The UNFCCC at the end of 2012

Introduction

The purposes of this note are to update and extend the discussion of the international environmental problem of climate change from Chapter 9, principally in regard to mitigation policy response. Section 1 brings up to date, as of mid-December 2012, the story about developments in the UNFCCC process. Section 2 discusses assessment of the Kyoto Protocol architecture. Section 3 considers explanations of how that architecture came to take the form that it currently does.

Note: during the period from the start of the negotiations toward the Kyoto Protocol through to the present, the European regional grouping recognised by the UNFCCC changed from the European Economic Community to the European Union, and changed its membership. In what follows this grouping is always referred as the EU, other than in a quote or reproduction.

1. UNFCCC history and outlook

Focusing mainly on mitigation, this section updates section 9.5.7.3 of the text. Unless otherwise stated, it is based on material downloaded (in October-December 2012) from the UNFCCC website (http://unfccc.int) where 'Documents and Decisions' and then 'Decisions' gives access to decisions and resolutions from Conferences of the Parties (COPs) and Conferences of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMPs). COPs and CMPs take place together, along with sessions of the two permanent subsidiary bodies of the UNFCCC - the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI). Thus, for example, the 2010 meeting Cancun comprised COP 16, CMP 6 and the 33rd sessions of SBSTA and SBI.

The 1992 UNFCCC seeks to combine efficient climate change mitigation with sustainable development. According to Article 2, its objective is to stabilise atmospheric greenhouse gas concentrations at a level that would 'prevent dangerous anthropogenic interference with the climate system'. Article 3.3 says that 'policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost'. According to Article 3.4, 'The Parties have a right to, and should, promote sustainable development', and Article 3.5 says that parties should work for an 'international economic system that would lead to sustainable economic growth and development in all Parties, particularly developing country Parties'.

In pursuit of this objective and these principles, the UNFCCC adopted a binary classification of signatories with, in Article 3.1, the principle of 'common but differentiated responsibilities' attaching to developed and developing parties to the convention. The main manifestation of such differentiation was that only Annex I parties committed themselves (Article 4.2 (b)) to the 'aim of returning individually or jointly to their 1990 levels those anthropogenic emissions of carbon dioxide and other greenhouse gases not controlled by the Montreal Protocol'. Also, Annex II parties undertook (Articles 4.3, 4.4 and 4.5) to provide climate change related financial resources to developing country parties. The Annex I parties are the developed countries plus parties 'undergoing the process of transition to a market economy' (Article 4.6), ie the former Soviet Union. Annex II is Annex I less countries in transition to market economies, essentially the OECD countries. In Table 1 below ticks and crosses show whether or not a country appears in each Annex. The European Economic Community, now the European Union, is the only regional grouping of nation states recognised by the convention.

Table 1. Annex I and II memberships

	Annex I	Annex II
Australia	√	√
Austria	√	√
Belarus	√	X
Belgium	√	√
Bulgaria	√	X
Canada	√	√
Czechoslovakia	√	X
Denmark	√	√
European Economic Community	√	√
Estonia	√	X
Finland	√	√
France	√	√
Germany	√	√
Greece	√	√
Hungary	√	X
Iceland	√	√
Ireland	√	√
Italy	√	√
Japan	√	√
Latvia	√	X
Lithuania	√	X
Luxembourg	√	√
Netherlands	√	√
New Zealand	√	√
Norway	√	√
Poland	√	X
Portugal	√	√
Romania	√	X
Russian Federation	√	X
Spain	√	√
Sweden	√	√
Switzerland	√	√
Turkey	√	X
Ukraine	√	X
United Kingdom	√	√
United States of America	√	√

1.1 The Kyoto Protocol

Here we deal with the main features of the protocol. For comprehensive official coverage go to http://unfccc.int/kyoto_protocol/items/2830.php . The full text of the protocol is at http://unfccc.int/resource/docs/convkp/kpeng.pdf . There is a good Wikipedia entry at http://en.wikipedia.org/wiki/Kyoto_Protocol , which provides many useful references. Chapter 4 of Grubb et al (1999) is a readable and comprehensive description of the Kyoto Protocol: Appendix 1 in that book is the text of the protocol. As discussed in the textbook, the two main features of the protocol were the quantitative and legally binding emissions targets, and the flexibility mechanisms.

Article 3 para 1 of the protocol states that:

> The Parties included in Annex I (of the UNFCCC) shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A (of the Kyoto Protocol) do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B (of the Kyoto Protocol) and in accordance with the provisions of this Article, with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.

The greenhouse gases listed in Annex A are:

Carbon dioxide CO_2
Methane CH_4
Nitrous oxide N_2O
Hydrofluorocarbons HFCs
Pefluorocarbons PFCs
Sulphur hexafluoride SF_6

In line with the UNFCCC binary classification of countries and its principle of differentiated responsibilities, only the countries listed in Annex B to the Kyoto Protocol made such commitments. The list of Annex B countries is that of Annex I of the UNFCCC with the deletion of Belarus, Czechoslovakia and Turkey, and the addition of Croatia, Czech Republic, Liechtenstein, Monaco, Slovakia, and Slovenia. Czech Republic and Slovakia are the two states into which Czechoslovakia split. Table 2 below gives the mitigation commitments made by the Annex B signatories.

Table 2. Annex B to the Kyoto Protocol

	Quantified emission limitation or reduction commitment (% of base year or period)
Australia	108
Austria	92
Belgium	92
Bulgaria*	92
Canada	94
Croatia*	95
Czech Republic	92
Denmark	92
European Economic Community	92
Estonia*	92
Finland	92
France	92
Germany	92
Greece	92
Hungary*	94
Iceland	110
Ireland	92
Italy	92
Japan	94
Latvia*	92
Liechtenstein	92
Lithuania*	92
Luxembourg	92
Monaco	92
Netherlands	92
New Zealand	100
Norway	101
Poland*	94
Portugal	92
Romania*	92
Russian Federation*	100
Slovakia*	92
Slovenia*	92
Spain	92
Sweden	92
Switzerland	92
Ukraine*	100
United Kingdom	92
United States of America	93

* Countries undergoing the process of transition to a market economy

The European Economic Community and all of its member states are shown here as signing up for 8% reductions. However, under the protocol member states actually worked to differentiated targets agreed within the EEC according to its principle of 'burden sharing', paralleling the 'differentiated responsibilities' of the UNFCCC. Some member states were actually to be allowed to increase their emissions. The protocol allowed for this at Article 4 which deals with Annex I parties that have agreed to fulfil their Article 3 commitments jointly - the only one of which was the EEC. It says that

provided the joint commitment is met, individual members do not have to do what Annex B says. It also states that if the joint commitment not met, members are individually responsible for the commitments listed in Annex B.

The provisions of the Kyoto Protocol do not relate to emissions from international shipping and aviation.

There are four flexibility mechanisms, discussed briefly at 9.5.7.1 in the textbook - Emissions Trading, Banking, Joint Implementation (JI), and the Clean Development Mechanism (CDM). These are all intended to reduce the costs of compliance and promote an efficient allocation of mitigation effort as between Annex B countries, and, in the case of the CDM, as between Annex B countries and developing countries. The CDM is intended also to serve the UNFCCC objective of promoting (sustainable) development in the developing nations by way of technology transfer. For further discussion see Hepburn (2007).

It is clear that the Kyoto Protocol sets up systems with extensive and complex monitoring and compliance verification requirements. These are addressed in general terms in Articles 3, 5, 7 and 8: for an interpretation see section 4.6.1 of Grubb et al (1999). Detailed rules on these matters were adopted at COP7 (Marrakesh) in 2001. As noted in section 4.6.2 of Grubb et al (1999) the Kyoto Protocol is somewhat unusual among international treaties in that, at Article 18, it does address non-compliance issues. There are no financial penalties. The compliance committee offers a party advice when it appears that things are going awry. If a country fails to comply with its commitment in a compliance period, it is to be required to make up the shortfall plus 30% in the next compliance period. Also, a party in non-compliance is prevented from selling emissions units.

As regards compliance enforcement, Article 27 also needs to be noted. At para 1, it says that:

> At any time after three years from the date on which this Protocol has entered into force for a Party, that Party may withdraw from this Protocol by giving written notification to the Depositary.

There are no penalties for withdrawal, so that a country facing non-compliance penalties can avoid them by simply withdrawing from the protocol. In fact Canada withdrew with effect from December 2012 because it could not meet its commitment . Whereas its commitment, as shown in Table 2 above, was a 6% emissions reduction on 1990, during the period 2000 to 2010 Canada's emissions were consistently some 30% above the 1990 level.

