

The issue of 'Adverse Effects and the Impacts of Response Measures' in UNFCCC

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Abstract:

The United Nations Framework Convention on Climate Change and its Kyoto Protocol require Parties to take measures to minimise the adverse effects of climate change on vulnerable countries including small island states. In negotiations the Alliance of Small Island States (AOSIS) argue that this should mean assistance for capacity building and transfer of technologies to help them adapt to a changing climate. The Convention and Protocol also require Parties to take measures to minimise the impacts of emission reduction activities on energy exporting countries. In negotiations the Organisation of Petroleum Exporting Countries (OPEC) countries argue that this should mean payment of compensation for the lost oil revenues, the growth of which is forecast to slow should the Protocol be implemented. Although seemingly unrelated, negotiations on these two agendas are currently intertwined and progress on both is deadlocked. This paper explores the political, economic and legal dimensions of this interlocked adverse effects/impacts issue.

The paper begins by discussing the key adverse effects/impacts Articles under negotiation (Articles 4.8, 4.9 and 3.14 of the Kyoto Protocol), and the ways in which progress has become deadlocked. The paper discusses the positions of AOSIS and OPEC countries, and considers the bases for their respective positions. The paper explains how, in insisting that progress on Articles 4.8, 4.9 and 3.14 - and indeed on all issues in the climate regime - be equal to progress on the issue of compensation, OPEC countries are obstructing financial and technical assistance to all developing and least developed countries for adaptation to the impacts of climate change. This suggests that tacit G77-China support for OPEC's position may therefore be counterproductive.

The paper gives considerable attention to the energy models that forecast losses to OPEC countries if the Kyoto Protocol is implemented. It explores the assumptions of these models which, in sum, render expected losses to oil exporters highly uncertain. It argues that there are sufficient grounds to suggest that even for many OPEC countries assistance to help manage the adverse effects of climate change is more important to their economic welfare than compensation for the impacts of response measures on oil revenues.

The paper then outlines how standard decision-making criteria cannot be applied to the adverse effects/impacts issue as the values that underlie the respective AOSIS / OPEC negotiating positions are incommensurable. Instead, it sees that a political solution is required and advocates a second-track dialogue and conflict resolution process in the UNFCCC. The paper posits that in situations where the proposed second-track dialogue and conflict resolution process fails, there may ultimately need to be some mechanism whereby deadlocked conflicts can be resolved through adjudication.

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1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) estimates that temperatures may increase by 1.4-5.8°C by 2100 and that this increase is due to ongoing human activities (IPCC 2001). Yet international action on the problem is blocked by many unresolved issues among the Parties to the United Nations Framework Convention on Climate Change (UNFCCC). One of the unresolved issues is the tension between means to minimise the adverse effects of climate change on vulnerable countries like Small Island Developing States (adverse effects), and means to minimise the impacts of efforts to reduce emissions on the economies of oil exporting countries (impacts of response measures). These two seemingly unrelated agendas are fundamentally intertwined and deadlocked in negotiations on the climate treaty. This deadlock has been described by the executive secretary of the UNFCCC as ‘one of the most critical aspects’ of the climate change negotiations (Capdevila 2000).

Negotiations on this adverse effects/impacts issue revolve around Articles 4.8 and 4.9 in the UNFCCC and Article 3.14 of its Kyoto Protocol. Two key players in these negotiations are the Alliance of Small Island States (AOSIS) and the Organisation of Petroleum Exporting Countries (OPEC). Both groups are members of the broader G77-China grouping which encompasses 130 developing and least developed countries. AOSIS believes that reducing greenhouse emissions is vital to the future welfare of small island developing states (SIDS). Further, because existing levels of greenhouse gas concentrations mean there is already a ‘commitment’ to climate change, AOSIS countries are seeking assistance to help them to minimise the adverse effects of climate change.

