trading can be seen as a policy flexibility that allows the trading of ‘unders and overs’. One emitter may find it difficult, or too expensive, to reduce emissions to the level of its initial allocation (or target). It will not be able to lower its emissions to comply with its quantity of initial emission units, so will be short



on units. Another emitter in the programme may find it much easier to reduce emissions, in fact to over-comply, so will have a surplus of units.

This situation, plus the fact that the units are tradable, sets the demand and supply fundamentals for a market to occur. Other crucial elements of the system are that:

- emissions are able to be measured (or estimated) with acceptable accuracy;
- emission units are held and tracked in a secure registry system; and
- there is a compliance process to ensure that the obligation to match units with emissions is enforced.

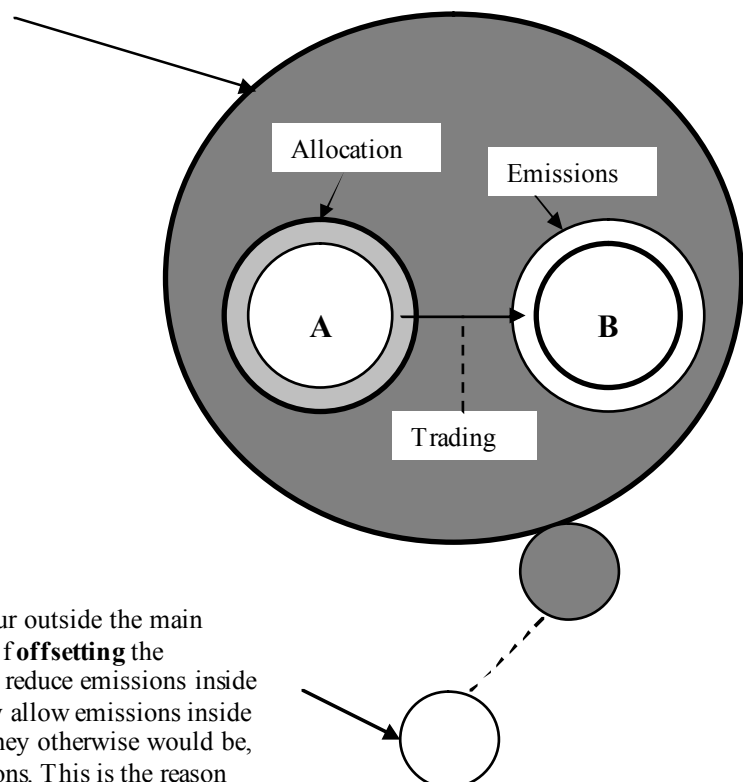
With these fundamentals in place, the units will have a market value. It is this value that can then guide the decision of emitters as to when it is to their financial advantage to reduce emissions, and when it is cheaper to buy units.

The Kyoto Protocol established the framework for an international 'cap and trade' greenhouse gas emissions trading programme through its Article 17 and associated measurement, national registry and compliance provisions. In turn, the EU has established its own entity-level cap and trade programme across its member states, to help manage a portion of the emissions it is responsible for under the Protocol.

However, cap and trade programmes are not the only forms of emissions trading when this term is used in its more generic sense. Another common form is so-called **offsets trading** programmes. This is where an emissions management policy framework has provided the flexibility of an obligation of some form to be able to be met alternatively through an 'offset' activity that is deemed equivalent.

**Figure 1. A simple depiction of emissions trading concepts**

The large shaded circle represents a group of emitters covered by a policy framework. Its perimeter can be seen as the aggregate emissions that will occur if all emitters fully meet their obligations. If the policy framework is **cap and trade** emissions trading, this would be the overall emissions cap. Inside this circle could be many individual emitters. Their emissions trading activities do not affect the overall cap. Two example emitters are shown: A has surplus emission units because their emissions are less than an allocation they have received. B is 'short' because their emissions are higher than their allocation. Emitter A trades its surplus units with B. Each is in compliance. Each is better off. And the objective is reached at lower cost.



Any **credits** from projects that occur outside the main policy framework have the effect of **offsetting** the requirement for actions that would reduce emissions inside the main group. To this extent they allow emissions inside the main group to be higher than they otherwise would be, i.e. they add to the allowed emissions. This is the reason that offsets programmes will generally have some form of 'additionality' policy element that is seeking to ensure that the reductions would not have just occurred anyway, i.e.



The Kyoto Protocol includes an example of offset trading. Developing countries sit outside the cap and trade programme of Article 17. They do not have emission targets. But the Protocol has another flexibility element, the Clean Development Mechanism (CDM). Here, projects in developing countries that reduce emissions, and would not have occurred in the absence of the CDM, are considered an acceptable offset to emission reductions that could occur in industrialised countries with Kyoto emissions targets. The CDM provides additional tradable units into the overall system, i.e. more supply to the carbon market created by the Protocol.

While the CDM is a recent example, offsets trading programmes for a range of pollutants have been a common feature of many environmental management programmes dating back decades, especially in North America. They do not need to be connected to a cap and trade emissions trading programme. There may be some other form of obligation placed on a group of emitters, or voluntarily taken on by them. **Offsets programmes** generally create tradable *credits*, so they are sometimes called **credit trading programmes**. The denomination of the credit can be tonnes of emissions or some other measurement that is directly related to the nature of the obligation set out in the management programme. Because there are willing buyers and sellers of the tradable credits, a market exists.

A final variant of what may develop a carbon market is one that may be unconnected to any formal emissions obligation or management programme per se. This is where a fund is established to buy emission reductions from activities. This creates a market of sorts, but other than the first transaction between buyer and seller, this market may not have any further trading features. Most of the ‘carbon funds’ that have been established to date are in fact connected to cap and trade or credit trading programmes, but they do not have to be. Air miles carbon offsets programmes, for example, can be seen as managed funds created by voluntary consumer donations, which then buy the outcomes of emissions reduction, or sink enhancement, activities. It is theoretically conceivable that large institutionalised funds could be created for a similar purpose.

## **2.2 The appeal of carbon trading – some practical and economic theory considerations**

This section explores the appeal of carbon trading, e.g. as expressed by the G8 leaders and the WEF Roundtable. This helps to show the diverse range of reasons that various groups of key actors support carbon market mechanisms, but also why some may not. Some of these reasons are quite straightforward and easy to understand. Others are more complex, because they relate to the underpinning economic logic that has seen emission trading being viewed as a ‘least cost’ environment management policy tool. These points provide a useful basis for later assessment and discussion sections.

Firms that are emitters can be expected to prefer flexibility over rigid policy prescription. They know that if they are called on to make emission reductions, policy mechanisms that provide *where* and *when* flexibility will be less costly than policies that do not. *Where* flexibility relates to the location of emission reductions, *when* flexibility to the timing. Some major firms have first hand experience of how emissions



trading provides a financial incentive to do more than simply comply; it has promoted collaboration among their technical innovators and financial management, where previous policy frameworks did not. Of course, some firms may prefer completely voluntary policy approaches that do not put them in the position of needing to seek flexible lower cost means. But others may prefer a more universally regulated policy environment (with flexibility) to ensure a more level playing field that minimises 'free riders'.

Firms that are 'solution providers' (including the supporting financial industry sector) can be expected to prefer the broader scope for business opportunities that *where* flexibilities provide. Exceptions may be firms that believe governments are likely to pick them as 'winners' in a prescriptive policy approach; for them, flexibility merely opens up the solutions market in their countries to competition. Moreover, the solutions may now also be found in other countries.

Connected with this point is that for countries that host solutions, *where* flexibility may open up important new sources of finance and institutional support for the deployment of climate friendly technologies.

Given the relationship between transferring clean technology and sustainable development, those actors involved in international development can be expected to welcome this new source of public and private sector resources. To the extent that flexibility extends across many sources and sectors, the reach of these market resources can touch on many development imperatives (e.g. sustainable energy, land-use, forestry).

Governments that take on the first line of responsibility in multilateral agreements can be expected to appreciate the cost reducing attributes of a flexible mechanisms approach. They may prefer not to have to 'pick winners', as a policies and measures-based agreement may require them to do. Moreover, they have witnessed how emissions trading programmes have surprised regulators, participants and observers in terms of the innovation that have emerged, resulting in much lower costs and faster compliance than expected. Countering these positive attributes may be the politics of some stakeholders with concerns about both *where* and *when* flexibility, i.e. preferring to see action at home now – not later and not abroad.<sup>2</sup> Governments may also be lobbied by industries to 'pick winners' that are favoured by them.

Economists (who are frequently primary advisors to governments) generally advocate the use of policies that can lead to overall least cost outcomes. In a theoretically ideal situation, all countries (and emitters within countries) would have an equalised marginal abatement cost. In simple terms this means they move up the abatement cost curve together. This would avoid the situation where abatement activities at, say, \$20 per tonne need to be taken in one country (or within a sector in one country) when there are still abatement opportunities existing elsewhere at, say, \$10 per tonne.

It is important to understand the difference between opportunity cost and cost under the application of economic instrument policies. There are many aspects of the 'appeal' of carbon trading that hinge on this difference. In simple terms, the opportunity cost of emissions can be thought of as the financial incentive

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<sup>2</sup> Beyond what may be primarily environmental-based concerns, there can be economics-based concerns about *where* and *when* flexibility – namely that deferring or displacing action may lead to a loss of focus on the need for short-term action and hence will lead to greater overall costs in the medium to longer term. For example,



to reduce the next tonne. In theory, a least cost outcome would result if this incentive can be equalised across emitters.

But this incentive can be created by means of both 'sticks' and 'carrots'. Consider first the use of a carbon tax. This is an example of an economic instrument policy tool that inseparably involves both opportunity cost and cost. A cost is imposed on each tonne of emissions, with the expectation that those on whom it is imposed will seek out all opportunities to reduce emissions in their operations up to that cost per tonne. In this way, so the theory goes, a carbon tax equalises the opportunity cost of emissions and results in an economically efficient least cost outcome.<sup>3</sup> Issues of distributive equity need to be addressed through revenue recycling; or some emitters could be exempted from paying the tax.

A cap and trade emissions trading programme that requires points of obligation to buy all their emission units at an auction or on the market is similar to a carbon tax. The cost of emissions and opportunity cost of emissions are the same. Distributive equity is effected through revenue recycling and/or exemptions.

But the situation where emission units are supplied gratis (e.g. under some 'grandfathering' rule) is clearly different. Consider a case where a firm is supplied with all the emission units they need to cover their emissions. This firm has no cost of emissions. But every tonne of its emissions carries the opportunity cost of the market price for emission units. This is because any tonne that could instead not be emitted will free up an emission unit that could be sold on the market. It is for this reason that the claim is often made that economic efficiency is not affected whether the method of allocation is gratis or auctioning.<sup>4</sup>

In a cap and trade emissions trading system, distributive equity is therefore effected through allocating out the shares of the overall cap. This is a key difference between this economic instrument and a carbon tax. For industrialised countries that took on targets under the Kyoto Protocol, given the provision of Article 17 (international emission trading), this might be seen to represent their having been allocated emissions units on a gratis basis under a specific grandfathering rule (e.g. 1990 levels less 8%).

At a practical level then, for an emitter that can be 'connected' to a carbon market, the opportunity cost of its emissions is the current market price of carbon less the transaction costs of connecting the next tonne of reduction to the market. In contrast, the cost of emissions for an emitter is the sum of any cost of emissions, e.g. if they are points of obligation, the cost of buying any needed emissions units from an auction or the market plus any associated transaction costs.