Article 25 para 1 says that:

> This Protocol shall enter into force on the ninetieth day after the date on which not less than 55 Parties to the Convention, incorporating Parties included in Annex I (of the convention) which accounted for 55 per cent of the total carbon dioxide emissions for 1990 of the Parties included in Annex I, have deposited their instruments of ratification, acceptance, approval or accession.

The protocol was adopted on11/12/1997, and entered into force on 16/02/2005. Chapters 2 and 3 of Grubb et al (1999) give a good account of the background to, and the history of, the negotiations leading to the adoption of the protocol. The USA did not ratify the protocol, and hence the entry shown for it in Table 2 above never became an actual commitment. Australia did not initially ratify, but following a change of governing party, it ratified in 2007. As will be discussed further in section 4 below, the European Economic Community, later the European Union, took an proactive leading role in negotiating the protocol text and its adoption, and in securing ratification. In regard to the latter, the non-participation of the USA meant that satisfaction of the 55 per cent coverage requirement of Article 25 para 1 (see above) was problematic, and required Russian participation. Russia was reluctant to ratify. In the event last minute Russian ratification followed a deal with the European Union by which the latter supported the former in its effort to become a member of the

World Trade Organisation.

According to a report, Oliver et al (2011) cited at http://en.wikipedia.org/wiki/Kyoto_Protocol whereas the Kyoto Annex B countries with commitments, ie excluding the USA, had a collective target of a 4.2% reduction on base year (1990 for most of them) for 2008-2012, their projected reduction is 16%. This projection excludes credits arising from land use and land use changes, from forestry, and from the CDM. This can be regarded as a success for the Kyoto Protocol, but it also needs to be noted that, on account of emissions increases in non-Annex I countries, this does not represent any significant progress toward the UNFCCC Article 3 goal of preventing 'dangerous anthropogenic interference with the climate system'. One statement illustrating this is the calculation in Wigley (1998), cited in chapter 24 of Lomborg (2001), that the effect of the Kyoto commitments maintained indefinitely, not just until 2012, would that the no-Kyoto 2100 temperature would be reduced by just $0.15^{O}C$. In fact the protocol commitments last only until 2012. As discussed below, a major focus of UNFCCC activity in recent years has been concerned with extending the life of the Kyoto Protocol, and/or replacing it with something with more nations committed to quantitative reductions and a longer life.

The other main feature of the protocol is the flexibility mechanisms, the principal rationale for which is the anticipated, on the basis of economic analysis, reduction in aggregate mitigation costs, and in the costs incurred in the Annex B countries. There do not as yet appear to be any *ex post* estimates of aggregate cost savings attributable to the flexibility mechanisms. Siikamäki et al (2012) look at the operation of JI and the CDM, and provide some information on prices and transaction cost estimates. Nordhaus and Boyer (2000) use, in Chapter 8, the RICE-99 model to generate *ex ante* estimates of, *inter alia*, mitigation (abatement in their terminology) costs for the emissions reductions for the Kyoto Annex B commitments continued out to 2100. The modelled reductions include those shown in Table 2 above for the USA. For this model, discounted total world mitigation costs out to 2100 are 852 billions of US dollars if there is no trade, that is if the Kyoto flexibility mechanisms are inoperative. Allowing emissions trading among OECD nations brings this down to 710 billions, extending trading to all Annex I nations further reduces this to 325 billions, and allowing all nations to trade brings the global cost down to 91 billions of US dollars.

1.2 COP 15: Copenhagen 7/12/2009 to 18/12/2009

COP 13 took place in Bali from 3/12/2007 to 14/12/2007. The main outcome was the 'Bali Action Plan', which was Decision 1/CP.13, which can be accessed at http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf#page=3 . This reports that

> *Recognizing* that deep cuts in global emissions will be required to achieve the ultimate objective of the Convention and emphasizing the urgency to address climate change as indicated in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

the COP

> 1. *Decides* to launch a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012, in order to reach an agreed outcome and adopt a decision at its fifteenth session by addressing.....

where the rest of decision 1 consists of a list of issues to be addressed including

> a long term global goal for emissions reductions
>
> enhanced national/international action on mitigation, where for developed country Parties there is

> reference to 'quantified emission limitation and reduction objectives' while for the other Parties there is reference to 'Nationally appropriate mitigation actions in the context of sustainable development'
>
> policy on deforestation and forest degradation, sustainable forest management and enhancement of forest carbon stocks
>
> opportunities for using markets to enhance the cost-effectiveness of mitigation actions
>
> enhanced action on adaptation
>
> enhanced action on technology development and transfer
>
> enhanced action on the provision of financial resources for mitigation and adaptation in developing countries

Decision 2 is that:

> the process shall be conducted under a subsidiary body under the Convention, hereby established and known as the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, that shall complete its work in 2009 and present its the outcome of its work to the Conference of the Parties for adoption at its fifteenth session

Clearly, while the Bali Action Plan was entirely within the letter and spirit of the UNFCCC in regard to the need to reconcile the needs of the developing countries with the mitigation of climate change, it generated high expectations for COP 15 in regard to higher objectives with respect to the latter.

In the event the outcome of COP 15 was a document, the Copenhagen Accord, that the Parties agreed to 'take note of'. It was not fully adopted, that is, as part of the UNFCCC, and is not legally binding. The adopted document was drafted by the USA and a group of countries comprising China, India, South Africa and Brazil.

The Copenhagen Accord (http://unfccc.int/resource/docs/2009/cop15/eng/107.pdf) adopted a target defined in terms of temperature change. Article 2 states that

> We agree that deep cuts in global emissions are required according to science, and as documented by the IPCC Fourth Assessment Report with a view to reduce global emissions so as to hold the increase in global temperature below 2 degrees Celsius.....

In regard to action in pursuit of this goal, it continued with the binary classification of countries in respect of mitigation action and financial transfers. Article 2 states that

> We should cooperate in achieving the peaking of global and national emissions as soon as possible, recognizing that the time frame for peaking will be longer in developing countries and bearing in mind that social and economic development and poverty eradication are the first and overriding priorities of developing countries.....

At Article 1, the signatories emphasised their ' strong political will to urgently combat climate change in accordance with the principle of common but differentiated responsibilities and respective capabilities'. Annex I parties committed (Article 4 of the Copenhagen Accord) to lodge 'emissions targets for 2020' by 31st January 2010, with delivery to be 'measured, reported and verified in accordance with existing and any further guidelines adopted by the Conference of the Parties'. Non-Annex I parties (Article 5) 'will implement mitigation actions' which will be subject to their domestic measurement, reporting and verification', and only 'nationally appropriate mitigation

actions' supported internationally 'will be subject to international measurement, reporting and verification'. In the event, the Annex I targets lodged by 31st January 2010 (see http://unfccc.int/meetings/copenhagen_dec_2009/items/5264.php) were mainly conditional on a global and comprehensive agreement (of some kind). The USA's offer was conditional on the enactment of necessary domestic legislation. Some important developing, non-Annex I, countries lodged statements about planned mitigation by 31st January 2010 (see http://unfccc.int/meetings/cop_15/copenhagen_accord/items/5265.php). China notified the UNFCCC Secretariat that it would 'endeavour' to reduce its carbon dioxide emissions per unit of GDP by 40-45% by 2020 on a 2005 base, and asked that the Secretariat 'note that the above-mentioned autonomous domestic mitigation actions are voluntary in nature'. India's communication said that 'India will endeavour to reduce the emissions intensity of its GDP by 20-25% by 2020 in comparison to the 2005 level', and noted that ' the proposed domestic actions are voluntary in nature and will not have a legally binding character'.

Both China and India stated in their notifications that the stated actions would be implemented in accordance with Article 4 paragraph 7 of the UNFCCC. This states that the implementation by developing country Parties of any commitments is conditional on the 'effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology'. It also has developing country Parties taking 'fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties'.

As regards financial transfers, the Copenhagen Accord recorded (Article 8) a 'collective commitment by developed countries' to provide to developing countries 'new and additional resources...approaching USD 30 billion for the period 2010-2012', increasing to 'USD 100 billion dollars by 2020', given 'meaningful mitigation actions and transparency on implementation'. These funds are to be used by developing countries (Article 8) to 'enable and support enhanced action on mitigation', and are to come from ' a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance'.