The tension between energy exporters and energy importers is a major fault line in climate politics (Paterson and Grubb 1992). OPEC countries believe that the Kyoto Protocol will slow growth in their revenues from oil exports. They believe that policies to implement the Kyoto Protocol (such as a carbon tax) will increase oil prices and reduce demand in developed countries which account for 60% of world oil consumption, thereby driving down global oil demand and prices. OPEC countries argue that they should be compensated for these losses. As a consequence of the climate regime being based on the consensus of all Parties (see below), by their insistence on “equal progress” on the compensation issue with progress on all other issues OPEC countries effectively hold progress on measures to minimise adverse effects on developing countries hostage to progress on their demands for compensation (ENB 12[137]). This demand for compensation also impedes finalisation of the rules of the Kyoto Protocol. This is important because developed countries will not ratify the Protocol until its details are clear, and serious emissions reductions are unlikely until these countries ratify.

This paper explores the political, economic and legal dimensions of this interlocked adverse effects/impacts problem. It introduces the key adverse effects/impacts Articles under negotiation and the ways in which progress has become deadlocked. The paper discusses the positions of AOSIS and OPEC countries, and considers the bases for their respective positions. Considerable attention is given to the energy models that forecast losses to OPEC countries if the Kyoto Protocol is implemented. The paper argues that the values that underlie the respective AOSIS / OPEC negotiating positions are incommensurable. Instead, it sees that a political solution is required and advocates a second-track dialogue and conflict resolution process in the UNFCCC. The paper posits that in situations where the proposed second-track dialogue and conflict resolution process fails, there may ultimately need to be some mechanism whereby deadlocked conflicts can be resolved through adjudication.

2. The adverse effects/impacts issue in the UNFCCC and the Kyoto Protocol

International action to tackle the problem of climate change was formalised with the adoption of the United Nations Framework Convention on Climate Change in May 1992. The UNFCCC entered into force on March 21 1994, and has now been ratified by 184 countries. As of September 7 2000, all of the 43 AOSIS member countries (excluding the four observing countries) have ratified the UNFCCC, as have 10 of the 11 OPEC member countries (Iraq has not).

The UNFCCC does not set binding emission targets on Parties. Its ultimate objective is the ‘stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system’ in a time frame ‘sufficient to allow ecosystems to adapt naturally.. and to enable economic development to proceed in a sustainable manner’ (Article 2). Exactly what constitutes ‘danger’, ‘natural adaptation’, ‘sustainable’ and the level of concentrations at which dangers are avoided are unspecified in the Convention, and are imprecise in climate science.

The climate regime is for the most part based on the consensus of all Parties. This stems from a lack of agreement about the Rules of Procedure with regard to decisions such that a de facto process has emerged whereby objections to a decision are frequently vetoes. At times, however, the regime has used a consensus minus-X voting procedure. This was particularly evident during negotiations over the Kyoto Protocol at the Third Conference of Parties in 1997 (Oberthur and Ott 1999). The absence of rules has at times placed considerable power in the hands of active Chairs of the COPs, and there are examples where small dissident groups’ objections have been overridden in final agreements (Kassler and Paterson 1997). Coalition building is therefore essential for efficacy in climate negotiations, but how many Parties are required for a successful veto of an agreement remains unclear. In the case of the objections of OPEC countries discussed in this paper, it is the tacit support they receive from the larger G77-China grouping that allows OPEC to be an effective actor in the regime.

Since the UNFCCC entered into force there have been six meetings of its supreme body – the Conference of Parties (COP). At the third Conference of Parties (COP-3) in 1997 the Kyoto Protocol was adopted. The Kyoto Protocol is a supplement to the UNFCCC. It sets legally binding targets for greenhouse gas emissions on 38 developed and ‘economies-in-transition’ countries listed in its Annex B. In aggregate these emissions reductions equal a 5% reduction of the main greenhouse gases below 1990 levels, to be achieved in the first commitment period 2008-2012. While this reduction will do little but temporarily slow the growth of greenhouse gas concentrations, it is nevertheless a critical first step towards tackling climate change.