The use of emissions trading mechanisms (in the generic sense of the term) also provides for another situation where an opportunity cost can be 'imposed', but without a cost. Consider the example of a

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there may be a reduction in technology research and development in the jurisdictions most technologically advanced and financially able.

<sup>3</sup> The broader theory of 'least cost' assumes that the carbon tax is continuously set at the marginal damage cost of emissions and this is known. But even in a more partial sense, i.e. where this is not known and done, a carbon tax in theory will seek out the least cost outcome for the aggregate quantity of emissions abatement available up to the cost of the tax.

<sup>4</sup> In practice there are often 'second round' effects that can lead to differences in efficiency.



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crediting mechanism like the CDM. It can be seen that, in theory, all emissions in developing countries carry an opportunity cost equal to the price of carbon in this market, because there is an opportunity to get a credit equal to this value if these emissions can be abated. Clearly this is different than there being a cost on emissions in developing countries.

Project-based credit mechanisms will generally have this feature of ‘opportunity cost but not the cost’. But these would of course normally sit within a larger market setting that has created a value for carbon reductions, i.e. has established buyers (demand) for credits.

The first point to note is that there can be a large difference between the opportunity cost and the cost faced by private decision makers (and governments/countries), depending on the architecture and rules that are chosen for a market-based policy framework.

The second point is that private cost (i.e. to emitters) is not the same as broader economic cost. There are likely to be transaction costs to government and other engaged ‘stakeholders’. But there can also be offsetting economic ‘gains’. These may come from any government revenue, and the recycling of this; or from the use of ‘windfall profits’ by firms who get emission units allocated free, but pass on a carbon price signal to the consumers of their products, as if they had paid the market price for the units. There can also be co-benefits that have both direct and indirect economic value.

The final point to note here about opportunity costs is that, in practice, it is unlikely that economically efficient outcomes will be fully achieved where policy frameworks impose opportunity costs, but not costs. In the situation of a cap and trade emissions trading system where units have been allocated on a gratis basis, the carbon price signal may not then be transmitted fully and transparently to the point of emissions. Indeed, firms may come under pressure from consumers and even governments not to make ‘windfall profits’. So the incentive of the carbon price signal is muted. Decisions taken at the point of activity that gives rise to emissions, directly or indirectly (e.g. use of electricity), would be unlikely to reflect the full value of the price of carbon. Inefficient decisions will then be made, e.g. capital investments that are more emissions intensive than they would be if the full price of carbon was factored into the financial analysis.

One way to attempt to reduce this problem is to add a project-based crediting mechanism, so that end use activities can also be incentivised from the bottom up. To avoid double crediting, any credits need to come either from the units allocated to an upstream firm, or from a ‘set aside’ of units that otherwise would have been provided gratis to an upstream firm.<sup>5</sup>

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<sup>5</sup> Consider a situation where units for, say, the power generation sector have been allocated gratis. A project-based scheme could then be implemented for energy efficiency projects and credits awarded that can be sold into the market. But any demand reductions mean that the generator will have surplus units from their free allocation that they too can sell in the market. This example generally holds true in any situation where units are provided gratis to ‘upstream’ firms. This is also the reason that under the Kyoto Protocol’s JI mechanism (Article 6), any credits from a project in an industrialised country must be created out of the country’s original stock of assigned amount units.



Wherever a system relies on project-based type crediting mechanisms, there are practical limitations on how effectively these will be able to ‘dig out’ all the opportunities that exist. To illustrate this point, reflect again on the CDM. Clearly, only a very small portion of the emissions in developing countries ‘feel’ the opportunity cost in practice. This point also generally holds for other project-based or offsets schemes. Moreover, greater effort to dig out opportunities will usually mean higher associated compliance and administrative costs. These costs all factor into the overall efficiency equation. This can be a particular problem if countries have a large aggregate potential of technically low cost emission reductions, but this potential is made up of a very large number of relatively small actions.

In sum, we live in an imperfect world. Tradeoffs need to be made between theoretically and practically achievable outcomes. Perceived equity will be a significant factor. But there are a range of tools in the carbon market mechanisms toolkit from which international and domestic policymakers can choose. This flexibility is probably the primary reason for the appeal of carbon market mechanisms.

### **2.3 Current carbon market situation**

The carbon market is often taken to mean simply the market created under the emissions trading and other flexibility mechanisms in the Kyoto Protocol. In fact, there are at least eight existing carbon markets (or programmes) internationally, which can be seen as functionally different in one or more key ways. These are summed up below, as they appear from the perspective of the buyers in each programme. In some cases it can be expected that these markets may indirectly influence each other. However, the underlying drivers for and access to these markets, and hence potential participation of buyers and sellers, are sufficiently discrete that the values for a tonne of carbon reduced or sequestered may be quite different in each.

#### ***Europe***

In terms of value and volume of GHG instruments traded, the international carbon market is currently dominated by the European Union Emissions Trading Scheme (EU ETS), which began on 1 January, 2005. This scheme is mandatory for all 25 EU member states. National governments allocate EU allowances (EUAs) in national allocation plans (NAPs) to energy-intensive plants and installations. In turn these firms must retire a quantity of EUAs equal to their emissions on an annual basis.

The first phase of the scheme will last until 2007. During this phase, covered installations may use EUAs or certified emission reductions (CERs) created from Clean Development Mechanism (CDM) projects for compliance (although the supply of CERs created by 2007 may be limited). From 2008, the scheme will coincide with the Kyoto Protocol’s first commitment period, and installations can use EUAs, CERs and emission reduction units (ERUs) created from Joint Implementation (JI) projects for compliance. EU ETS sectors cannot purchase assigned amount units (AAUs) for compliance. It is estimated that over 75 million EUAs were traded in the first six months of 2005.



In its first phase, the EU ETS covers CO<sub>2</sub> emissions from six sectors: electricity generation, heat and steam production, mineral oil refineries, processing and production of ferrous metals, cement, bricks and ceramics manufacturing, and pulp and paper. In total, around 12,700 European installations are to be covered by the scheme. This represents about 45% of EU countries' CO<sub>2</sub> emissions and about 30% of their total GHG emissions.<sup>6</sup>

Some points about the EU ETS that are particularly relevant are:

- The EU ETS is a policy tool for managing emissions of firms in key industry sectors. It does not control the possible buying and selling by individual EU member states as they manage their Kyoto compliance for 2008-2012. Such buying intentions are, however, flagged in their EU ETS NAPs and a purchase quantity of about 500 Mtonnes of units is indicated. Based on emission projections, this quantity may not be sufficient to meet the EU's overall Kyoto target of 6% below 1990 levels.<sup>7</sup>
- The EU ETS is therefore only part of the overall international carbon market emerging in Europe associated with Kyoto compliance. A number of European countries have been very active in pursuing credits from international CDM and JI projects. It can be expected that in time, the same will be true for emission units (AAUs) from other countries. There is considerable discussion occurring about making 'hot air' units<sup>8</sup> more politically acceptable to EU governments through so called 'green investment schemes', whereby revenues from the sales would be tagged to specific environmental project investments in the seller countries.
- Allocations of allowances in the EU ETS have been agreed only for the first phase, 2005-2007. So the current EU ETS market is not for the first Kyoto period. Any reports on the price of allowances need to be seen in this light. Participation in the market is still not broad. Trading has been dominated by electricity generators and energy producers in a few countries. Prices have changed significantly in 2005, rising from approximately €8 to approximately €30 in July. They have subsequently declined to around €20 in November. Some believe that prices do not yet reflect supply and demand dynamics for this specific constrained pre-Kyoto

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<sup>6</sup> *EU emissions trading - An open scheme providing global innovation to combat climate change*, European Commission (2004)

<sup>7</sup> The European Environment Agency (EEA) projects that EU-15 emissions in 2010 will be 7.7% below baseline levels of 4204 Mt CO<sub>2</sub>e in 2010, based on existing policies and measures and additional measures being planned, and assuming that several member states surpass their emission reduction targets. This would be equivalent to approximately 252 Mt below the EU's KP target of 1990-8%. Based on this shortfall in 2010, EU member states would need to purchase approximately 68 Mt over the 2008-12 period. However, if additional measures are not implemented, EEA projects 2010 emissions will be 1% below baseline levels in 2010, assuming that Sweden and the United Kingdom surpass their emission reduction targets. This would be equivalent to approximately 336 Mt below the EU's KP target of 1990-8%. Based on this shortfall in 2010, EU member states would need to purchase approximately 1680 Mt over the 2008-12 period. European Environment Agency, 'Greenhouse Gas Emissions Trends and Projections in Europe 2004,' EEA report no. 5/2004, Copenhagen, 2004.

<sup>8</sup> 'Hot air' is the term used to describe that portion of surplus emission units that Russia and some other former Soviet Union countries will have because their Kyoto emissions target was based on much higher 1990



market. Prices may change over time as more participants enter the market, including participants from Eastern Europe that may have surplus EUAs to sell, and as the CDM Executive board creates more CERs. EU market observers often attribute current prices and price changes to the expected availability of hydropower resources, expected demand for electric power, and the relative relationship between coal, natural gas and electricity prices. Higher than expected natural gas prices have increased the use of coal as a fuel for generation and increased demand for EUAs. On the supply side, the lack of CERs and ERUs has also exerted upward pressure on EUA prices.

- In sum, the Europe market can be seen as two markets, a pre-Kyoto compliance market and a Kyoto first commitment period (cp1) compliance market.
- The NAPs for the 2008-2012 period are expected to be completed by the end of 2006. More stringent reductions will be required if EU countries are to achieve their Kyoto targets. Additionally, it is possible that the program may be expanded to cover key sectors not included in the first phase, including chemicals and aluminium and all GHGs.

In addition, other European countries have or are expected to implement emissions trading schemes that may be linked to the EU ETS, e.g. Norway and Switzerland.

### ***Trading activities outside Europe***

While the EU ETS and project credit purchasing activities by European governments have dominated the international carbon market scene over the last year, emissions trading has also risen in stature as a predominant policy tool in other countries and settings.

As part of its overall Kyoto climate change plan, Canada plans an emissions trading programme that will cover greenhouse gases from large final emitters (LFEs), including thermal electricity, oil and gas, mining, pulp and paper, chemicals, iron and steel, smelting and refining, cement, lime and glass. The program will set emissions intensity targets for covered sectors. Firms will be issued credits on an *ex post* basis for reductions in excess of intensity targets. These credits, representing the difference between actual and allowable emissions, would be tradable. In addition, Canada is developing a domestic offsets system that in principle could generate offsets from any emitting activity in Canada that is not covered by the LFE trading system. LFEs could use trading system credits, domestic offsets, ERUs, CERs or greened AAUs for compliance. A key element of the Canada system is the Government's pledge to cap LFE compliance costs at CDN\$15/metric ton CO<sub>2</sub>e. Several characteristics of the LFE system, including the price cap (also known as the price assurance mechanism) and the emissions intensity targets, may create challenges to linking the program to other trading schemes. With respect to international GHG purchases by the Government, it has indicated that it will not purchase AAUs that have not been greened.