Article 9 of the Accord establishes a 'High Level Panel....to study the contribution of the potential sources of revenue, including alternative sources of finance, toward meeting this goal' . Article 10 records the decision to establish the Copenhagen Green Climate Fund

> as an operating entity of the financial mechanism of the Convention to support projects, programme, policies and other activities in developing countries related to mitigation, including REDD-plus, adaptation, capacity-building, technology development and transfer.

REDD stands for Reducing Emissions from Deforestation and Degradation. For a history of REDD prior to Copenhagen see 'The History of REDD Policy' at http://unfccc.int/files/methods_science/redd/application/pdf/the_history_of_redd_carbon_planet.pdf : for a general discussion of REDD, and REDD+, and references see the Wikipedia entry at http://en.wikipedia.org/wiki/Reducing_Emissions_from_Deforestation_and_Forest_Degradation .

The Wikipedia entry for the Copenhagen Accord (http://en.wikipedia.org/wiki/Copenhagen_Accord accessed 29/10/2012) reports several estimates of the effect on global emissions of the pledges associated with the Accord. None found the effect to be such as to meet the accord's temperature increase objective. According to Nicholas Stern (of the Stern Report), for example, whereas a reasonable chance of meeting the 2^{O} target would require 2020 emissions of 44 gigatons, the pledges registered by March 2010 would produce nearer to 50 gigatons of emissions. The IEA's *World Energy Outlook 2010* is reported as containing a scenario in which the Copenhagen pledges give long term stabilisation at 650 ppm CO_2 equivalent, which could lead to $3.5^{O}C$ above the pre-industrial global average temperature.

Given that the accord did nothing to replace the binding mitigation commitments of the Kyoto Protocol, many commentators considered this COP to have been a failure. An article in *The Economist* on December 19th 2009 reporting the main features of the Accord has the headline 'Better than nothing', concluding that 'the leaders who turned up in Copenhagen seem to have made a difference by finding their way to a sub optimal deal rather than none at all'. An interesting, and little commented on, aspect of the Copenhagen pledges is reported in an article, 'Copenhagen accounting: what countries are currently offering on climate', in the on-line version of *The Economist* (http://www.economist.com/node/15539489). It reports analysis by the European Climate Foundation (http://www.europeanclimate.org) according to which, looking at what countries said that they would do irrespective of the actions of others, whereas prior to Copenhagen the total mitigation compared with business as usual was 3.6 billion tonnes of carbon dioxide, post Copenhagen it was 5.0 billion tonnes, with developing countries accounting for 4.2 billion tonnes of that. Whereas developing countries increased their commitment by two-thirds, developed cut by about a quarter. The latter is mainly on account of changes by Russia and Canada, the former mainly on account of larger and firmer commitments on deforestation by Indonesia and Brazil.

1.3 COP 16: Cancun 29/11/2010 to 10/12/2010

For what the Cancun Agreements meant stated in plain language see 'The Cancun Agreements' at http://cancun.unfccc.int/what-governments-will-do-in-2011/ . The formal statement of COP 16 decisions is at http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=2 . As summarised by the UNFCCC itself (at http://unfccc.int/meetings/cancun_nov_2010_/meeting/6266.php), the highlights were:

> to commit to a maximum temperature rise of 2 degrees Celsius above pre-industrial levels, and to consider lowering that maximum to 1.5 degrees in the near future
>
> to make fully operational by 2012 a technology mechanism to boost the innovation , development, and spread of new climate-friendly technologies
>
> to establish a Green Climate Fund to provide financing for projects, programmes, policies and other activities in developing countries via thematic funding windows
>
> the Cancun Adaptation Framework which included setting up an Adaptation Committee to promote the implementation of stronger, cohesive action on adaptation

This document includes a 'Note on the Gaps', where it states that:

> .....all pledges put forward by governments came to the combined total of only 60% of the emissions reductions needed for a 50% chance of keeping temperatures below that [two degree] goal. And the conference left the future of the Kyoto Protocol unresolved, which also left open the question of the fate of the international carbon market.

It is not made clear here what is included in ' all pledges', but it would appear to mean all of the conditional and non-binding 'pledges' lodged in connection with Cancun, rather than just the binding Kyoto commitments.

In regard to these pledges there is no significant change on the Copenhagen situation. Those for developed economies are documented at Subsidiary Body for Scientific and Technical Advice 34th session Bonn June 2011 'Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention'
(http://unfccc.int/resource/docs/2011/sb/eng/inf01r01.pdf). *The EU pledge is*

For the USA the document says:

> The United States communicated a target in the range of a 17 per cent emission reduction by 2020 compared with 2005 levels , in conformity with anticipated United States energy and climate legislation, recognizing that the final target will be reported to the secretariat in the light of the enacted legislation. In addition, the pathway set forth in pending legislation would entail a 30 per cent emission reduction by 2025 and a 42 per cent emission reduction by 2030,in line with the goal to reduce emissions by 83 per cent by 2050. The submission of the target by the United States was made on the assumption that other Annex I Parties, as well as more advanced non-Annex I Parties, would, by 31st January 2010, associate with the Copenhagen Accord and submit mitigation actions for compilation into an information document in accordance with paragraph 4 or 5 of the Accord, as the case may be.

It was agreed that the industrialised nations would boost the regular reporting of their progress toward their targets by submitting detailed annual inventories of greenhouse gas emissions and biennial progress reports. These nations also undertook to develop low carbon development strategies.

In regard to the developing countries, ie Non-Annex I Parties, some new terminology was introduced - Nationally Appropriate Mitigation Actions, NAMA's. These were developments of the undertakings made at Copenhagen. While the terminology is new, in most cases there is little of substance that is new. The Cancun NAMA's are set out in a document produced by the Ad Hoc Working Group on Long-term Cooperative Action under the Convention March 2011 'Compilation of information on nationally appropriate mitigation actions to be implemented by Parties not included in Annex I to the Convention'
(http://unfccc.int/resource/docs/2011/awglca14/eng/inf01.pdf). In many cases it would be more accurate to use 'Aspirations' rather than 'Actions', with the aspiration little different from that lodged at Copenhagen. The Chinese communication is reported as:

> China communicated that it will endeavour to lower its CO_2 emissions per unit of GDP by 40-45 per cent by 2020 compared with the 2005 level. It also expressed the intention to increase the share of non-fossil fuels in primary energy consumption to around 15 per cent by 2020 and to increase forest coverage by 40 million ha and forest stock volume by 1.3 billion m^3 by 2020 compared with the 2005 levels.

China stated that the above-mentioned autonomous domestic mitigation actions are voluntary in nature and that they will be implemented in accordance with the principles and provisions of the Convention, in particular Article 4 , paragraph 7. As noted above, this has implementation by developing countries conditional on financial transfers from developed countries, and prioritises economic and social development for developing countries.

For India the communication is reported as:

> India communicated that it will endeavour to reduce the emissions intensity of its GDP by 20-25 per cent by 2020 compared with the 2005 level. It added that emissions from the agriculture sector would not form part of the assessment of its emissions intensity
>
> India stated that the proposed domestic actions are voluntary in nature and will not have a legally binding character. It added that these actions will be implemented in accordance with the provisions of relevant national legislation and policies, as well as the principles and provisions of the Convention.....

It was agreed that developing countries would increase reporting of progress towards their mitigation

objectives, and that a process of international analysis of the arising biennial reports would be established.

In regard to linkages between developed and developing Parties, it was agreed that the Clean Development Mechanism (CDM) would be strengthened by a loan scheme to encourage CDM projects in countries having fewer than ten such, and that, subject to resolving technical and safety issues, carbon capture and storage projects would be allowed in the CDM. Emissions trading to encourage clean technology investment from industrialised into developing countries, in order to count toward the former's targets, was to continue. There was agreement that governments would work toward one or more new market mechanisms.

In regard to land use, land use change and forestry the submission of reference levels for forest management was called for, to enable future agreement on regulation of such activities. Stronger concrete actions on forests in developing countries were called for.

The Cancun Adaptation Framework was established with the intention of strengthening action in developing countries through international cooperation, with increased financial and technical support from developed countries, and the development of regional centres and networks. There were additional adaptation initiatives, such as the agreement to establish an Adaptation Committee to promote the implementation of the framework.