The Kyoto Protocol will enter into force 90 days after 55 Parties to the Convention, including Parties accounting for 55% of Annex B reductions, have ratified it. Because the United States accounts for 36% of Annex B emissions it has near-veto power over the Kyoto Protocol’s entry into force. As of November 27 2000, 17 of 39 AOSIS member countries have signed the Kyoto Protocol, and 14 have ratified it (of a total of 31 ratifications overall). Of the OPEC countries only Indonesia has signed the Kyoto Protocol and none have ratified it. Only one of the developed countries from whom binding emissions reductions are required has ratified the Protocol (Romania in February 2001). The European Union countries have signalled their intention to ratify in 2002.

The adverse effect/impacts issue revolves around Articles 4.8 and 4.9 of the UNFCCC, and Art.3.14 of the Kyoto Protocol. In principle these three Articles should be tackled separately as these are distinct articles spread among the Convention and Protocol which are themselves separate legal instruments. However, negotiations on all three articles have been linked, largely at the instance of OPEC countries. Indeed, one of the key topics of negotiations over these articles is whether the COP should pass decisions on them as two separate entities split among 4.8/4.9 of the Convention and 3.14 of the Protocol. Thus far negotiations on Articles 4.8/4.9 and 3.14 have occurred in the same contact group convened by the subsidiary bodies to the UNFCCC.

2.1. Article 4.8

Article 4.8 is the key to the adverse effect/impacts problem. It commits Parties to give: full consideration to what actions are necessary ... including actions related to funding, insurance and the transfer of technology, to meet the specific needs and concerns of developing country Parties arising from the adverse effects of climate change and/or the impact of the implementation of response measures, especially on: Small Island Countries Countries whose economies are highly dependent on income generated from the production, processing and export, and/or on consumption of fossil fuels and associated energy-intensive products.

The salient features of this article are its reference to developing countries, its explicit mention of both small island developing states (SIDS) and energy exporting countries, and its compacting of the two issues of ‘adverse effects’ and ‘impacts of response measures’. Thus there is a paradox of sorts within Art.4.8, for

avoiding the adverse effects of climate change requires implementing the Convention, but at the same time implementation of the Convention should not impact on energy exporting countries.

OPEC insist that the text on Art.4.8 must include compensation for lost oil revenues as an impact-minimising measure. This is strongly opposed by developed countries. This compacting of the 'adverse effects' with the 'impacts of response measures' issues establishes a mutual hostage situation in a system in which decisions are made by consensus. So, OPEC holds assistance for developing country adaptation hostage to their demands for compensation by insisting on 'equal progress' in negotiations on both aspects of Art.4.8. For AOSIS countries the pressing problem is that this blocks funding and technology transfer for the purposes of adaptation. The inclusion of Article 4.8 in the UNFCCC was required by OPEC countries in exchange for their support for the Convention (Pershing 2000).

OPEC has considerable support for its position from within G77-China who have proposed a "concrete compensation mechanism for damages arising from the implementation of response measures on developing countries referred to Article 4.8" (Depledge 2000: 55). Perhaps it is thought that if compensation is established for OPEC countries it will set a precedent of value to other G77-China countries. Such a strategy is only logical if it is possible that developed countries would sign a treaty that legally binds them to pay unspecified but potentially many billions of dollars of compensation for a variety of injuries related to climate change; but this is highly unlikely to occur. Instead, G77-China's support for OPEC's compensation claims probably reflects the confusion that arises from the size and complexity of the regime; for it is not only SIDS' adaptation needs that OPEC holds hostage, but also the adaptation needs of all developing countries, especially those identified in Art.4.8, including: countries prone to natural disasters and those liable to drought and desertification, and countries with low-lying coastal areas, arid and semi-arid areas, forested areas, and fragile ecosystems including mountainous ecosystems. This encompass nearly all countries within G77-China. Thus the G77-China countries' support for OPEC's compensation demand comes at a direct cost to themselves through the loss of considerable funding and technology to assist with adaptation. This support is therefore only logical if they value OPEC's claims of possible economic losses above their own likely losses due to climate change. The issue is not entirely a function of intra-G77-China differences, the EU and Umbrella Group countries need to demonstrate demonstrable progress on assistance to Article 4.8 countries. The prospect of genuine assistance may catalyse a firmer position from G77-China on the adverse effects/impacts of response measures issue. However, thus far the developed countries have been largely unforthcoming on assistance to developing countries.