Japan continues to debate the use of emissions trading as part of its domestic Kyoto plan. The same is true of an emissions charge. It is unclear which policy tool, if either, may be taken up. What is clear is that

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emissions levels, i.e. before the break up and decline of their economies and consequent large reduction in



Japan will need to purchase significant volumes of international units to comply with its Kyoto target. It is estimated that Japan will be short of its Kyoto target by approximately 800 million tonnes.<sup>9</sup> Both the Japanese Government and Japanese firms have now become active in the project-based credits market, i.e. CDM and JI. Japanese private firms were the largest buyers of candidate CERs in 2003 and 2004.<sup>10</sup> In terms of purchases of AAUs, it remains unclear whether Japan will do this solely at a government-government level, or whether they will devolve responsibility down to their own entities through initiating a domestic emissions trading scheme linked to the international carbon market. Japan is also indicating a willingness to procure greened units from Russia and the Ukraine.

### ***Carbon funds***

A major feature of the international carbon market is the emergence of **carbon funds** that are purchasing credits. These are mostly seeking project-based credits for the KPcp1 (i.e. from CDM and JI). Particularly noteworthy are the proactive efforts of the World Bank. It now has four active funds totalling over \$US 500 million investment by public and private entities, including the European Investment Bank. In addition, the World Bank is involved in separate partnership funds with four different European governments, totalling nearly another \$500 million. Also notable have been the ‘early mover’ efforts of the Netherlands government, through their ERUPT and CERUPT tender processes.

There is now an array of public and private funds, some in partnership with multilateral or private development banks, others through independently managed tender processes. The total investment goals of all these funds now come to over US\$ 3.7 billion.<sup>11</sup>

### ***Who will be the sellers of Kyoto ‘compliance units’?***

Against all this demand for KPcp1 compliance units, the seller side supply can be expected to come from:

- Russia and other Eastern European countries – ERUs from JI projects and, potentially, surplus AAUs (which for some buyers may need to be ‘greened’)
- CDM projects, including those that may be initiated in a unilateral manner (i.e. where there is no project participant identified in the Project Design Document that is from an Annex B country)
- New Zealand – units from its contestable bid-in domestic Projects mechanism (either as AAUs or ERUs, depending on the buyers’ preference), and potentially AAUs made available to firms

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emission levels.

<sup>9</sup> Japan’s Second National Communication Under the United Nations Framework Convention on Climate Change, Government of Japan, 1997,

[http://unfccc.int/national\\_reports/annex\\_i\\_natcom/submitted\\_natcom/items/1395.php](http://unfccc.int/national_reports/annex_i_natcom/submitted_natcom/items/1395.php). Emissions shortfall estimated based on existing measures to reduce GHG emissions. While this source is somewhat dated, it was selected because it provides a shortfall estimate based on existing measures. Given the many uncertainties in predicting future emissions and the effectiveness of any additional policies, estimates based on existing policies are useful to consider, although they may result in somewhat inflated shortfall estimates.

<sup>10</sup> “State and Trends of the Carbon Market 2004,” Franck Lecocq, Development Economics Research Group, World Bank, based on data and insights provided by Natsource LLC and Point Carbon, June 7, 2004.

<sup>11</sup> IEA, 2005, *Act Locally, Trade Globally – Emissions Trading for Climate Policy*, International Energy Agency, OECD, Paris



covered by its negotiated industry agreements programme, which incorporates Kyoto-like flexibilities and provides units to firms that over-achieve their agreements.

- In general, entities in Annex B countries covered by emissions trading systems that can abate emissions at a cost less than the prevailing international carbon market price, and where domestic policies provide bi-directional linkage to the international market.

### *Non-Kyoto markets*

A number of carbon markets that exist or are expected to exist fall outside the KP setting. These are grouped and described below. It should be noted that because the underlying traded commodity is some form of carbon (i.e. tonnes of carbon, CO<sub>2</sub> or potentially CO<sub>2</sub> equivalent), in principle there can be some connection to, or influence on, the Kyoto market. This could be either very direct (e.g. compliance in a non-Kyoto market being able to be satisfied by bought-in Kyoto units), or indirect (e.g. buyers seeking units from projects in developing countries, in essence competing with the CDM).

In the US, nine states in the Northeast and Mid-Atlantic region appear to have reached an agreement in principle under the Regional Greenhouse Gas Initiative to require reductions of CO<sub>2</sub> emissions from power plants. Details are being finalised and the programme may start as early as 2009. In a separate initiative, a ‘bi-partisan’ proposal for a national emissions trading programme has been put forward to Congress by Senators McCain and Lieberman. While the bill was rejected by the Senate earlier this year, and does not have the support of the Bush Administration or Republican controlled legislatures, some believe that it reflects a growing bipartisan view that the US must begin to take its responsibilities regarding global climate change much more seriously. There are also markets for carbon offset credits that derive from utility regulatory requirements in some states (e.g. the approval of new fossil-based power plants). In an important development, the Senate passed a non-binding resolution during debate over comprehensive energy legislation that moves the US towards implementing emission reduction targets in the future.

In Australia, the State governments have announced an intention for a state level-driven national emissions trading programme covering major power generation and industry sources. Details on this proposal are forthcoming. New South Wales already has a carbon trading market of sorts under the Greenhouse Benchmark Scheme for electricity retailers. This is a ‘baseline and credit’ scheme built around tradable certificates, each representing a notional tCO<sub>2</sub>e of avoided GHG emissions.

There are also a number of non compliance related emissions trading schemes that are noteworthy. These tend to be voluntary by nature and reflect the range of interests of their respective proponents.

- The Chicago Climate Exchange (CCX) is a greenhouse gas emission reduction and trading pilot program for emission sources and offset projects in the United States, Canada, Mexico, and Brazil. CCX is a self-regulatory, rules based exchange designed and governed by CCX Members, a diverse range of major industries and organisations. These members have made a voluntary,



legally binding commitment to reduce their emissions of greenhouse gases by 4% below the average of their 1998-2001 baseline by 2006, the last year of the pilot program.

- To cater to the interest in 'carbon offsets' of a growing worldwide number of corporate and government buyers (in both compliance and non-compliance markets), a number of international organisations offer carbon offsets from project-based forestry and/or energy initiatives. Examples here include Forests Forever, Future Forests and EBEX21. In addition, the World Bank's BioCarbon Fund will support projects for this buyer client group which do not qualify to generate Kyoto compliance units under the CDM (i.e. they fall outside the 'only Afforestation and Reforestation' rules).

## **2.4 Prospects for the carbon market to 2012**

### ***Kyoto Protocol compliance***

Regional energy demand projections by the IEA suggest that net transactions from sellers to buying regions could be about 1,020 million tonnes of CO<sub>2</sub> equivalent in the year 2010, given the current set of energy policies. Of this, some 870 million tonnes of surplus AAUs and ERUs might be available in that year from EIT countries (not including those now part of the EU-25). The balance provides an indication of the demand for units from the CDM in that year, assuming that all EIT country units are available and are not, for example, partially banked for use in a second Kyoto period.

Against this big picture, there are a number of cautionary details:

- Emissions projections in economic models vary significantly, and there are still significant uncertainties regarding total demand and supply in 2010.
- Industrialised countries must meet 'eligibility rules' to be able to participate in the Kyoto mechanisms. These include putting national inventory, reporting and registry systems in place that meet the scrutiny of international expert review teams.
- The current coverage of emissions potentially linked by domestic policies to the international carbon market is still quite limited. The EU ETS, for example, does not cover about 70% of the EU's GHG emission sources, and the allowable buying of those that are covered is currently limited to international project-based credits. In general, this points to the important role of domestic policies in enabling linkages of domestic emissions with the international carbon market.
- The 'take off' of the CDM has not met the expectations of many (some of which were probably unrealistic). Some are teething problems and are fixable; these relate mainly to initially insufficient institutional resources. But others are more fundamental; these relate to the 'approved activity by approved activity' nature of the CDM. A common expert observation is that the CDM will never be a mechanism that influences a significant portion of the capital investment in major energy infrastructure which is expected to occur in developing countries between now and 2012, and beyond 2012.



- The lack of certainty about post-2012 (i.e. whether there will be a multilateral framework that places an international price on carbon) will have a significant dampening effect on market activity, as the influence of 'carbon' on firms' investment decisions has a progressively shorter time horizon.

### ***Non-Kyoto***

The issues here are necessarily speculative. They hinge mainly on the extent to which regional trading emissions trading programmes heralded in the US and Australia become implemented, and the stringency of these programs. A key question then is how these may be linked with the international carbon market, beyond simply creating additional demand for international project-based activities, and perhaps drawing Kyoto units in a one-way flow from the Kyoto system<sup>12</sup>.

## **SECTION 3: SUMMARY OF PROPOSALS FOR POST-2012 INTERNATIONAL CLIMATE CHANGE REGIMES**

This summary covers those proposals that appear to have some following or may be a basis for emerging ideas. These ideas come from a general survey of post-2012 literature, as well as a review of the status of specific initiatives, e.g. Pew Pocantico, CCAP Future Actions Dialogue, OECD Annex I Experts Group (AIXG).

Two pieces of summary literature are particularly useful:

- *International Climate Efforts Beyond 2012: A Survey of Approaches*; Bodansky, Chou and Jorge-Tresolini for the Pew Centre, Dec 2004; and
- *Approaches for Future International Co-Operation*; Cedric Philibert, IEA for the AIXG, to be published May 2005.

These summaries provide more detailed accounts of proposals than it is possible to include here. The assessment tables in Appendix A give some additional details on these proposals.

For consistency purposes, where applicable the descriptions of the proposals or elements used below are those selected by the authors of this summary literature. Some of the proposals listed below are additional to those covered by Bodansky et al and Philibert.

A number of proposals contain multiple elements. These elements are shown separately here. A key point, is that elements can be assembled in different packages, not necessarily just the packages of specific proposals.

Two terms are commonly used in the literature to describe different approaches, but their meanings vary. 'Top down' is usually used to mean an approach that is driven by some overall aggregate goal, and normally means taking a 'quantitative approach'. 'Bottom up' is usually used to mean an approach that is



not guided by an explicit aggregate goal, but rather seeks to engage actions by a wide range of players, perhaps of quite different natures. Another frequently used term is ‘pledge and review’. This is normally associated with ‘bottom up’ approaches. It usually means an overall non-quantified approach consisting of pledges of action, with future review to see if more action is needed. Given the potential for different understandings and perceptions, these terms are not used here.

In the following summary, post-2012 ideas and proposals are grouped under the terms ‘Quantitative Approaches’ and ‘Non-Quantitative Approaches’.

### **Quantitative Approaches**

Quantitative in this context usually means that a specific climate change objective is, or will be, proposed, and this implies the need for an approach that quantifies an emissions outcome.

#### ***Fixed and binding targets (including potentially with price caps)***

Participation/Allocation ideas:

- Multistage
- Contraction and Convergence
- Common but differentiated convergence
- Global Triptych
- Immediate equal per capita
- Brazilian Proposal – or variant thereof, relating to accumulated historical emissions
- Cost-based allocation

#### ***Indexed (dynamic) targets***

#### ***Non-binding targets***

#### ***Sector-wide targets / sector crediting mechanisms***

- In-country sectors
- Transnational sectors

#### ***CDM/Enhanced CDM***

#### ***Action Targets***

#### ***Allowances and Endowments***

#### ***Long-term permits***

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<sup>12</sup> A non-Kyoto trading system could accept Kyoto units as compliance units. Kyoto units would be cancelled in the registries of Kyoto countries and ‘mirror’ units enter a non-Kyoto system. Nothing in the Kyoto rules prevents this.