It was agreed to establish a Green Climate Fund to provide long term financing for projects, programmes and policies in developing countries. The fund to be governed by a board of 24 members with equal representation from developed and developing countries, and administered by a Trustee, initially to be the World Bank. Governments agreed on the establishment of a committee to assist the COP in exercising its functions in regard to long term financing. Industrialised countries committed to provide funds rising to USD 100 billion per year by 2020 to support mitigation actions in developing countries, with the funds raised from public and private sources. It was also agreed that Governments would endeavour to make more transparent how developing countries might access fast-start finance approaching USD 30 billion by 2012. The sources for these financing undertakings were not specified.

It was decided to set up a Technology Mechanism and a Technology Executive Committee to strengthen technology development and transfer, and to increase support for capacity-building in developing countries. The details of these matters were left for further work and consideration at COP 17. It was agreed that there was a need boost information-sharing, awareness-raising and public education on climate change.

Reaction to COP 16 was mainly that it did not amount to much in the way of progress beyond COP 15. Mainly, what it did was to take the Copenhagen Accord into the formal UNFCCC process. Many commentators criticised the Cancun Agreement for doing nothing to put in place Kyoto-like commitments for the period beyond 2012, when Kyoto itself expires. Some argued that the outcome at Cancun was further demonstration that the pursuit of legally binding emissions targets for all economies is futile, and that the way forward is to abandon that pursuit and concentrate on the Green Climate Fund, technology transfer, deforestation limitation, regional and bi-lateral agreements and trading. On this view COP 16 could be seen as a, partial, success. As an article on the Cancun outcome in *The Economist* on 16th December 2010 put it:

> .....treating hard targets as a make or break issue would surely lead to another [this is a reference to the Copenhagen outcome], perhaps final, breakage. The UN climate process did quite well out of Cancun. The climate, not so well.

1.4 COP 17: Durban 28/11/2011 to 9/12/2011

Durban comprised: COP 17, CMP 7, the 35th meetings of the SBI and the SBSTA, and sessions of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention and the Ad Hoc Working Group on Further Actions for Annex I Parties under the Kyoto Protocol. In broad terms, the outcomes were the firming up and fleshing out of decisions taken at Cancun, and an objective to negotiate by 2015 a universal and legal agreement on mitigation, effective 2020, with a second commitment period for the Kyoto running from 2013 to 2020 (or 2017).

The Report of the Conference of the Parties on its seventieth session
(http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf) records decisions relating to

1. Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action

2. Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention

3. Launching the Green Climate Fund

4. Technology Executive Committee

5. National Adaptation Plans

The decisions at 2 to 5 here mainly relate to matters concerning the implementation of decisions adopted at previous COPs. The major innovation of the Durban meetings is recorded at 1.

This section of the report begins by ' *Recognizing* that climate change represents an urgent and potentially irreversible threat to human societies and the planet....', and

> *Noting with grave concern* the significant gap between the aggregate effect of Parties' mitigation pledges in terms of global annual emissions of greenhouse gases by 2020 and aggregate emissions pathways with having a likely chance of holding the increase in global average temperature below 2^0C or 1.5^0C above pre-industrial levels

It then, 1, decides to extend the life of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention by one year, and 2

> *Also decides* to launch a process to develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties, through a subsidiary body under the Convention hereby established and to be known as the Ad Hoc Working Group on the Durban Platform for Enhanced Action

and 4 also decides that this group:

> shall complete its work as early as possible but no later than 2015 in order to adopt this protocol, another legal agreement or an agreed outcome with legal force at the twenty-first session of the Conference of the Parties and for it to come into effect and be implemented from 2020.

Decision 6 here is that the process 'shall raise the level of ambition' and be informed by the Fifth Assessment Report of the IPCC.

The wording - ' protocol, another legal instrument or an agreed outcome with legal force ' - relating to what is to be negotiated by 2015 is of interest and importance. The COP ran 36 hours past its intended closure due to difficult negotiations over this wording. The EU wanted the successor to Kyoto to be legally binding, while many developing countries, and especially India, did not. The

adopted form of words is a compromise designed to bridge this gap - its meaning is unclear. The EU made it clear that it would, through the Ad Hoc Working Group on the Durban Platform for Enhanced Action, continue to press for a legally binding agreement.

The decisions regarding the Kyoto Protocol as an interim arrangement bridging the gap between the end of the first commitment period and the intended new mitigation agreement are set out in the Report of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol at its seventh session (http://unfccc.int/resource/docs/2011/cmp7/eng/10a01.pdf)[1].

1.5 COP 18: Doha 26/11/2012-8/12/2012

The main outcome of the Doha meetings was the extension of the life of the Kyoto Protocol, the only international agreement with any legally binding emissions reduction targets, which would otherwise have expired at the end of 2012. The CMP accepted the report of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol, which is accessible at http://unfccc.int/resource/docs/2012/cmp8/enf/109.pdf . This took the form of amending the original protocol.

At I.4 the second commitment period for the protocol is stated to be January 1st 2013 to December 31st 2020. For this period, C on page 9 of the report calls for the insertion of a new paragraph after paragraph 1 of Article 3. This states that the aim of the quantified emission limitation and reduction commitments shown in the revised Annex B to the protocol is ' reducing their overall emissions of such gases by at least 18% below 1990 levels in the commitment period 2013 to 2020'. Recall that for the first commitment period the equivalent figure was 5%. Table 3 below shows the individual emissions limitation and reduction commitments in the revised Annex B. Note that as compared with the original Annex B: the USA is missing because the USA did not ratify the Kyoto Protocol; Canada is missing because, as noted above, it withdrew effective December 2012; Japan and Russia are missing because they had, in 2010, notified that they would make no commitment for a second period; New Zealand is missing because it has not yet notified its commitment. The situation in regard to the European Union and its members in terms of actual targets for those members is the same in nature here as was the case with the original protocol.

[1] If this link does not work go to the UNFCCC website and click at 1/CMP.7 in the Decisions list for COP 17/CMP 7.

Table 3. Commitments for 2013-2020 from Annex B to the Kyoto Protocol as amended at Doha

	Quantified emission limitation or reduction commitment (% of base year or period)
Australia	99.5
Austria	80
Belarus*	88
Belgium	80
Bulgaria*	80
Croatia*	80
Cyprus	80
Czech Republic	80
Denmark	80
European Economic Community	80
Estonia*	80
Finland	80
France	80
Germany	80
Greece	80
Hungary*	80
Iceland	80
Ireland	80
Italy	80
Kazakhstan*	95
Latvia*	80
Liechtenstein	84
Lithuania*	80
Luxembourg	80
Malta	80
Monaco	78
Netherlands	80
Norway	84
Poland*	80
Portugal	80
Romania*	80
Slovakia*	80
Slovenia*	80
Spain	80
Sweden	80
Switzerland	84.2
Ukraine*	76
United Kingdom	80

* Countries undergoing the process of transition to a market economy

Given what was said above here about the impact of the original Kyoto commitments on the path of global emissions in relation to the UNFCCC aims and objectives, it is not necessary to do any calculations to see that these Doha commitments are nowhere near doing what the UNFCCC calls for. The report implicitly recognises a problem here, and addresses it at III. There the CMP

> 7. *Decides* that each Party included in Annex I will revisit its quantified emissions limitation and reduction commitment for the second commitment period at the latest by 2014. In order to increase the ambition of its commitment, such Party may decrease ....its quantified emissions limitation and reduction commitment, in line with an aggregate reduction....of at least 25 to 40 per cent below 1990 levels by 2020.

Given the now restricted coverage of Annex I binding commitments - effectively just the EU - it is clear that even revised commitments at the top end of this range are very unlikely to realise UNFCCC aims and objectives. Fig 21.1, for example, in Chapter 21 of Stern (2007) shows that if all of the Annex I (to the Convention) cut 60% from 1990 levels by 2050, getting the concentration down to 450 ppm by 2050 would require non-Annex I emissions to be down 70% on 1990 levels. Non-Annex I nations have no binding commitments under the revised protocol. According to an article in *The Economist* ('Theatre of the absurd: after three failures, this year's UN climate summit has only modest aims', December 1st 2012), a UNEP report published on the eve of the Doha meetings said that even if all the countries that made pledges at Copenhagen met the ambitious versions of those pledges, that 'would leave countries less than halfway to the 2020 level required to keep the global temperature rise at 2^0C'.

Some commentators have come close to saying that it was agreed at Doha that UNFCCC parties would work toward a Kyoto-type, ie with legally binding commitments, arrangement to take effect in 2020 when the amended Kyoto Protocol expires. In fact what was adopted was a re-statement of the form of words that came out of COP 17 at Durban. Thus, under the heading 'Advancing the Durban Platform'
(http://unfccc.int/files/meetings/doha_nov_2012/decisions/application/pdf/cop_advanc_durban.pdf)
the Parties

> 4. *Determined* to adopt a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties at its twenty-first session, due to be held from Wednesday 2 December 2015, and for it to come into effect and be implemented from 2020.