2.2 Article 4.9

Article 4.9 commits Parties to 'take full account of the specific needs and special situations of the least developed countries in their actions with regard to funding and transfer of technology'. This article therefore explicitly refers to *least developed* nations as distinct from 'developing' nations mentioned in Art.4.8. It is, therefore, quite distinct from Art.4.8. The inclusion of Art.4.9 was at the insistence of the least developed countries (of which 10 are SIDS), particularly those in Africa, as a means to distinguish their particular circumstances from other developing countries. However, OPEC countries insist that negotiations on both Articles be linked, and that there be 'equal progress' on both, and indeed on broader issues such as compliance (holding the fortunes of least developed countries hostage to recognition of OPEC's demands for compensation). A process to identify actions that were necessary to meet the needs of those developing and least developed countries specified in Articles 4.8 and 4.9. was launched at COP-3 and was to (but did not) culminate at COP-6.

2.3 Article 3.14

As a result of intense pressure by OPEC countries during negotiations over the text of the Kyoto Protocol, it contains a number of articles pertaining to the Adverse Effects issue (Yamin 1998). In the long-term perhaps the most problematic of these is Article 2(3), which refers to the obligation of Parties to minimise the impacts of any policies and measures on 'international trade, and social, environmental and economic impacts on other Parties, especially developing country Parties and in particular those identified in Article 4, paragraphs 8 and 9, of the Convention'. This linking of the impacts of implementing the Protocol to international trade "has the potential to become the most heavily litigated of the Protocol's provisions" under the World Trade Organization's dispute settlement procedures (Yamin 1998: 117).

Article 3.14 is the major adverse effect/impacts clause of the Kyoto Protocol, but it adds little to Art.4.8. Its principal difference is that it refers to the obligation only of *developed* countries to ‘strive to implement’ their commitments ‘in such a way so as to minimize adverse social, environmental and economic impacts on developing country Parties’, particularly those identified in Art.4.8 and 4.9 of the Convention. It commits these Parties to ‘consider’ actions to minimise the adverse effects of climate change and the impacts of response measures, and mentions ‘funding, insurance and transfer of technology’ among the issues to be considered. Like Art.4.8 then, this article refers to both adverse effects of climate change and impacts of response measures. Not unlike Art.4.8, Art.3.14 is seen by many as the inducement for OPEC’s agreement on the Protocol (Yamin 1998). Action on Article 3.14 was initiated at COP-5.

Although Art.3.14 is contained within a separate legal document from the UNFCCC, negotiations have addressed both, in part because Art.3.14 mirrors Art.4.8 in most ways. Any finalised text on Art.4.8 could be relatively easily applied to Art.3.14. This means that Art.4.8 is the more important article – once it is resolved Art.3.14 could be fairly rapidly concluded. However, the particular identification of developed countries as the source of minimising activities in Art.3.14 makes it more important to OPEC countries because it is these countries that are required by the Protocol to reduce emissions, and these countries are the largest consumers of OPEC oil. Through the ‘equal progress’ policy OPEC countries couple progress on Art.4.8 to Art.3.14, thereby binding progress on both to progress on the compensation issue.

Neither Articles 4.8, 4.9 nor 3.14 mention the issue of compensation. There is no obligation on Parties to pay compensation for any losses arising from the impact of response measures, nor, by the same token, is there any obligation for payment of compensation for losses resulting from the adverse effects of climate change. It is not impossible that under the provisions for further action and review in both the Convention and the Protocol compensation could formally be put on the agenda. However, it is questionable that compensation exists a general principle of international law as argued by OPEC, not least because in this instance oil producers have no more of a right to sell their good as the vendor of any other product: “the fundamental question is whether commodity buyers owe anything more to producers than the price stipulated in their mutually agreed contracts” (Kassler and Paterson 1997: 57).