### **Non-Quantitative Approaches**

Non-quantitative in this context usually means that an overarching quantitative emissions context is absent. Instead, objectives are framed in different ways. Some of these may be seen as quantitative in nature, e.g. in economic terms, as is the case with carbon taxes, or in performance terms, e.g. percentage uptake of some technology by some given date.

#### ***Policies and Measures (P&Ms)***

- Pledge of adoption of specific P&Ms
- P&Ms in specific sectors, and harmonised
- Institutionalised funding to incentivise uptake of P&Ms

#### ***Technology Agreements***

- Adoption of specific performance standards for key technologies by given dates
- Technology cooperation partnerships

#### ***Carbon taxes***

- Internationally harmonised domestic carbon taxes



#### **SECTION 4: ASSESSMENT CRITERIA**

The introduction noted that: this study would ‘analyse the range of proposals included in all these (post-2012) reports and literature through the lens of two key questions: *How would these ideas work with the Carbon Market? How could the Carbon Market work for these ideas?*’

A market involves buyers of a *specific* desired commodity (or commodities) coming together with sellers and making a deal at an agreed price. ‘The market’ can therefore be seen as this process, including the setting(s) where it all happens. However, the carbon market has a purpose beyond markets for other more routine market commodities. As section 2 notes, the objective of the use of market instruments to manage emissions is to continuously equalise the opportunity cost of emissions, so that all actors make decisions which ensure that they move up the abatement cost curve together. This, in turn, will help to achieve an overall ‘least cost’ outcome.

With these concepts in mind, the assessment criteria used to test the various approaches have been expressed through the following questions, grouped by general issue. This list of assessment criteria is seen as being sufficiently comprehensive to identify and elucidate proposals’ critical issues and differences, but not so extensive or detailed that it makes the assessment process too complicated to be readily understandable.

##### ***Market system architecture***

- Is there/can there be a market commodity or commodities?
- If so, what is it, or what are they?
- How is the commodity (or commodities) generated and secured?
- How predictable is the value of the commodity (or commodities)?

##### ***Efficiency, Transaction Costs***

- Will the market help to equalise the opportunity cost of emissions? Across sectors? Across countries?
- How simple (or complicated) is the process underlying the creation of the commodity and the ensuing functioning of the market?

##### ***Fungibility***

- If there is more than one commodity, how equivalent are they?

##### ***Market mechanics***

- Who will have access to the commodity(ies)? Why? How?

##### ***System utility/efficacy***

- Are the market mechanics and the value of the commodity likely to mobilise investment in needed climate friendly technology, especially in major capital investments occurring worldwide?
- What about a market ‘pull’ for future technologies?



### *Developing country engagement*

- Can the system equalise opportunity costs without imposing a cost of emissions?

### *System negotiability, resilience*

- Does the system architecture facilitate addressing differing equity perspectives, and if so, how?
- Is the agreement for this system likely to be sustainable over time?

## **SECTION 5: KEY EMERGING THEMES, ISSUES AND INSIGHTS**

A number of key issues and insights can be drawn from the assessments provided in detail in Appendix A. These are grouped under the themes:

- The key role of domestic policies
- Evolution or transformation
- Other issues:
  - dealing with competitiveness
  - idea bundles
  - amenability of sectors to emissions trading
  - linking fragmented carbon markets.

### **5.1 The key role of domestic policies**

The assessment of the ideas for a post-2012 international climate change regime consistently shows that key objectives of a carbon market-based approach (such as flexibility and least cost) are unlikely to be met in the absence of enabling domestic policies. An enabling international framework is, in itself, not sufficient.

The core reason can be found in the widely held belief that ‘private actors’, not governments, best know what opportunities exist to most cost effectively reduce emissions, or enhance sequestration by sinks. This involves aspects of both location (where) and timing (when). It depends on where individual firms, sectors and countries are in terms of their capital investment cycle, the market penetration of energy efficiency technologies, and natural resource endowments. It also depends on the nature of countries’ economies, state of development, and emission profiles. Many developing countries, for example, have more rural/agricultural economies. But some rapidly industrialising developing countries have hugely expanding manufacturing sectors (especially for export markets).

In theory, the least cost outcome for a given amount of emission reductions from global aggregate emissions occurs if all emitters (individuals, firms, sectors and countries) move up the mitigation abatement cost curve together. This is what ‘equalising opportunity costs’ is all about. Practical considerations such as transaction costs and other socio-economic (and political) factors cloud this ‘pure’ theoretical vision. But this does not detract from the overall point: the more that individual emitters’



decisions can be influenced by a common international price of carbon, the more closely we will approach the theoretical ideal.

However, to have an international carbon price there needs to be a market demand, or ‘buyers’. Most post-2012 ideas, including those of the G8 leaders in Gleneagles and the business leaders in the WEF G8 Climate Change Roundtable, have pointed to emissions trading mechanisms as providing the enabling international framework for this. Fundamentally, this means quantitative restrictions being taken on by some. However, as the ideas assessed in this paper show, the nature and scale of these restrictions can be very differently tailored to suit national circumstances (and perhaps even sectoral circumstances). In fact, use of the generic word ‘targets’ is perhaps no longer appropriate. For example, the idea for developing countries of ‘sectoral crediting baselines’ much better describes what is meant, and avoids the negative sense that ‘targets’ may have, if they are seen mainly in a Kyoto sense.

However, an international framework that enables emissions trading is most likely to be agreed only between countries, perhaps with some transnational sectors. As with the Kyoto framework, it is also likely to open the door to the engagement of ‘entities’ within countries, but would probably not go much further, as it would encroach on the jurisdiction of national sovereignty. So what happens beyond this point – where the emitters, sequesterers and opportunities really exist – depends on domestic policies.

Section 2 set out a number of policy means by which countries have so far engaged (or not engaged) their entities with the emerging international carbon market. These include the EU Emissions Trading Scheme, and other existing or planned domestic emissions trading schemes. Japan’s voluntary commitment scheme with its industry, or New Zealand’s negotiated industry agreements ‘with flexibilities’ and contestable bid-in domestic projects programme, show other possible mechanisms. Interestingly, the New Zealand example shows how entities can be engaged as sellers as well as buyers. This may provide a model for a possible means to engage entities in developing countries inside sectors covered by a sectoral crediting baseline. More generally, it may be applicable in those circumstances where carbon price signals are not getting through to downstream emitters.

In terms of the ‘efficacy’ criteria of ‘mobilising investment in needed climate friendly technology, especially in major capital investments occurring worldwide’, some broader considerations apply. Industrialised countries, in addition to engaging emitter entities through emissions trading, might seek ways to engage their entities involved in technology, and capital infrastructure development. Importantly, this should involve entities in both the technical and financial sectors. Domestic policies beyond domestic emissions trading schemes alone therefore seem to be needed.

The assessment of how an alternative policies and measures (P&Ms) approach may involve the use of a carbon market shows that domestic policies would once again play a crucial role. Importantly, it also shows that an international carbon market does not ‘live or die’ on whether a quantitative international emissions trading-based climate regime is agreed. However, for this alternative ‘P&Ms plus market’ approach to compare favourably on efficiency and efficacy criteria with an international emissions-trading approach, it would probably require very stringent P&Ms, as well as the use of substantial



institutionalised contestable funds. Equivalent aggregate emissions performance means incentivising similar overall levels of emission reductions or enhanced sequestration. The question explored here is how this can be done.

One insight is that simply having an international carbon market (of sorts) relies neither on an enabling international emissions trading policy framework, nor on an enabling domestic framework, but it does require one or other. However, how such a market would score on efficiency and efficacy criteria depends critically on the extent to which both are provided.

For example, a Kyoto-like framework could be provided, but governments of participating countries might choose not to engage their entities directly. They could implement a full P&Ms programme domestically, and take full responsibility for emissions trades with other countries and the purchasing of credits from JI and CDM-like projects. Under a very different system architecture, an international agreement could reject the quantitative emissions trading model. Instead it could adopt a stringent P&Ms commitment approach for industrialised countries, and allow participating countries to implement ‘plus market’ policies domestically (i.e. that allowed the crediting of domestic or international ‘offset’ activities). In both cases an international carbon market would develop. In the latter case so would domestic markets.

It is clear that neither of these approaches would score particularly well across the efficiency and efficacy criteria used in this study. The first case fails to engage the private entities of participating countries in the international market, instead relying on governments to pick all the cost effective opportunities in their countries through their P&Ms programmes. The second relies entirely on a credits-based market which would be challenged to establish the equivalency of offsets and deal with the additionality of the offset activities. Moreover, it lacks the overall quantitative constraint which helps to establish a value for the market commodity. In turn, this calls into question the effectiveness of such an approach in mobilising investment in activities in developing countries or creating market pull for technologies.

An additional consideration on the role of national policies, perhaps more implicit than explicit, is what might be termed ‘the division of responsibility’ between the public and private sectors. Consider two policy ‘extremes’ both seeking to achieve similar outcomes, in terms of (1) aggregate global emissions performance over a given management period, and (2) mobilising investment in climate friendly technology in major capital investments occurring worldwide. In the first case, having taken on ‘deep’ quantitative emission reduction targets, industrialised country governments implement domestic emissions trading schemes and shift the full challenge onto their private sector emitters. In the second, industrialised country governments adopt a moderate stringency ‘P&Ms plus market’ approach and contribute substantial public monies to a large international contestable fund, which in turn effects resource transfers to capital infrastructure projects in developing countries.

Clearly, these represent two considerably different cost distribution models (as well as a potentially significant difference in aggregate costs). Between these extremes, there would be degrees of cost distribution, with variants (or shades) of either the emissions trading or ‘P&Ms plus market’ approach.



The point here is to show how important domestic policy is in this regard, in order to encourage further analysis and fruitful discussion.

## **5.2 Evolution or transformation?**

The issue here is the extent to which a future regime involving an international carbon market may be arrived at through an evolution of the existing climate regime (i.e. the Kyoto market-based quantitative framework), or through fundamental transformation to a new model. To some extent, the evolution or transformation question also applies to elements within the current regime, where there may be a need for transformation even if the overall regime is undergoing evolution only.

There are many options for what a future regime may look like. The evolution or transformation question is difficult to answer if we do not know where we are headed.

For the sake of simplicity, the discussion considers the two general models discussed above:

- (i) the quantitative, international emissions trading model
- (ii) the ‘P&Ms plus market’ and international fund model.

For model (i), the Kyoto framework serves as a solid base, in particular in Article 17, (international emissions trading) and the underpinning Articles 5, 7 and 8 (dealing with measurement, reporting, accounting, registries and review). Any ‘overhaul’ would need to focus on how emission commitments were to be framed. To illustrate this, a potential mix might be:

- binding fixed emission limits for industrialised countries
- for industrialised countries not able to agree to the above, binding fixed or dynamic emission limits for some sectors in some regional groupings – or possibly economy-wide binding dynamic emission limits
- binding transnational sectoral emission limits (fixed or dynamic) for some key sectors represented by multinational ‘operators’, such as cement, steel and aluminium (with these sources excluded from any national or regional emission limits)
- for developing countries, individually customised voluntary ‘no lose’ sectoral crediting baselines in sectors for which these countries seek to attract major investment in clean technology consistent with national sustainable development priorities, and for which a project-based mechanism is inadequate
- a project-based crediting mechanism to provide coverage of emission reduction/sink enhancement activities not already covered by other market-based mechanisms.