Similar wording appears in the preamble to Working Group report cited above regarding the extension of the Kyoto Protocol (http://unfccc.int/resource/docs/2012/cmp8/enf/109.pdf).

Similarly, some commentators claimed that it was agreed that developed countries would compensate developing countries for damage suffered as a result of climate change. For example, the online version of *The Daily Telegraph* (http:// www.telegraph.co.uk) on 8th December ran a story with the headline ' Doha: climate change talks end with compensation deal for poor nations that could cost billions', in which according to the first sentence just Britain ' faces paying billions of pounds in compensation to less developed countries.....'. The headline to an 8th December online report by the BBC's environment correspondent (http://www.bbc.co.uk/news/science-environment-20653018) was ' UN climate talks extend Kyoto Protocol, promise compensation'. According to the text of this report the 'broad principle' of compensation was agreed, and this was described as a 'breakthrough' in a quote from an NGO.

The relevant conference text does not use the word ' compensation '. A document with the title **Approaches to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change to enhance adaptive capacity**
(http://unfccc.int/files/meetings/doha_nov_2012/decisions/application/pdf/cmp8_lossanddamage.pdf)
at 9 says that the conference

> *Decides* to establish, at its nineteenth session, institutional arrangements, such as an international mechanism, including functions and modalities, elaborated in accordance with the role of the Convention as defined in paragraph 5 above, to address loss and damage associated with the

> impacts of climate change in developing countries that are particularly vulnerable to the adverse effects of climate change.

where at 5 it says that the role of the Convention includes, *inter alia*,

> (c) Enhancing action and support, including finance, technology and capacity-building , to address loss and damage associated with the adverse effects of climate change.

Clearly, exactly what these words mean remains to be negotiated - 'address' is not the same as 'compensate for' though it may encompass it.

On financial flows and transfers, there was little substantive progress beyond what had been agreed at previous COPs. The following is an indicative summary taken from a press release put out by the Qatar conference host (http://www.cop18.qa/news/singlestory.aspx?id=297).

> 4) Long-term climate finance
>
> Developed countries have reiterated their commitment to deliver on promises to continue long term climate finance support to developing nations with a view to mobilizing 100 billion USD both for adaptation and mitigation by 2020.
>
> The agreement also encourages developed countries to increase efforts to provide finance between 2013-15 at least to the average level with which they provided funds during the 2010-2012 fast start finance period. This is to ensure there is no gap in continued financial support while efforts are otherwise scaled up.
>
> Governments will continue a work programme on long term finance during 2013 under two co-chairs to contribute to the on-going efforts to scale up mobilization of climate finance and report to the next COP on pathways to reach that target.
>
> Germany, the UK, France, Denmark, Sweden and the EU Commission announced concrete finance pledges in Doha for the period up to 2015 totalling approximately 6 billion USD.

This press release also reported that the conference

> endorsed the selection of the Republic of Korea as the location of the Green Climate Fund and the work plan of the Standing Committee on Finance. The Green Climate Fund is expected to start its work at Sondgo in the second half of 2013, which means that it can launch its activities in 2014.

The Doha outcomes on such matters as technology transfer, adaptation and forests were similar in nature to those on finance - mainly a re-affirmation of previous intentions and work programmes.

2. Assessing the Kyoto architecture

In assessing the Kyoto architecture as it now exists, one can adopt either of two perspectives. One could, as in 2.1 below, use the objectives of the UNFCCC as the criteria, or one could, as in 2.2 below, use some alternative, ideal, comprehensive international agreement (CIA) as yardstick. The first approach is used by many who approach the matter from primarily an environmental perspective, the second tends to be that of many economists. A different approach comes mainly from the international relations perspective. It, as discussed in 2.3 below, starts from the presumption that an effective CIA is infeasible, and asks how Kyoto looks in a 'regime complex' - where there are,

as there are in fact, a variety of multilateral, bilateral and unilateral policy responses to climate change.

Many of the issues raised in this section are addressed in more detail in the contributions to Aldy and Stavins (2007), and more succinctly in Aldy and Stavins (2008).

2.1 Assessing Kyoto against UNFCCC criteria

As noted at the beginning of section 1 above, put briefly here, the objective of the UNFCCC is to cost effectively avoid dangerous anthropogenic climate change (now specified as 2^0C above pre-industrial) while promoting sustainable development. To this end it adopted a binary classification of nations - developed and developing - to which common but differentiated responsibilities attached. To date, the principal manifestation of differentiation has been that only (some) developed nations have undertaken binding emissions limitation/reduction commitments. Differentiation also entails flows of financial and technical assistance from developed to developing. Cost effectiveness is addressed via the flexibility mechanisms, where the CDM is also seen as a means for flows of finance and technology.

It was always clear that the emissions reduction commitments of the developed country parties would mean that it was unlikely that the climatic objective would be realised. As noted above, the failure of the USA to ratify the protocol, and the later withdrawals, made this very unlikely. As also noted above, some developed and developing countries have made pledges, or statements of conditional intent, which go beyond their protocol commitments, but even if these were realised it is unlikely that the UNFCCC climatic objective would be met. For those who see the UNFCCC process as the only, or the principal, means for realising its climatic objective, the hope has to be that the 2020 successor to Kyoto, that Doha has set in train negotiations for, will involve more ambitious emissions reduction commitments for all nations.

The binary developed/developing classification adopted by the UNFCCC and endorsed by the Kyoto Protocol is un-helpful. It is inequitable and creates anomalies which work against general acceptance. The following Table 4 illustrates this with some examples of 2007 per capita GDP for Annex I and Non-Annex I countries: units are PPP US$. Why should the citizens of, say, (South) Korea be exempt from any costs associated with emissions reduction commitments and be candidates for transfers in part financed by the citizens of, say, Portugal, who are liable for costs associated with emissions reduction ?

Table 4 GDP per capita for selected countries

Non-Annex I			**Annex I**	
	GDP pc			GDP pc
Singapore	49704		Russian Federation	14690
Republic of Korea	24801		Portugal	22765
Trinidad and Tobago	23507		Greece	28517
China	5383		Luxemburg	79485
India	2753		Norway	53433
Sierra Leone	679		USA	45592
Niger	672		Ireland	44613

Source: UNDP Human Development Report 2009

Developing countries generally do not consider that Kyoto does sufficiently well for them in terms of the sustainable development objective, and have consistently pressed for larger and more assured financial flows from developed to developing. As is reported above, little progress was made as between COP 15 (Copenhagen) and COP 18 (Doha) in this area. It remains unclear, for example, to what extent the 100 billion USD per annum represents new and additional funding. It can also be noted that

even 100 billion dollars is not, in context, a lot of money. The damage cost of Hurricane Katrina, which among other things flooded much of New Orleans, has been put at USD150 billions. Estimates of the damage associated with the 2012 hurricane that struck the east coast of the USA come in at around USD 60 billions. The current level of ODA by the OECD countries is of the order of USD 120 billions. As noted above, at Doha a form of words was introduced that in the view of some commentators may lead to the payment of compensation by developed countries for damage suffered by developing countries.

As noted at 1.1 above, while economic modelling provides estimates of substantial cost savings from the flexibility mechanisms, there does not appear to be as yet any *ex post* evidence on the size of actual cost savings.

2.2 Assessing Kyoto against ideal criteria

Many economists have criticised the UNFCCC and the Kyoto Protocol on the grounds that targets are not set by an optimisation exercise, that there is no proper and formal comparison of costs and benefits: see, eg, chapter 8 of Nordhaus and Boyer (2000), and also Lomborg (2001). The approach taken by the UNFCCC is, as discussed in the textbook, in the nature of the Safe Minimum Standard idea, which, as discussed in Chapter 13 of the textbook, many, including some economists, consider a proper approach in the face of the uncertainty which characterises the climate change problem. It is also noted there - see Box 131 - that one major examination of climate change policy by economists - the Stern Review - does actually derive its global policy target from an SMS criterion rather than a risk adjusted optimisation.