2.4. The state of negotiations

At the third COP, when the Protocol was adopted, the Parties decided to launch a process to identify actions needed to meet the needs of those developing countries specified in Articles 4.8 and 4.9 both in terms of adverse effects of climate change and impacts of response measures (UNFCCC 2000). A work programme was adopted at COP-4 which was intended to culminate at COP-6, at which time Article 3.14 was also to be considered, effectively creating a convergence of action on all three articles. In March 2000 there were two separate UNFCCC subsidiary body workshop on Articles 4.8 and 4.9 - one on adverse effects and one on the impact of response measures (ENB 12[125]).

The latest (sixth) Conference of Parties was held in The Hague in November 2000, it saw continued lack of agreement between the European Union (24% of Annex B emissions) and the United States on four key issues relating to the Kyoto Protocol: the inclusion and timing of Land Use, Land Use Change and Forestry activities as ‘sinks’ of CO₂; unresolved differences on mechanisms for emissions trading and emissions reductions projects; unresolved differences about funding sources; and lack of agreement on a compliance system (ENB 12[163]). The sixth COP was notable for the way developing countries were excluded from key discussions between developed countries (Dessai 2001). This is perhaps the inevitable result of making the Kyoto Protocol’s entry into force contingent upon the ratification of developed countries - a move that is consistent with the principle of common but differentiated responsibility, but which is proving counterproductive in terms of developing countries’ influence in the regime.

In the lead-up to COP-6 at the twelfth meeting of the UNFCCC subsidiary bodies (SB-12) in June 2000, negotiations in the adverse effects/impacts contact group were extremely tense and unproductive, with Annex B countries arguing against the demands of OPEC countries. This tension spilled over into the working group on mechanisms where Saudi Arabia sought adjournment of the meeting as a reprisal for the obstructive position of the Annex-B countries on the compensation issue (ENB 12 [133]). The *Earth Negotiations Bulletin* reported that the delegates saw this as a manifestation of “the difficulties in moving

forward on a ‘package’ given some Parties’ insistence on simultaneous progress on all issues” (12 [133]: 2). This incident revealed the way the particular concerns of one group of countries can significantly obstruct progress on the whole Treaty.

The issue of adverse effect/impacts was seen as a ‘crunch issue’ for COP-6 (ENB 12[159]). However, little progress was made. The UN’s legal advisers recommended that separate decisions be taken on 4.8/4.9 as distinct from 3.14, but the Parties were unable to agree whether one or two decisions should be taken (ENB 12[154]). Discussion on an adaptation fund linked to Articles 4.8 and 4.9 was passed on to the working group on financial mechanisms. OPEC argued that Art.3.14 be enforceable, a move resisted by most developed countries and small island states (ENB 12[154]). In essence, the OPEC countries wanted not just payment of compensation, but that this payment be legally enforceable through the Protocol. On most of these issue the negotiations were described as ‘deadlocked’ (ENB 12[162]). Other outstanding issues on the adverse effects/impacts relate to funding, the issue of compensation and other measures to reduce the impacts of response measures on energy exporting countries, and linkages between Art.3.14 and other Articles on reporting, review and accounting within the Protocol. (ENB 12[163]: 8).

The question of compensation is by far the largest sticking point in negotiations over Articles 4.8/4.9 and 3.14. Its inclusion as a mandatory action is advocated by OPEC countries and is supported by many G77-China countries. It is opposed by developed country Parties because it entails direct financial payments for losses which will be impossible to quantify (see below). Because it obstructs funding and technology transfer to developing countries and threatens the Kyoto Protocol, the AOSIS countries are also opposed to compensation. A further reason for opposition is that if compensation were allowed then it will take some - if not a large share of – the limited pool of whatever resources are made available for project funding, research and technology transfer to assist developing and least-developed countries with adaptation. OPEC were reported to be apparently willing to “scuttle the entire process at COP-6” unless there was serious recognition of the compensation issue (ENB 12[137]: 14). Negotiations are to resume at the reconvened session of COP-6 in July 2001.

Following COP-6 in March 2001, the United States announced that it would not seek mandatory controls on its own carbon dioxide emissions, signalling an intention to not ratify the Kyoto Protocol. President Bush is reported to have said: "I oppose the Kyoto Protocol". In July Australia also substantially weakened its commitment to the Protocol, with Federal Environment Minister reconfirming that Australia would ratify the Protocol only after the US has. New Zealand has since put its plans to ratify the Protocol by 2002 on hold. Despite these changes, the European Union remains committed to the Protocol, seeking to ratify it by 2002 and to bring it into force even without US and Australian participation. This is technically possible but will be extremely difficult politically.