This diverse mix is assembled (for illustrative purposes) because it responds to many of the concerns raised about the existing Kyoto framework – in particular, around wider participation through greater flexibility of commitment forms, and getting beyond the CDM project model for developing countries. It represents an assembled ‘wish list’.



Even for this diverse mix, the necessary linkages for an international carbon market could be effected by something closely akin to the Kyoto Protocol's Article 17 and Article 12. A key area that would need attention in any such agreement is compliance, given the nature of the actors (who are not all sovereign countries with similar legal systems) and the form of commitments.

This may be seen to represent evolution rather than transformation. Compared with the current Kyoto framework, the key innovations are how developing countries are engaged (i.e. the sectoral crediting baselines approach), the possibility of sub-national participants (e.g. states or regional groupings within countries), and the possibility of having transnational sectors participating along with countries. The first of these in particular might reasonably be seen as more than just an evolution of the current CDM framework.

Model (ii) is a different story. While considerable effort was expended during the negotiations that led to the Kyoto Protocol on a harmonised policies and measures approach, in the end this was not the route taken. Moreover, its primary advocates (the European Union) have themselves now moved to embrace the quantitative emission trading model. So there has been little effort put into P&Ms since then, at least by industrialised countries.<sup>13</sup>

The 'plus market' part of 'P&Ms plus market' is not particularly new or unique. Offsets programmes have been part of some countries' domestic policies and voluntary efforts of some major industry groupings for over a decade. But the challenges on the 'P&Ms' front should not be underestimated. The history of the Kyoto negotiations illustrates how issues around level playing fields (competitiveness), national circumstances (very different), technology lock-in (stifling innovation), picking winners (governments should not do this) and costs (not efficient) all militated against a P&Ms approach. These issues and arguments would be no different today. Given the lack of international policy attention given to P&Ms since Kyoto, a major turnaround in thinking would appear to be required to proceed in this direction.

On balance, model (ii) would seem to represent transformation rather than evolution.

These are, of course, not the only two possible models. Other variants emerge from the array of ideas described in section 3. But as the assessment in Appendix A shows, many of the ideas tend generally to line up behind or complement one or other of these 'generic' models. Thus these two models do usefully illustrate the 'evolution or transformation' question.

An important issue connected to this question is that of transition: how would we get to there from here? In terms of the current international carbon market, two key practical issues are:

- how to deal with ongoing CDM projects – do they still generate credits?
- how to deal with Kyoto units that countries have banked in cp1 for use in the future.

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<sup>13</sup> A 'North-South Dialogue' initiative has advanced the concept of sustainable development policies and measures (SDPAMs) for developing countries. Also the Pew Centre's Pocantico Dialogue has looked at policy and measure formulations for some key global sectors, e.g. the auto industry and coal fired power generation.



A detailed analysis of such questions is beyond the scope of this study and report. However, the preceding discussion shows that addressing these issues is much more viable with a regime model that specifically enables an international carbon market than with one that does not. Transitions are possible for both of the models discussed and illustrated above. The transition to model (i) is likely to be significantly more straightforward because of its more direct links to the existing Kyoto model.

### **5.3 Other Issues**

This final section addresses a mix of specific technical issues regarding emissions trading and the carbon market, and some more political/policy issues.

#### ***Dealing with competitiveness***

It may be considered that this should be one of the assessment criteria. Concerns about competitiveness are always present and underpin many of the complexities and contentiousness of climate change policy. The perspective taken in this study is that competitiveness concerns result from other issues, for example participation (of countries and sectors), whether participants face the same opportunity costs (and costs), and the availability and nature of flexibilities in a regime. In different ways, the assessment questions are intended to get at these issues. This is why dealing with competitiveness separately in Appendix A is seen as unnecessary. Doing so would have made this part of the paper overly complex.

However, some general points related to competitiveness do need to be made:

- It seems implausible to expect that in this next step of multilateral agreements dealing with global climate change, developing countries will have exactly the same form of commitments as industrialised countries. While broad participation in an emissions trading-based regime and an effective international carbon market can serve to help equalise the opportunity cost of emissions and sequestration (which may considerably allay competitiveness concerns), this is not the same as completely levelling the costs playing field.
- The purpose of analysing the viability of including transnational sectors as separate participants in a regime (for example, as the OECD SD Roundtable are doing) is primarily to look at whether this approach may help to resolve competitiveness concerns of some key global industries, and lead to an agreement.
- A harmonised policies and measures-based approach is another way to address competitiveness concerns. But this can become a minefield of technical and economic complexity for analysts and negotiators.
- Domestic policies play a key role; an international policy framework crafted to help deal with this issue is not, in itself, enough.
- Given the trade nature of competitiveness concerns, other multilateral and bilateral agreements can have significant influence as well (for better or worse).



### *Idea bundles*

It is beyond the scope of this work to assemble and assess idea ‘bundles’. This would necessarily become a speculative and subjective exercise. The assessments made of individual ideas do nevertheless point out that many ideas are not standalone in nature. Some explicitly rely on others, e.g. a market for credits relies on buyer demand such as that created by having quantitative targets on some groupings of emitters and/or the activities of institutionalised buying funds. Others are seen as complementary, e.g. technology agreements and R&D partnerships that have a different time focus and are filling a gap in the absence of sufficient current ‘market pull’.

Section 5 does also note that there seem to be two generally different models that the ideas line up behind or complement. To this extent, this paper does provide some insights into idea bundles.

### *Amenability of sectors to emissions trading*

The Kyoto Protocol took a six gas bundle approach and included all key sectors, albeit in a partial manner for land use, land use change and forestry (LULUCF). The international trading framework enabled through Articles 17 (JET), 6 (JI) and 12 (CDM) in general was fully open to all gases and sectors – again with some LULUCF restrictions.

Some of the post-2012 literature does focus solely on CO<sub>2</sub> but in general an all GHG approach seems to be favoured. Another way to put this is to say that there is no particular discrimination about non-CO<sub>2</sub> GHGs. Discussion on sectors is mostly in the inclusive sense, i.e. practical means of engaging developing countries or, in the case of transnational sectors, addressing competitiveness.

However, as section 2 pointed out, the current situation of the international carbon market, dominated as it is by the EU ETS, has limited coverage of non-CO<sub>2</sub><sup>14</sup> and does not yet include some key CO<sub>2</sub> sectors, e.g. transportation. This reality is mostly an outcome of domestic policies, not of the international framework. It does reveal where countries are finding it more challenging to implement cap and trade type domestic trading programmes. The reasons can be technical, e.g. measurement of emissions or apparent lack of mitigation options. They can also be political, e.g. imposing costs on the transport or the farming sectors.

These are very much domestic issues, and differ according to country circumstances. It is beyond the scope of this paper to delve deeply into possible domestic market-based policies. But, as the assessments in Appendix A show and the discussion above in section 5 further elaborates, countries may choose a range of means to engage their entities with the international carbon market, with a view to the coverage of ‘equalised opportunity cost’ being as wide as possible. Domestic emissions trading is only one such means. Crediting schemes can be specifically targeted at sectors not otherwise covered by a market-based scheme.

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<sup>14</sup> The exception here is with some high global warming potential ‘F gas’ and methane projects in the CDM.



### *Linking fragmented carbon markets*

Most post-2012 literature is written with a view to participation being as wide as possible. It therefore tends to focus on an international carbon market as a whole, not a mosaic of markets each with its own peculiarities. This is perhaps because this literature favours an overall quantitative emissions outcome, which is unlikely to be achieved through a fragmented international response.

Some literature has looked into the technical question of how fixed and relative (dynamic) targets might sit comfortably together. This is partly because of the early experience of the UK’s domestic emissions trading system, which used a gateway between its fixed and relative sector participants. But this example represented a specific policy intention of the UK government, which was seeking an absolute reduction from the sector covered by fixed targets (i.e. a firm emissions cap). This situation is unlikely to apply in general with a more open international climate regime framework.

It is true that fixed and relative targets are different, and this implies some difference in market mechanics – e.g. for relative targets, the timing of issuance and availability of emission units, or whether a more ex-post ‘baseline and credit’ approach is taken.

Other linkage issues arise if countries choose to introduce a price cap. Unless this is coordinated internationally (as some propose), the potential exists for the price in an international carbon market to exceed different countries’ domestic price caps at different times. Depending on how the countries manage the price cap domestically, and the nature of the links with the international carbon market, there is the potential for arbitrage, where market actors could buy units in a country with a price cap lower than the current international price, then immediately sell them into the international market at a profit.

In the assessments in Appendix A, linking issues are indirectly addressed by questions touching on system architecture, efficiency and fungibility. Broadly speaking, the emissions trading literature including that on the EU ETS and its Linking Directive, shows that linking different markets is possible, although there are technical and political issues to be addressed, and the need for linking ‘fixes’ probably indicates a loss of overall system efficiency.



## **APPENDIX A: ASSESSMENT OF PROPOSALS**

The following tables provide qualitative assessments of the proposals outlined in section 3 using the assessment questions outlined in section 4. This main analytical work is necessarily systematic and laborious. Readers may wish to ‘come back’ to this detail to see the basis for the “key emerging themes, issues and insights” outlined in section 5.

### **Fixed and binding targets (including potentially with price caps)**

#### **PROPOSAL**

##### ***Fixed and binding targets (including potentially with price caps)***

Participation/Allocation ideas:

- Multistage
  - These approaches are about the staging of participation by different countries and country groupings, usually based on the crossing of specific thresholds representing emissions, wealth or development status. They work in conjunction with specific target setting (allocation) proposals. Part of these approaches can also be what countries may be doing, or be required to do, prior to crossing the thresholds.
- Contraction and Convergence (C&C)
  - This approach allocates emission allowances on the basis of per capita emissions and requires progressive contraction of global emissions and convergence on equal per capita emissions later this century
- Common but differentiated convergence (CBDC)
  - This is a variant on C&C that allows some major rapidly developing countries’ per capita emissions to grow for a period before they need to contract and converge
- Global Triptych
  - This is an approach where countries’ targets are developed through a process of sector by sector analysis of emission reduction potentials
- Immediate equal per capita
  - This approach set a global emissions total for 50 years based on 2015 emissions and provides allowances to countries based on their populations.
- Brazilian Proposal – or variant thereof
  - This family of approaches are based on targets being set based on the effect that the accumulated historical emissions has had on global warming (measured as temperature or some other physical indicator)
- Cost-based allocation
  - Various (diverse) proposals base allocations or participation timing on some cost measure, e.g. ability to pay, mitigation costs



While these ideas represent quite different equity perspectives in their allocation ‘principle’, and there may be inherent differences in expected participation and perhaps sector coverage, in general terms they share the feature that they rely on an international emissions trading ‘carbon’ market to equalise opportunity costs and to effect financial and investment transfers.

### ***Market system architecture***

*Is there/can there be a market commodity? ...or commodities? If so what is it? ...or what are they?*

*How is the commodity generated and secured?*

*How predictable is the value of the commodity(ies)?*

Yes, there would be a ‘units’ commodity akin to the KP AAUs (and possibly RMUs?). These would be generated and allocated based on the overall emissions reduction goal (or total ‘allowed emissions’) established and the allocation principle followed in the agreement. The value would be secured by the compliance aspects of a ‘binding’ target. It would be predictable to the extent that the ‘BAU’ projected emissions and emission reduction/sink enhancement cost curves of participants is predictable. This is also influenced by what related and linked market mechanisms may apply to those not covered by fixed and binding targets. If a price cap is part of the agreement this provides an upper cost boundary.