Given a target, economists focus on achieving it at least cost. They are clear that least cost solutions involve setting a uniform price - either by a tax or by tradable permits - to which agents adjust. In an ideal world a global agency would either auction permits to sources, or tax sources at a uniform rate. In such a context there is a lot to be said for treating carbon dioxide separately from the other GHGs. On the one hand, CO_2 is some 80% of the problem. On the other hand, the monitoring problem can be relatively straightforward for CO_2 emissions from fossil fuel combustion, which is where most of the problem originates. Given that the carbon contents of the fossil fuels are known, emissions from this source can be monitored by monitoring fossil fuel use. The global agency could deal with most of its problem by using taxes/permits in relation to fossil fuel extraction, by targeting the firms that extract fossil fuels rather than trying to monitor emissions. The cost effects of such 'upstream' intervention would be passed forward by fossil fuel extractors, and would cascade through the global economy affecting the prices of deliveries to final demand so that those relative prices would reflect relative carbon content (see Chapter 8 of the textbook on economy wide modelling). Carbon sinks could be addressed by a system of credits for sink enhancement, and debits for sink reduction. Other GHGs would need to be separately dealt with.

Such a global agency would be in receipt of large revenues from taxation or permit auctions. This revenue could be distributed to nations in inverse proportion to per capita income levels, which would address international equity issues, and encourage participation by poorer nations. It is not difficult to devise formulae for such disbursement of revenues - the Appendix below derives a formula and provides some illustrative numbers. Not all of the revenue need be so disbursed. Some could be set aside for funds to deal with countries especially vulnerable to climate change, and to support research and development and its diffusion.

At the level of principle, the dimensions of the choice between tax and permits for such an agency are basically those originally set out in Weitzman (1974), and discussed in section 7.3.3 of the textbook, concerning imperfect knowledge of the marginal cost and damage functions. Many economists take it that for carbon dioxide and the climate change problem, these considerations point to a carbon tax rather than a cap and trade system. Kahn and Franceschi (2006) argue that the uniform tax is to be preferred on the grounds that, as compared with tradable permits, it provides a

continuing incentive to reduce emissions even if the tax remains constant, and it generates greater incentive for technological innovation in emissions reduction technologies. It should also be noted that it would appear that upstream intervention by way of differentiated, by carbon content, tax rates across fossil fuels would administratively simpler than upstream intervention by way of tradable permits for fossil fuel extraction and importation. For some commentators a decisive argument against taxation is that it would not guarantee that the global target is met.

This ideal is clearly politically infeasible because nation states would not yield to a supra-national body the power to tax firms within their jurisdiction. It does, however, serve to anchor some observations regarding the Kyoto architecture. One of the problems of addressing equity via a binary classification of nations has already been mentioned. Also relevant to some notions of equity is the fact that given international trade, a nation's contribution to global emissions is not properly measured by emissions arising within that nation's boundaries. Rather, they are the emissions that the consumption of its citizens gives rise to, wherever that consumption is produced. By shifting carbon intensive production offshore, a nation can reduce the emissions within its borders while retaining the carbon intensity of production. Figure 8.1 in Box 8.2 in the textbook shows for 1992-2004 the increasing percentage of the total CO_2 attributable to UK household consumption due to imports. Similar trends are observable for other European economies, and for the USA. For the EU, this has been one of contributory factors in meeting its Kyoto commitment. This is sometimes called 'carbon leakage'. While such leakage helps Annex I Parties meet their carbon reduction commitments, it does nothing to reduce global emissions, and may increase them to the extent that production technology in the non-Annex I countries to which production moves is more carbon intensive. Critics of the Kyoto Protocol have also cited possible carbon leakage effects on employment in Annex I countries.

While recognizing the infeasibility of an international global tax regime, some economists have argued for national carbon taxation rather than the Kyoto flexibility mechanisms: see, for examples, Helm (2009) and Cooper in Aldy and Stavins (2007). Most advocates of national carbon taxation argue that rates should be harmonised so that there is a single global price on carbon. Cooper argues for differentiation of rates so as to favour developing countries. The tax could be levied 'upstream' on domestic fossil fuel extraction and fossil fuel imports, which would be administratively simpler than taxing final deliveries according to their estimated carbon intensity. To the extent that all countries participated in such a system, the leakage problem would be avoided. If such a system were to be adopted within the current Kyoto architecture with only Annex I countries introducing carbon taxation, there would be a leakage problem. It has been suggested that this could be addressed by allowing Annex I countries to use border tax adjustments according to carbon intensity on imports of final and intermediate goods. In response it has been suggested that such taxes would give rise to problems with the WTO, but Keohane and Victor (2010) suggest that this need not be the case.

2.3 Regime complex rather than a CIA?

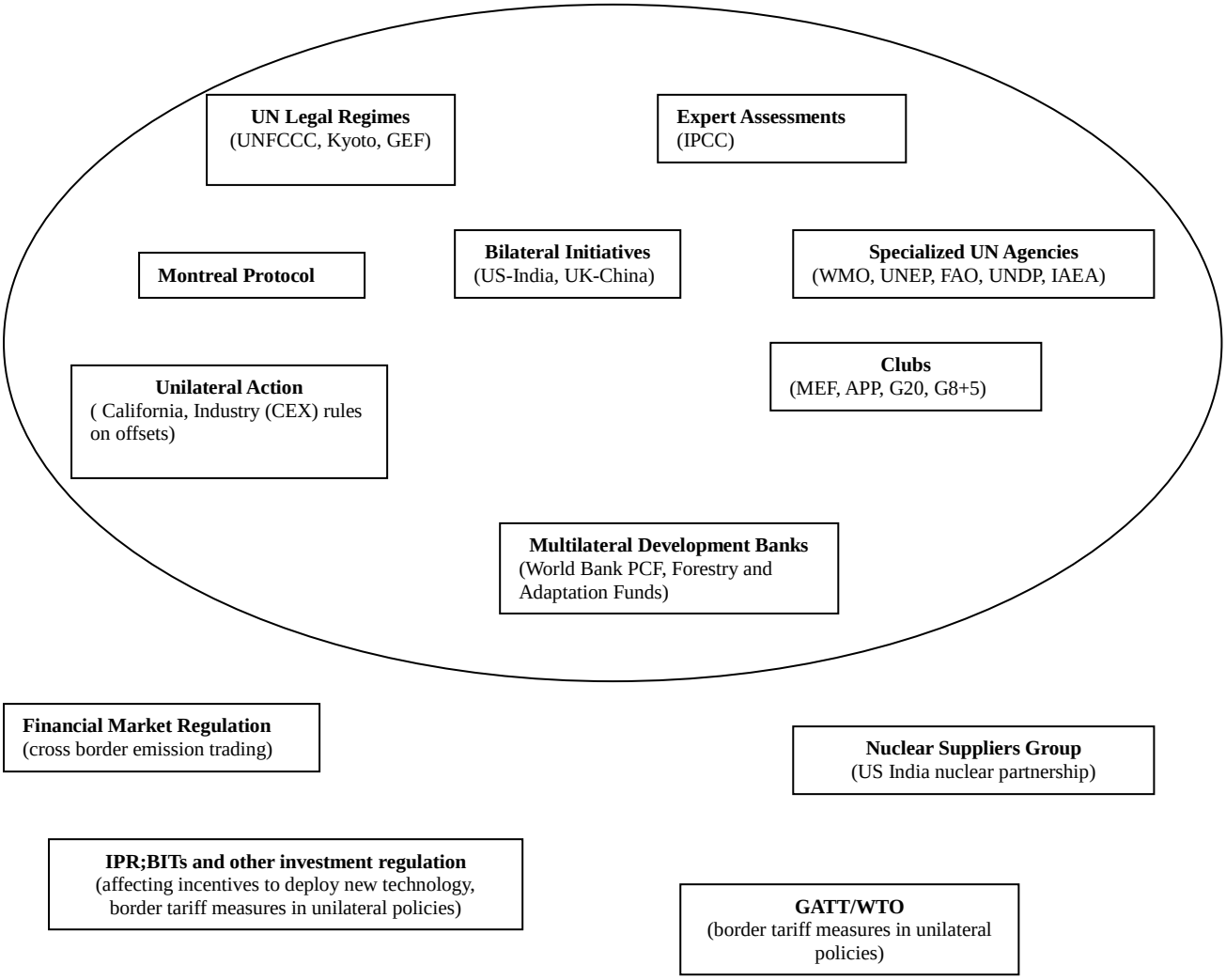
In terms of policy responses to the climate change problem, the UNFCCC and Kyoto are not 'the only game in town'. There are many unilateral, bilateral and multilateral responses: Climate Policy Watcher at http://www.climate-policy-watcher.org is a useful point of entry for finding out more about many of these.