### ***Efficiency, Transaction Costs***

*Will the market help to equalise the opportunity cost of emissions? – across sectors? across countries?*

*How easy (or complicated) is the process underlying the creation of the commodity and the ensuing functioning of the market?*

Equalise opportunity costs? Potentially yes. Importantly this depends on how the countries covered by the regime engage their entities with the international market, e.g. through linked domestic emissions trading schemes and perhaps linked baseline-and-credit schemes. Moreover, while economic theory suggests that following the allocation process countries should take equal efforts to reduce emissions up to the market cost of carbon, reality suggests that countries’ efforts may depend on how challenged they feel, i.e. if they are provided considerable ‘headroom’ in their allocation they may not feel as motivated to implement the domestic policies necessary to equalise opportunity costs in practice. Also, if countries implement price caps (e.g. in a domestic emissions trading programme), by their very design these ‘shelter’ private actors from the international market price. (However an associated domestic crediting mechanism that provided tradable international units could be a means to redress this.)

The ease (or not) of creating and ‘putting’ the commodity into the market, and the transaction costs associated with doing this will largely depend on the in-country policy approach taken.



***Fungibility***

*If there is more than one commodity, how equivalent are they?*

For this part of the market (i.e. not considering possible market commodities resulting from policies for those not covered by fixed and binding targets) there should be full fungibility – unless domestic policies of buyers or sellers create acceptability ‘grades’.

If LULUCF related units are treated differently this may also raise fungibility issues.

***Market mechanics***

*Who will have access to the commodity(ies)? Why? How?*

This again depends critically on the nature of how countries engage their entities with the international emissions trading market. But potentially there can be wide and open access.

***System utility/efficacy***

*Are the market mechanics and the value of the commodity likely to mobilise investment in needed climate friendly technology, especially in major capital investments occurring worldwide?*

*What about creating market ‘pull’ for future technologies?*

This market, depending on the engagement of entities, can be effective to mobilise investment within the coverage of its participants. Indeed it is proposed as a major vehicle to do so. However, different coverages are implied in the ideas, e.g. multistage is not full coverage at its first stage. So where major capital investments occur outside the coverage, the answer depends on what associated and linked market mechanisms exist in the agreement. Regarding ‘value’ this depends on the stringency of the overall aggregate emissions reduction goal.

Market ‘pull’ depends on this value. In KP cp1 it is perceived the market value of carbon is too low for there to be any significant pull. Market pull also depends on potential coverage of a regime as this heralds the potential market size for future technologies.

***Developing country engagement***

*Can the system equalise opportunity costs without imposing a cost of emissions?*

Not all the ideas imply the coverage of developing countries, at least initially. But for those that do and where the allocation principle inherently is intended to endow developing countries with excess allocations, e.g. C&C (although there is some question if this proposal would do this for all developing countries), there is no cost because of these allocations. But opportunity costs have been equalised (again with the caveats above about domestic implementation for entities).



***System negotiability, resilience***

*Does the/how does the system architecture facilitate addressing differing equity perspectives?*

Is the agreement for this system likely to be sustainable over time?

Inherently this is the point of the different allocation ‘principles’ proposed for these ideas, i.e. to a greater or lesser extent they reflect specific equity perspectives – so an agreement adopting any of these specific ideas is taking up the underlying equity perspective(s). Given that some of these ideas are dynamic over time, e.g. C&C and also CBDC, they may address the question about resilience of the agreement over time.

**Indexed (dynamic) targets**

**PROPOSAL**

***Indexed (dynamic) targets***

These have been primarily (but not only) proposed for developing countries as a means to address concerns that fixed targets may stymie economic growth. The normal metric has been emissions per GDP (or some variant thereof). One proposal has been for “dual intensity targets” where there are consequences of a binding nature (e.g. a requirement to buy from the market) for exceeding the upper target and a market link exists for bettering the lower target (i.e. ability to sell units or credits).

This idea needs to be seen in conjunction with an international carbon market primarily established by fixed and binding targets on industrialised countries. The assessment below is in this light. It is feasible to have a market created where dynamic targets apply to all participants, but this is not assessed here because there are no considered-serious proposals for this.

***Market system architecture***

The key difference of a dynamic target of a fixed target is that the total ‘allowed emissions’ for a country (or at any participant level) are not known until the management period is over and the underlying performance metric is assessed. But then the level of allowed emissions is known ‘absolutely’.

In this sense the commodity is exactly the same as for fixed targets, its quantity and availability (or need) is just delayed. (But of course a market in forwards and derivatives can still occur in the meantime.)

Unlike for fixed targets where allocations of the commodity are inherently made up-front (i.e. initial quantities of AAUs, using KP terms), there are two options with dynamic targets:

- A “baseline and credit” approach where ‘ex-post’ the commodity would be issued in quantities related to over-achievement of targets, i.e. as ‘credits’.
- An up-front allowances approach based on estimates of the dynamic metric with corrections made as required through the management period (e.g. by cancellations or additional issuance)

Dual intensity targets complicates all this somewhat. If at the end of the period a country has performed in



between the targets there should be no net buying or selling. This could be achieved by having no connection to the market until the end point is determined. Or if there is a prior connection to the market, adjustments could be made at the end to ensure the net-zero outcome.

Having a system where some participants have dynamic targets complicates predictions of market value for the commodity because of the need to also predict the other indexed variables which may be highly uncertain. The extent to which this is a significant issue depends on the relative influence (i.e. economy and emissions size) of the participants with dynamic targets cf with fixed targets.

### ***Efficiency, Transaction Costs***

A country with a dynamic target would face the same opportunity cost as one with a fixed target, i.e. the price of carbon at the final point of overall system compliance (except in the instance of a dual intensity targets’ country operating in the ‘dead band’ with no connection to the market).

Associated with the ‘predicting the value’ issue raised above, there may be an effect on overall system efficiency, relative to a system that did not have dynamic targets.

As with fixed targets, equalising opportunity cost within the country depends on how the country engages its entities with the international market, e.g. through linked baseline and credit or cap and trade schemes.

And, again like fixed targets, the same goes for the ease (or not) of creating and ‘putting’ the commodity into the market, and the transaction costs associated with doing this.

There are likely to be differences in transaction costs between the two system options, i.e. adjusted allocations versus ex-post credits.

### ***Fungibility***

As with fixed targets there should be equivalence of the commodity – unless domestic policies of other countries with fixed targets create acceptability ‘grades’ or fixed-dynamic ‘gateways’ (e.g. like that in the UK emissions trading regime).

And, again like fixed targets, if LULUCF related units are treated differently this may also raise fungibility issues.

### ***Market mechanics***

Who will have access to the commodity again depends critically on the nature of how countries engage their entities with the international emissions trading market. But potentially there can be wide and open access.



***System utility/efficacy***

Given that dynamic targets are one potential means to connect developing countries to an international carbon market created by fixed and binding targets on industrialised countries (plus IET), they could be a means to mobilise inward investment in needed climate friendly technology.

Regarding ‘value’ this depends on the stringency of the overall aggregate emissions reduction goal.

As with fixed targets market pull depends on this value and system coverage. The provision for dynamic targets is likely to increase system coverage.

***Developing country engagement***

Assuming that dynamic targets are constructed with a view to mobilising inward investment for the developing countries, there is no cost but opportunity costs have been equalised (again with the caveats above about domestic implementation for entities).

***System negotiability, resilience***

Proposals for dynamic targets are made specifically with equity concerns of developing countries in mind.

But over time there would likely be expectations for these to be converted to fixed binding targets once developing countries reach certain development thresholds.

**Non-binding targets**

**PROPOSAL**

***Non-binding targets***

These are not distinct and separate ideas per se; rather they usually apply to other forms of targets, e.g. dynamic economy-wide targets or dynamic sectoral targets or crediting mechanisms. They are usually discussed in a developing country context (as is true for these ‘target’ types). The assessment below is only where specific issues arise for non-binding targets. A “n/a” denotes where this does not seem to be the case for the issue in question.

A key point made about non-binding targets of the forms discussed is that the motivation for major developing countries to take them on is to mobilise inward investment (i.e. through the sale of units or credits). But this only occurs if the targets are met and beaten. So the non-binding nature is less of a concern.



<p><b><i>Market system architecture</i></b></p> <p>The key issue here is ‘securing’ the commodity, including its value. If all targets were non-binding, i.e. there was no consequence for exceeding targets, there would be no basis for a carbon market to exist as it relies on a constraint in the supply of units.</p> <p>But with ‘non-binding’ only proposed as applying to targets for developing countries, and with the commodity expected to be generated only for an over-achievement of these targets, this is not so much an issue.</p>
<p><b><i>Efficiency, Transaction Costs</i></b></p> <p>These matters are more related to other aspects of the targets than whether they are binding or non-binding, in particular when this is just for a ‘seller’ sub set of the overall countries.</p> <p>Transaction costs associated with compliance would be less (i.e. would apply in proving over-compliance but not for addressing consequences of non-compliance).</p>
<p><b><i>Fungibility</i></b></p> <p>There may be issues if buyer countries chose to differently ‘grade’ units from countries covered by non-binding targets.</p>
<p><b><i>Market mechanics</i></b></p> <p>n/a</p>
<p><b><i>System utility/efficacy</i></b></p> <p>n/a</p>
<p><b><i>Developing country engagement</i></b></p> <p>Developing countries are expected to require non-binding forms of ‘targets’ to participate in the next stage of an international climate agreement.</p>
<p><b><i>System negotiability, resilience</i></b></p> <p>The provision of non-binding targets for developing countries stems directly from equity considerations and should aid in the negotiability of the ‘next’ step.</p>



## Sector-wide targets / sector crediting mechanisms

### PROPOSAL

#### *Sector-wide targets / sector crediting mechanisms*

- In-country sectors
- Transnational sectors

There has been a growing interest in these ideas in the last year. One reason is that analysis of the dynamic economy-wide type of target for developing countries turned up some rather fundamental problems with any metrics using GDP, especially where this is the denominator. However dynamic metrics are considered as being feasible at the sector level and are being actively explored (e.g. by the CCAP *Future Actions Dialogue* and OECD AIXG). Moreover a sector approach is seen as more acceptable and feasible for developing countries.

The in-country sectoral approach is likely to involve dynamic non binding targets with a view to using the international carbon market to help mobilise needed inward financing, especially for major capital infrastructure investments.

The separate issue of transnational sectors recognises that for some key globally traded emissions intensive commodities a relatively small number of multinational operators may better have the necessary levers to effect change than individual country governments. Detailed, but still preliminary, analysis of the transnational sectoral approach has recently been published by the OECD SD Roundtable (*Can transnational sectoral agreements help reduce greenhouse gas emissions?* Watson, Newman et al, OECD 2005). But key issues need further work, e.g. it remains unclear whether fixed or dynamic targets may be appropriate (given issues around maintaining incentives for climate friendly material substitution). And given the varying ownership and industry coordination structures of possible transnational sectors, an important issue is ‘who’ would be the responsible party that represents such industries in negotiations and can ensure their compliance with any agreement.