Keohane and Victor (2010) characterise this situation as a 'regime complex'. They posit a continuum with fully integrated institutions that ' impose regulation through comprehensive, hierarchical rules' (a CIA) at one extreme, and highly fragmented collections of institutions with 'no identifiable core and weak or nonexistent linkages between regime elements' at the other. A regime complex is an arrangement

> of the loosely coupled variety somewhere in the middle of this continuum: there are connections between the specific and relatively narrow regimes, but no overall architecture that structures the

whole set.

Reproduced below is their schematic representation of the regime complex for climate change. Elements inside the oval represent forums where substantial rule making has occurred, focussed on one or more of the tasks needed to manage climate change: elements outside are areas where climate rule making has required additional, supporting rules. The bracketed items are examples of the generic class for the box. For the meaning of the acronyms and some discussion of the non-UNFCCC activities and institutions go to the paper.



Keohane and Victor argue that the emergence of a regime complex with respect to the climate change problem was inevitable, and that the emergence of a single CIA never was, and is not, feasible. They argue that a regime complex has, provided it meets certain criteria, advantages, in terms of flexibility and adaptability, over any CIA *that is politically feasible*. They also argue that while the way forward is in the evolution of the regime complex, the UNFCCC has an important role to play in that evolution. The role of the UNFCCC shifts from being the single CIA for climate change to being one component of an evolving system. The implication is that the sorts of assessments of the UNFCCC/Kyoto made above are missing the point by judging it as if a single CIA was feasible and desirable. For Keohane and Victor:

> The Framework Convention would best be used as an umbrella under which many different efforts proceed. It would supply functions that are best provided on a universal basis, such as standards for reporting on emissions, providing a forum negotiating broad decisions, and perhaps instructing

technical bodies (e.g. the IPCC) to gather and assess information.

3. Why Kyoto?

Keohane and Victor's argument that an effective CIA in relation to the problem of climate change was not, and is not, feasible echoes the analysis in section 9.3 of the textbook, which was developed using game theory tools. While the effectiveness and comprehensiveness of the Kyoto Protocol, and where it is as of the end of 2012 are questionable, the fact is that there exists an international agreement, and there are those who hope that steps have been taken which will make it more comprehensive and more effective. In the light of the section 9.3 analysis, and the arguments of Keohane and Victor (2010) (and others in, for example, contributions to Aldy and Stavins (2007); see also contributions by Barrett cited in section 9.3), questions arise as to how to explain the existence and form of the Kyoto Protocol, and its subsequent development - why Kyoto? Can a satisfactory explanation be provided solely in terms of the pursuit of national self-interest?

In regard to the Kyoto Protocol as it emerged in 1997, Chapters 2 and 3 of Grubb et al (1999) give a good account of the negotiations leading up to and at COP3 in Kyoto, largely in terms of the pursuit of self-interest. In summary, the stories are as follows:

EU

The EU, and many of its member states acting individually, has from the outset consistently been the main proponent of a CIA on climate change. It is the largest single political entity, both in terms of population and economic output, in the developed world. It has also been the main proponent of legally binding emissions limitation and reduction commitments as part of that CIA. As regards self-interest, it is widely noted that the EU as a whole is a net fossil fuel energy importer, so that for the EU to act to reduce its fossil fuel use would align with a strategic interest in reducing dependence on foreign sources for a vital economic input. At the time that positions on what was to become the Kyoto Protocol were being developed and negotiated, the EU was in a favourable position regarding emissions limitation/reduction relative to some recent base year in as much as two of its major economies and sources, the UK and Germany, were anyway experiencing reductions, or at least slowing growth. In the UK this was on account of the 'dash for gas' associated with the privatisation of the electricity supply system. In Germany this was on account of re-unification, and the closing down of much energy-inefficient plant in the east. As a result, emissions limitation/reduction would be cheaper in the EU than on other industrialised countries, notably the USA. It is also argued that the EU saw opportunities following from being a technological leader in the decarbonisation of economies.

USA

As of the 1990s, the USA was the largest single source of greenhouse gases, and was among the highest per capita emitters. The USA has, in regard to a comprehensive CIA, always been less proactive than the EU, and as noted above did not ratify the Kyoto Protocol. It has also, as compared with the EU, always been keener on flexibility mechanisms such as emissions trading. In terms of self-interest, this is generally seen in terms of the USA being itself a large fossil fuel energy producer with a history of cheap energy, to which industry and consumers are adjusted, so that de-carbonisation would be relatively costly. This was a widely held perception in the USA, supported by a number of economic modelling exercises. Results reported in Table 8.6 of Nordhaus and Boyer (2000), for example, concerning a Kyoto Protocol (with the USA in it as per Table 2 above) with no flexibility mechanisms have global abatement costs of 884 billions of USD and USA abatement costs of 852 billions of USD. If emissions trading among Annex I parties is allowed in the model, these numbers change to 217 and 325 respectively.

Other OECD

These are, in terms of self-interest, a mixed bunch. Japan has virtually no fossil fuel resources and is highly energy efficient with a large nuclear sector, so the perception was that emissions reductions would be expensive. Canada and Australia have economies that are energy and emissions intensive, and growing populations, again making emissions limitation/reduction seen as expensive. Norway, Switzerland and New Zealand all have lots of hydroelectricity and low per capita emissions, also making for the perception of high costs associated with emissions limitation/reduction.

In the negotiation of the Kyoto Protocol these countries together with the USA formed a loose alliance, in opposition to the EU, known as JUSSCANNZ. As Table 2 above, for the Annex B commitments, shows, with the exception of Switzerland, they all took on smaller commitments than the EU. In the case of the USA, this happened only after the inclusion of the flexibility mechanisms in the protocol.

EIT

EIT stands for 'Economies in Transition', which are identified by asterisks in Table 2 here listing the Annex B commitments. These are the countries of central and eastern Europe which emerged from the break-up of the Soviet Union in 1980s. Under the Soviet system most of these countries had developed economies which used lots of fossil fuels inefficiently. After the break-up economic outputs declined, and emissions moved correspondingly. This worked to make it easy for these economies to accept emissions limitations reductions. Also, several of them were, at the time that the protocol was being worked toward and negotiated, looking to join the EU and aligned their positions with that of the EU.

As reflected in Table 2 here, this was not the case for Russia and Ukraine, both of which signed up for limitation at the 1990 level rather than reduction below the 1990 level. In the final stages of the negotiations these two aligned with the JUSSCANNZ grouping, which then came to be known as the Umbrella group. With limitation it was clear that Russia in particular would overachieve on its commitment and thus have credits that it could sell under the emissions trading flexibility provision. The main potential market for such credits was generally understood to be the USA, which as noted above was keen on 'flexibility' as a means of reducing its compliance costs, and it appears that an understanding between these two countries was a factor in enabling both to accept the final text as it appeared at Kyoto. The Nordhaus and Boyer (2000) modelling results for the impact of Annex I trading on USA abatement costs, in their Table 8.6, noted above also showed negative costs of 112 billions of USD for Eastern Europe, as compared with negative 2 billions of USD without any trade.

Developing countries

In relation to the UNFCCC all non-Annex I countries are 'developing countries' - more than 120 countries. These differ greatly in terms of population size, vulnerability to climate change impacts, and, as noted above, per capita income levels. What has made them a group is the perception that their interests require them to unite to deal with the strength of the industrialised, Annex I, countries. They argue that since it is the industrialised countries that have to date created the problem, and benefited from it, it is those countries that should take the lead in dealing with the problem. Acceptance of this principle is fundamental to the UNFCCC process to date.

> The Alliance of Small Island States, AOSIS, comprises 42 states particularly vulnerable to sea level rise - some have a highest point just 2 metres above sea level. Their self-interest is clear and stark, and reflected in their negotiating positions.
>
> Some, but by no means all, of the OPEC countries have high per capita emissions and high per capita incomes. All see the limitation or reduction of global CO_2 emissions as a threat to their oil revenues.
>
> The remainder are a very mixed bunch with divergent particular interests, but almost all of them are poor and have economic development as their primary concern, and consistently argue that any commitments that they might make are conditional on action by developed nations.

Clearly the pursuit of self-interest has been a major factor in the UNFCCC process and the form taken by the Kyoto Protocol, and has continued to influence the direction of events since 1998. It is not clear, however, that it is the whole story.