#### *Market system architecture*

A fully tradable and fungible commodity is the objective of these proposals, i.e. credits that are compliance commodities for industrialised countries covered by fixed and binding targets.

The in-country mechanism is likely to be based on dynamic sectoral crediting baselines with credits for over-achievement.

As noted above the transnational sector approach is still being elaborated. If fixed targets were to be utilised this would mean an AAU type commodity; if dynamic the option of units or credits (as previously discussed).

The value of the commodity would be set more by the targets of industrialised countries as this sets the market demand. The greater the supply of credits from a sectoral crediting mechanism in developing countries the lower will be the overall marginal cost per tonne. Transnational sectors such as the airlines industry are more likely to be net buyers overall, than major suppliers of credits. But the situation with other possible sectors is less clear, and depends on both their target allocations and mitigation cost curves.



***Efficiency, Transaction Costs***

By having full links to an international carbon market any in-country sector or transnational sector would then face the opportunity cost defined by the market. How emitting activities within the sector may then face this opportunity cost depends on how programmes are organised within the sector, i.e. this is similar in concept to how countries engage entities.

And, as with national targets, the ease (or not) of creating and ‘putting’ the commodity into the market, and the transaction costs associated with doing this, will depend primarily on the policy approach taken to engage entities within the sector.

***Fungibility***

As noted above, the underlying purpose of these approaches is full fungibility. This should be the case unless buyers create different grades of units. There is also the LULUCF treatment issue should this be a sector covered (which would be expected in some countries at least).

***Market mechanics***

This depends on the intra-sector policy approach taken. At the first point, the credits or units will accrue to the country or transnational representative body. How they might then become distributed into the economy to incentivise those whose underlying emission reduction/sink enhancement activities help lead to the over-achievement of the full sector is an important issue needing further elaboration in such proposals.

***System utility/efficacy***

For the in-country sector approach mobilising inward investment is likely to be the primary motivating factor for countries to engage in the post-2012 regime and propose inclusion of specific sectors. Domestic policies would need to be aligned to ensure that credit distribution achieved this objective (and to ensure that, in total, a covered sector over-achieved its agreed baseline).

For transnational sectors the key issue is different than mobilising investment. It is mostly about addressing competitiveness and leakage issues in a more direct and negotiable manner than through including these sectors’ emissions under countries’ responsibilities.

As previously discussed market pull depends on the market value for carbon and system coverage. The provision of an in-country sector approach is likely to increase system coverage. The effect of a transnational sectors approach is unclear. Increased certainty for these sectors may improve the decision making environment for enhanced R&D. But increased emissions trading flexibility may lessen the imperative for in-sector technological solutions.



***Developing country engagement***

Equalising opportunity costs without imposing a cost of emissions is key among the intended purposes of this approach as it applies to developing countries, at least for this next stage for the international climate change regime. Moreover, a sectoral approach allows the focussing of attention on priority sectors of these countries, e.g. where significant investment is needed for their sustainable development.

***System negotiability, resilience***

Addressing equity issues will be inherent in the process of negotiating and accepting developing countries’ proposals for sectoral crediting baselines.

**CDM/Enhanced CDM**

**PROPOSAL**

***CDM/Enhanced CDM***

While there is a range of literature on this matter one notable piece that consolidates key examples from this as well as extends the thinking is an input working paper to a workshop held in Tokyo on 22-23 March 2005.

This is titled *CDM in the Post Kyoto Regime: Incentive mechanisms for developing countries to promote energy conservation and renewable energies*, Sugiyama et al.

The assessment below tries to take all the ideas in this paper that can be described as CDM or Enhanced CDM as a general suite. Some ideas are beyond the CDM and, given that these represent ideas from the broader literature, are picked up elsewhere in this proposals assessment work.

***Market system architecture***

The focus of these proposals is credit generating initiatives in developing countries. They therefore sit within the broader carbon market established by targets in industrialised countries and international emissions trading.

The value of the commodity would be set more by the targets of industrialised countries as this sets the market demand. The greater the supply of credits from a CDM-type mechanism the lower will be the overall marginal cost per tonne.

***Efficiency, Transaction Costs***

In theory the CDM means that developing countries already face the opportunity cost of the carbon market for all emissions – if they can reduce them they can get CDM credits. In practice this is constrained by the reach and efficacy of the CDM; this means considerable limits to this theoretical situation. It is for this reason that there are a wide range of proposals to enhance the CDM. These range from ideas to improve the institutional bottlenecks of the current system to ideas such as “sectoral CDM”, which conceptually is similar to the “sectoral crediting mechanism” described in the previous table.



***Fungibility***

In theory, under the CDM credits are fully fungible ‘Kyoto units – except for units from LULUCF activities which are unique because of the need to address “permanence” concerns (i.e. that have led to tCERS and ICERS). But the case of the EU ETS and its linking directive show that buyer countries can create different ‘acceptance grades’ of units.

***Market mechanics***

The current project nature of the CDM leads to a direct connection between activities and credits. Ideas for CDM enhancements moving more towards policy, programme and sector-level initiatives will need to elaborate how the credits will be distributed into the economy to incentivise those undertaking emission reduction/sink enhancement activities.

***System utility/efficacy***

The general view is that, while a useful beginning, the current CDM is too constrained by its current project by project nature and institutional framework to influence more than just a very small percentage of the capital investments occurring. This is the key problem that ideas for CDM enhancements are addressing.

In addition there is the issue of the relatively low expected value for credits in KP cp1. To the extent that this value increases significantly post-2012 and the institutional bottlenecks can be resolved, the current CDM framework would have more influence on major capital investments – and enhanced CDM more so. But the ‘approved activity by approved activity’ nature of the CDM will always be a constraint.

As previously discussed market pull depends on the market value for carbon and system coverage. Any “enhanced CDM” approach is likely to increase system coverage.

***Developing country engagement***

Equalising opportunity costs without imposing a cost of emissions is fundamental to the CDM ‘credit generating’ mechanism.

***System negotiability, resilience***

The CDM means that developing countries sit outside the targets-based framework for industrialised countries. This is how equity is currently effected. But this can have its equity downsides, as carbon market incentives may not be as readily available to those in developing countries who can reduce emissions/enhance sinks (e.g. A&R ‘sinks’ projects must be ‘additional’ whereas Annex B countries get credits for BAU A&R projects). Where enhanced CDM ideas are more like sectoral crediting baselines this difference becomes considerably lessened, at least for the sectors covered.



## Action Targets

### **PROPOSAL**

#### *Action Targets*

An idea proposed in Goldberg and Baumert (2004), action targets are another possible approach for developing countries. Like 'sectoral crediting baselines' they provide credits for the over-achievement of a target. However, they are different in that:

- they require units to be bought from the international market if countries fail to meet the target
- the target is dynamic in a different sense; it is % reductions that are agreed. An emissions baseline is created using future emissions adjusted by the reductions achieved by demonstrated actions. This avoids having to estimate a future emissions baseline at the time of joining an agreement.

#### *Market system architecture*

Like a sectoral crediting mechanism or CDM/Enhanced CDM approach, this sits within the broader carbon market established by targets in industrialised countries and international emissions trading. However, the creation of the credits (or debits) requires (1) an ex-post calculation of a 'without actions' emissions baseline that is determined by adding the reductions of specific actions to observed emissions; and (2) determining if the resultant reductions overachieved (or underachieved) the percentage reductions agreed in the action target.

#### *Efficiency, Transaction Costs*

By having full links to an international carbon market any sources covered by the action targets face the opportunity cost defined by the market. How true this is for individual emitting sources depends on domestic policy programmes.

The above noted process for the generation of credits (and debits) may involve significant transaction costs because of the necessary 'without actions' calculations. Issues as with project-based mechanisms arise.

#### *Fungibility*

The commodities would appear to be fully fungible. However this also requires that buyers see any credits as being full equivalents for compliance purposes. Issues may arise if there are concerns about the determination of baselines and, hence, whether action targets have been complied with.

#### *Market mechanics*

Who will have access to the commodity(ies) would depend on domestic policies, i.e. how credits are distributed or units (debits) are required to be remitted.



***System utility/efficacy***

It is unclear how individual actions that, at the margin, may help the achievement of an action target (thereby putting the country into a credit situation) would themselves be incentivised. This will be decided by domestic policies, but the nature of these needs further elaboration.

As previously discussed market pull depends on the market value for carbon and system coverage. To the extent that an action targets approach attracts wider system coverage there will be some market pull effect.

***Developing country engagement***

Any credits mechanism can equalise opportunity costs without imposing a cost of emissions. But the debits side of this approach introduces the potential for some cost of emissions to be imposed.

***System negotiability, resilience***

Addressing equity issues will be inherent in the process of negotiating and accepting developing countries’ proposals for action targets.

**Allowances and Endowments**

**PROPOSAL**

***Allowances and Endowments***

An idea proposed in McKibbin and Wilcoxon (2002), this rather unique approach to the use of an emissions trading-like framework to manage GHG emissions focuses on countries, and perhaps even regions within (large) countries. It specifically proposes that there not be international carbon trade because of concerns over international financial transfers. However, to maintain some common international carbon price (and hence opportunity cost for emissions) countries would agree on a common capped carbon price. The proposal uses a mix of perpetual ‘emission endowments’ (emission allowances every year forever) and additional annual emission allowances at the stipulated carbon price cap. (See referenced literature for more specifics on the domestic elements of this proposal.)

***Market system architecture***

There is no internationally tradable carbon commodity.

***Efficiency, Transaction Costs***

As noted this is achieved through participating countries agreeing to a common carbon price cap in their domestic programmes. However, annual allowances at this price are only required if needed over and above the annual availability of the perpetual emission endowments. So the extent this opportunity cost exists in practice is unclear.



<p><b><i>Fungibility</i></b></p> <p>There is no fungibility across countries</p>
<p><b><i>Market mechanics</i></b></p> <p>There is no international market.</p>
<p><b><i>System utility/efficacy</i></b></p> <p>This approach explicitly dismisses the notion of having a carbon market effect international resource transfers.</p>
<p><b><i>Developing country engagement</i></b></p> <p>This system can not equalise opportunity costs without imposing a cost of emissions. If a developing country adopts this approach to manage its own GHG emissions it potentially will impose a cost of emissions at the same rate as agreed by industrialised countries. This will happen if annual allowances are required in addition to emission endowments.</p>
<p><b><i>System negotiability, resilience</i></b></p> <p>The proposal differentiates between participating industrialised and developing countries through the quantity of perpetual emissions endowments. Industrialised countries get these based on their Kyoto targets. Developing countries would receive endowments equal to their current emissions plus an agreed percentage.</p>

**Long-term permits**

<p><b>PROPOSAL</b></p> <p><b><i>Long-term permits</i></b></p> <p>A long commitment period, e.g. out to 2070 is proposed by Peck and Teisberg (2003) to provide maximum “when flexibility”. Participating countries would establish national emissions trading systems involving long term tradable permits that could be used to cover emissions at any time during the period. The system would initially apply to the seven largest countries or regions (North America, Europe, Russia, China, Japan, India and Brazil). Permits would account for natural absorption, e.g. a CO<sub>2</sub> permit allowing 1 tonne in 2070 would allow 1.71 tonnes in 2010. Initially permits could be traded only nationally, although over time national markets could be linked to create an international trading system.</p>
<p><b><i>Market system architecture</i></b></p> <p>There is not an international carbon commodity until markets are eventually linked</p>



<p><b><i>Efficiency, Transaction Costs</i></b></p> <p>Prices in the individual national markets would reflect national policies and circumstances, so could be very different. The proposal notes that “because international trading would not be allowed initially, allocation of emission permits should aim at achieving a comparable permit price in each participating country in order to maximise economic efficiency”.</p>
<p><b><i>Fungibility</i></b></p> <p>There is no fungibility at an international level, at least until markets are linked in the future when it would become a system design issue.</p>
<p><b><i>Market mechanics</i></b></p> <p>There is no international market.</p>
<p><b><i>System utility/efficacy</i></b></p> <p>Until markets are linked in the future there is no international emissions trading framework for mobilising investment.</p> <p>The proposal notes that “the permit price would likely be low initially, but would rise steadily over time, providing incentives for R&amp;D”.</p>
<p><b><i>Developing country engagement</i></b></p> <p>The proposal is for permit trading programmes in countries, including some developing countries. In the absence of international trade it doesn’t equalise opportunity costs. Permit trading can impose costs.</p>
<p><b><i>System negotiability, resilience</i></b></p> <p>Equity considerations are addressed through the initial participation country groupings and the long term emission allocations among these that would be negotiated. The proposal also notes that “equity concerns could be addressed through financial payments or other side payments”.</p>

**Policies and Measures**

<p><b>PROPOSAL</b></p> <p><b><i>Policies and Measures</i></b></p> <ul style="list-style-type: none"><li>• Pledge of adoption of specific P&amp;Ms</li><li>• P&amp;Ms in specific sectors, and harmonised</li></ul> <p>Institutionalised funding to incentivise uptake of P&amp;Ms</p>
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### ***Market system architecture***

With any policies and measures (P&Ms) approach there potentially can be a complementary tradable ‘offsets’ market approach. The traded unit could be in carbon or a commodity directly related to the policy and measure in question. So, for example, a pledge to implement a P&M (say, generation of so many GWh of wind or solar power, or reduced generation of so many GWh of fossil-fuel based power) could allow location and/or timing flexibility for that specific measure. It could also allow this obligation to alternatively be met by some carbon equivalent offset (e.g. carbon sequestration in new forests). Such flexibility provisions could be included in international policy agreements, domestic policies or both. The use of the term ‘flexibility’ here indicates some form of tradability. This flexibility could just be intra-firm (e.g. different operations/sites of a given firm) or cross-firm. Where ‘location’ flexibility is allowed across borders, an international market is likely to be created.

Moreover, some proposals explicitly suggest the creation of institutionalised funds to purchase carbon ‘reductions’. These would create a market demand for ‘carbon units’ (emission reductions or enhanced carbon sequestration) not unlike that currently generated by the funds that have been created to purchase CDM or JI credits within the Kyoto framework. The key difference is that these are not used as credits against some form of quantitative emission constraint obligations; rather the fund’s task is just to purchase carbon ‘reductions’.

To secure any of these commodities and provide the basis for them to be valued in a market, any commitments of a P&Ms form, including to create institutionalised buying funds, need to provide an assurance of compliance that is credible and testable. Markets are based on there being finite and knowable quantities of demand which the supply side responds to.

The value of any such commodities will depend on the stringency of the commitments to these P&Ms, and associated compliance consequences. For institutionalised funds a market value can be discovered through a contestable process seeking to buy as many units as possible with a finite number of ‘dollars’.

### ***Efficiency, Transaction Costs***

Potentially such complementary trading approaches can result in a mosaic of markets, each with its particularities of commodity, supply and demand and hence price. Emissions in countries where such markets are active (or reach to) will have an opportunity cost, i.e. if there is the potential to derive a value from their reduction (or in the case of sequestration, its enhancement).

Equalising opportunity cost is another matter. This gets to the potential losses in efficiency and increases in overall costs of this ‘P&Ms plus market’ international approach to managing GHG emissions. (Notably these cost concerns were paramount for some countries in the UNFCCC negotiations that led to the Kyoto market-based framework.)

Part of the overall costs issue is transaction costs. Experience with trading markets generally suggests that the transaction costs for “offsets” or project-type trading programmes are considerably higher than for cap and trade-type trading programmes because of the higher levels of institutional oversight needed. But not all ‘P&Ms plus market’ programmes are necessarily of the offsets or projects type. For example, renewables



obligations with tradable renewables certificates are more akin to cap and trade; the commodity is just different than carbon.

### ***Fungibility***

As noted above there could be a mosaic of markets with different commodities and different prices for the same commodities. Fungibility becomes a key issue, particularly if these markets are to be linked in some way. The relationship between the implementation of P&Ms and the emissions (or removals) consequences can be indirect and difficult to quantify.

### ***Market mechanics***

Who will have access to the commodity(ies), and how, would depend on the nature of each programme. So this will be ‘prescribed’ by both domestic policies and any overarching international policy that may apply.

### ***System utility/efficacy***

This would depend on the nature and coverage of each P&Ms programme. It is quite likely that there would be programmes specifically tailored to mobilising resources for ‘best’ technologies in major capital infrastructure investments, especially where institutionalised funds are involved. Similar tailoring could be done to address ‘market pull’ for R,D&D of future technologies.

### ***Developing country engagement***

As noted above equalising opportunity costs would be a major challenge. But the ‘plus market’ element of a ‘P&Ms plus market’ approach can certainly place an opportunity cost on emissions and carbon sequestration in developing countries.

### ***System negotiability, resilience***

Equity considerations could be addressed by the nature and coverage of any P&Ms obligations and also the tailoring of ‘market plus’ aspects of the overall approach.

## **Technology Agreements**

### **PROPOSAL**

#### ***Technology Agreements***

- Adoption of specific performance standards for key technologies by given dates
- Technology cooperation partnerships

In a way, technology-based agreements can be seen as just another P&M, but they are normally discussed separately, perhaps because of their political topicality. However they do typically have unique features, in particular their inherent international cooperation and coordination attributes and longer term focus. They are also normally discussed in more of a complementary context, not as a singular solution. So they could complement a P&Ms-based approach or a quantitative emission trading-based approach.



***Market system architecture***

As with the previous broader P&Ms discussion any obligations to specific actions on the technology front could incorporate some ‘market plus’ elements. Again these could involve a commodity directly connected to the technology agreement in question, or a commodity of a ‘carbon offsets’ form. They could also provide location and/or timing flexibility.

However, experience or discussion of such possibilities is limited, so it is unclear how such commodities might be secured and a market value placed on them.

***Efficiency, Transaction Costs***

Because of the lack of understanding about how ‘market-based’ attributes may develop it is difficult to speculate on these points. But generally, given the longer term nature of most technology agreement ideas, it may be seen as unlikely that they would play much role in helping to equalise opportunity costs in the near to medium term.

***Fungibility***

Unknown, given the lack of clarity about how any related market may develop.

***Market mechanics***

Unknown, given the lack of clarity about how any related market may develop.

***System utility/efficacy***

It is the agreements themselves, not any market mechanics per se, that are likely to mobilise investment in technologies. To the extent that any technology agreements address the challenge of deploying current or near-ready ‘best technologies’ in major capital infrastructure investments in the near and medium term, they would be relevant. However, the focus of most technology agreements has been more on the second ‘market pull’ question. In fact the complementary aspect of such agreements is usually because it is seen that the current market value for ‘carbon’ is too low to create significant market pull. A key purpose of the agreements is therefore to create some needed ‘push’ for R,D&D.

***Developing country engagement***

The issue of equalising opportunity costs without imposing a cost of emissions is not relevant here.

***System negotiability, resilience***

Again, noting that such agreements are likely to just be part of a larger ‘system architecture’, the equity issues that arise are most likely to be around technology access, cost sharing arrangements and IP protection/sharing.



## Carbon Taxes

### **PROPOSAL**

#### ***Carbon taxes***

- Internationally harmonised domestic carbon taxes

Again, this might be seen as just a specific P&M. But these ideas have some important and specific economic attributes.

#### ***Market system architecture***

Carbon taxes are normally seen as the economic alternative to emissions trading. So while they are a market-based economic instrument there is no associated tradable market commodity. But some proposals for institutionalised funds have suggested that the source of these funds could be from the revenues from implementing carbon taxes. So a complementary carbon market could be created, as described in the P&Ms discussion.

While a carbon tax does not create a commodity per se, an opportunity cost of carbon is set directly by the \$/tonne amount of the carbon tax. (Note that a market value created by a contestable buying fund is quite likely to be different because it will be established by different supply/demand market forces.)

#### ***Efficiency, Transaction Costs***

In theory, carbon taxes equalise the opportunity cost of emissions for all those covered (including downstream) at the \$/tonne amount of the carbon tax. If carbon tax rates are harmonised across countries then this equalisation occurs across countries as well.

In practice market barriers and workings of the market in general suggest that this opportunity cost may not in fact be ‘felt’ by many downstream points of emission. This reality provides the economic basis for potentially having a complementary carbon market mechanism (e.g. ‘offsets’ crediting mechanism) even within a sector covered upstream by a carbon tax (or auctioned permit system).

#### ***Fungibility***

There is no international market.

#### ***Market mechanics***

There is no international market.



***System utility/efficacy***

As noted above, revenues from a carbon tax could be a source of monies for an institutionalised fund (or funds) which could be focused on mobilising resources for ‘best’ technologies in major capital infrastructure investments.

Likewise, carbon tax revenues could help fund or leverage enhanced technology R,D&D.

***Developing country engagement***

A carbon tax system can not equalise opportunity costs without imposing a cost of emissions. Carbon taxes impose a cost on emissions. They also raise revenues so can be economically neutral (albeit not without cost distribution outcomes).

***System negotiability, resilience***

A key feature that distinguishes emission trading from carbon taxes is that with the former equity issues are addressed in the method of allocation; with the latter this is not possible (except through exemptions) and any ensuing equity concerns need to be redressed through revenue recycling.



**APPENDIX B: KEY REFERENCES THAT HAVE INFORMED THIS STUDY.**

The first two references summarise a large body of work by many authors. These should be reviewed to access the detailed list of relevant references.

In addition to the list below there are some references provided in footnotes.

1. *International Climate Efforts Beyond 2012: A Survey of Approaches*; Bodansky, Chou and Jorge-Tresolini, Pew Centre on Global Climate Change, (Dec 2004)
2. *Approaches for Future International Co-Operation*; Cedric Philibert, IEA (May 2005)
3. *Statement of G8 Climate Change Roundtable*; World Economic Forum (June 2005)
4. *Gleneagles Plan of Action: Climate Change, Clean Energy and Sustainable Development*; G8 Gleneagles (July 2005)
5. *EU emissions trading - An open scheme providing global innovation to combat climate change*, European Commission (2004)
6. *Act Locally, Trade Globally – Emissions Trading for Climate Policy*, International Energy Agency, OECD, Paris (IEA 2005)
7. *Exploring Options for ‘Sectoral Crediting Mechanisms’*; Bosi, Ellis, IEA/OECD (May 2005)
8. *Can transnational sectoral agreements help reduce greenhouse gas emissions?* Watson, Newman et al, OECD 2005
9. *CDM in the Post Kyoto Regime: Incentive mechanisms for developing countries to promote energy conservation and renewable energies*, Sugiyama et al, METI (Mar 2005)