While Grubb et al (1999) analyse the positions and behaviour of the groupings listed above primarily in terms of the self-interests involved, they introduce other considerations to explain the actions of some of the actors. With respect to Japan, for example, it is noted that because it was a country with high energy efficiency it had concerns about its ability to reduce emissions, but nonetheless signed up for the same commitment as the EU in the Kyoto Protocol. However, it is also noted that in the early 1990s debate in Japan ' turned towards environmental issues as an area where the country could assume its rightful role as a mature and responsible international player, leading the world into a sustainable twenty-first century'. Other commentators suggested that as host to the COP Japan saw itself as having an obligation to set an example. It is of interest that, as noted above at Table 3, Japan has not made a commitment for the extension of the Kyoto Protocol negotiated at Doha.

The most obvious problem for an explanation of Kyoto related behaviours solely in terms of self-interest would appear to be the differences between the EU and the USA. Whereas the former has consistently been proactive in pursuit of a climate change CIA, the latter did not ratify the original Kyoto Protocol, and made no commitments for 2013-2020 at Doha. While the EU and the USA do have different interests, primarily in terms of the perceived costs of domestic abatement, the differences are not obviously enough to explain the radically different behaviours.

Schreurs and Tiberghein (2007) argue that for the EU action on climate change is seen as ' a moral and ethical issue that must transcend narrow economic interests' and explain EU behaviour primarily in terms of the structure of its institutions. They argue that these made it fertile ground for 'policy entrepreneurship' in regard to climate change policy, both internally and externally. Thus:

> The open-ended and competitive governance structure of the EU in an issue of shared competence such as the global environment has created multiple and mutually-reinforcing opportunities for leadership. .....Institutionally, environmental policy is an issue where the Commission and Member States have joint competence and one where the decisions in the EU Council are taken by qualified majority voting. Under these circumstances, a positive cycle of competing leadership among different poles can take place.

Schreurs and Tiberghein do not completely discount the role of interests as understood by economists, but they see them as permissive rather than as drivers. Thus, for example, in discussing the role of Member States they ask 'What are the origins of the UK's strong leadership in climate change?'.They note public opinion in the UK and the consequences of the 'dash for gas', and then state that

> in more recent years, the UK leadership's concern about being seen as too closely tied to the US given the UK's central role as a member of the "coalition of the willing" in Iraq. It was important to Blair to show policy leadership in an area where he could prove his independence from the US and gain a degree of leadership in EU decision-making. To Tony Blair personally, climate change policy was also a tool to regain legitimacy within his own labour party.

Here is an interest of a political rather than economic nature, which is contingent on other political matters. Interests of a kind more familiar from the public choice literature come up in their discussion of the role of the European Commission. According to Schreurs and Tiberghein in relation to climate change policy, the Commission has three main goals:

> to respond to European public opinion thereby showing its relevance
>
> as a means to push forward European integration and empower the Commission with new regulatory tools
>
> to use external climate change policy as a means to build up the EU's foreign policy presence

Van Schaik and Schunz (2012) consider essentially the same question as Schreurs and Tiberghein - how to explain EU activism in global climate change policy. They posit two alternative explanations - norms and interests. For the EU and climate change the relevant norms are: a belief in multilateralism, sustainable development, and the precautionary principle. Interests are seen as economic opportunities and the climate change-security nexus. The first here refers to first-mover advantage, and the second to the idea that curbing emissions by de-carbonising the European energy system would mean reduced dependence on imported fossil fuels. Van Schaik and Schunz claim to demonstrate that EU behaviour was driven by norms rather than interests, albeit that the pursuit of norms was constrained by interests - they note that circumstances such as German re-unification and the UK 'dash for gas' made it possible for the EU to pursue its norms as it did. They argue that the EU's pursuit of its norms was not very successful in that it failed to get them 'uploaded' to the international context.

Finally it is worth noting an historical irony. In the negotiations to the Kyoto Protocol, the EU reluctantly conceded to the USA on the introduction of flexibility mechanisms, and the USA signed a Protocol which did not, as it had wanted, include any developing country emissions limitation/reduction commitments. In the event, the USA did not ratify the protocol, but it did come into force. So, from the EU's point of view it lost the prize of a CIA and got stuck with flexibility mechanisms that it had not wanted. However, for a variety of reasons, including the increasing leverage of economic analysis, things in the EU have changed. It now has its own flexibility mechanism - carbon trading - and is looking to see this linked internationally. Were the Kyoto Protocol being negotiated now, it is unlikely that the EU would oppose flexibility. It does still appear to be the case that domestic politics, if nothing else, would prevent the USA ratifying an agreement that did not include commitments by the major developing countries.

While interests as understood by economists do matter a lot, so do institutions, history, and contingency.

Appendix: A simple system for distributing revenue from a global carbon tax

With

X - amount available for total payout

x_i - per capita payment to signatory i, i = 1,2.....N

P_i - population of signatory i

y_i - per capita GDP in signatory i, PPP$s

the requirement that all of the money available is paid out is

$$X = \sum_{1}^{N} P_i x_i \qquad (1)$$

and

$$x_i = a - by_i \qquad (2)$$

gives the per capita payout falling linearly with y_i.

Substituting (2) into (1):

$$X = a\sum P_i - b\sum P_i y_i \quad (3)$$

To fix a and b fix payout to richest country, let $x_i = 0$ for $y_i = y_{max} = K$. Then

$$a - bK = 0$$

so that

$$a = bK \qquad (4)$$

Putting (4) in (3)

$$X = bK\sum P_i - b\sum P_i y_i \qquad (5)$$

and

$$b = \frac{X}{K\sum P_i - \sum P_i y_i} \qquad (6)$$

and then the number for a follows from (4).

The operation of such a system can be illustrated using data taken from the Human Development Report 2009 on 2007 GDP per capita in PPP US$ and population for 2007. The figure used for total emissions, 7,777 MtCe, is for CO_2 excluding land use changes in 2006, and is taken from WRI's CAIT. The GDP and population data used here covers 182 nations. The omitted nations have a combined population of approximately 100 million, are mainly low income and with low per capita emissions. The results shown for selected participants in Table 5 assume a tax of $50 per tonne of carbon giving X equal to 388, 850 million $s. In these data the country with the highest per capita GDP is Luxembourg at $79,485 and for the calculations reported in Table 5 K was set at $79,485.

These data then give:

$$x_i = 67.5366 - 0.0008497y_i \qquad (7)$$

Table 5 gives the resulting payouts to the countries shown in Table 4 above. For different values for X,

scale the entries in Table 2 by the ratio of the desired value to 388,850 x 10^6. Note that the value used here for X is almost 4 times the level of transfers envisaged in the Copenhagen Accord for 2020. Table 5 assumes that all the tax revenue is paid out to participants: to get the results if z% of the revenue is used for other purposes, on which see below, multiply the entries there by (100-z)%.

Table 5 Selected per capita and total payouts from GCF

	Per capita Payout x_i $s	Total Payout $P_i x_i$ $s x 10^6
Luxemburg (AI)	0	0
Norway (AI)	22.14	104.038
Singapore	25.30	113.869
USA (AI)	28.80	8,889.972
Ireland (AI)	29.63	130.371
Greece (AI)	43.31	480.700
Republic of Korea	46.46	2,230.259
Trinidad and Tobago	47.56	61.832
Portugal (AI)	48.19	510.853
Russian Federation (AI)	55.06	7,812.278
China	62.96	83,684.000
India	65.20	75,935.000
Sierra Leone	66.96	361.582
Niger	67.00	944.754

Note: AI indicates an Annex I party to UNFCCC

The amount available to the poorer countries would be increased if some rich countries were excluded from the payouts calculation. For example, setting K at Norway's level of GDP pc and excluding Luxemburg, Qatar (GDP pc $74882) and UAE (54626) gives

$$x_i = 72.6031 - 0.00159y_i \qquad (8)$$

and above $9947.97 x_i is lower with (8) than with (7), whereas below $9947.97 switching from (7) to (8) gives a higher x_i. Using (8) the per capita payout for the USA falls to $10.65, while that for China increases to $65.29, for examples.

It is tempting to use a country's emissions to compute what it pays in tax and thus by how much it is a net beneficiary or a net payer. In 2006, for examples, China's emissions were 1693.9 Mtce and the USA's were 1575.0 Mtce, which at $50 per tonne give $84,995 million and $78,750 million respectively. It is then tempting to say that China would be a net payer in amount $1,311 millions and the USA a net payer in amount $69,860 millions. This would be wrong. The carbon tax is passed forward, and given current trade flows, $84,995 overstates the initial impact on the inhabitants of China, and $78,759 understates it for the USA.

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