3. Adverse Effects on Small Island States

There is a strong consensus among scientists that unless emissions of greenhouse gases are reduced small island developing states (SIDS) will experience losses of land, economic losses, cultural disruptions and some may ultimately cease to be habitable. Driving these adverse effects will be slowly rising sea levels, more intense if not more frequent extreme events, salt contamination of freshwater resources as a result short and long term sea level rises, and depleted inshore fisheries (Nurse et al 1998). The most comprehensive discussion of this is the chapter on Small Island States in the IPCC’s 1998 *Regional Impacts* report (Nurse et al 1998). The 2001 IPCC Third Assessment report also contains a chapter on SIDS. Both discussions confirm that SIDS “clearly” have “high vulnerability” to climate change (Nurse et al 1998: 350). There is also strong consensus that existing concentrations of greenhouse gases have already ‘committed’ the world to a certain degree of future change regardless of future efforts to reduce emissions (Jones 1999). While much has been made of the uncertainties in climate change predictions, there is little debate that climate change will adversely effect Small Island States. The precise nature and timing of these change may be unknown, but the trend is certain (Barnett 2001).

The serious consequences climate change poses for SIDS gives them moral leverage in the climate regime; no less than their culture and sovereignty is at risk. They gain added leverage by acting as a negotiating group called the Alliance of Small Island States (AOSIS). AOSIS’s position on the many unresolved issues in negotiations is guided by clearly stated principles, including the principle of preventative action, the

precautionary principle, the polluter pays principle, the duty to co-operate and the principle of equity. AOSIS is seeking strong emission-reduction commitments, strong monitoring and compliance measures in the Treaty, and assistance for adaptation to the adverse effects of climate change.

The commitment to climate change makes assistance to minimise its adverse effects critical to SIDS. The actions that AOSIS is seeking to have implemented through the Convention in this regard include:

- enhancing capacity for monitoring, systematic observation and vulnerability assessment;
- building capacity in environmental management and integrated assessment;
- building capacity in climate and weather forecasting;
- building capacity in hazards planning and management;
- identifying and facilitating adaptation options when impacts are understood and measures are feasible;
- establishing regional climate change centres;
- improved delivery of funds to least developed countries;
- assistance to participate in processes associated with the UNFCCC including assistance with preparation of national communications;
- funding and technology transfer to least developed countries to help manage adverse effects on water resources, food security, human health, and coastal zones.

(ENB 12[159], FCCC/SB/2000/12, FCCC/SB/1999/MISC.13)

For the most part most Parties have little objection to the inclusion of these actions in the text on Articles 4.8, 4.9 and 3.14. The OPEC countries are not directly opposed to the substantive issue of SIDS adaptation needs.

4. Impacts on oil exporting countries

Oil consumption is responsible for some 25% of greenhouse gas emissions, so efforts to reduce emissions would seem likely to effect the market for oil (Rowlands 2000: 341). It is thought that implementing the Kyoto Protocol will require a carbon tax (or equivalent) in Annex B countries, and this will raise the price of oil and therefore reduce demand there. Because these Annex B countries account for more than 60% of world oil consumption any significant reduction in demand there may well cause a decline in the price of oil on the global market. Further, if the principle mechanism by which Annex B countries reduce emissions is through a carbon tax, then this tax wedge may increase the ‘rent’ that governments in energy importing countries have in the oil market, transferring wealth from oil producers to consumers (Mabey et al: 274). To put this in perspective, the G7 countries (US, Canada, Japan, Germany, Italy, Britain and France) already earn some 70% more income from oil taxes than OPEC countries earn from petroleum exports (OPEC 2001). So, both through reduced demand, reduced price and reduced market rent it is thought that implementation of the Kyoto Protocol will reduce oil export revenues.

Oil export revenues account for between 9% and 40% of GDP in OPEC countries, so reduced oil revenues means reduced economic growth. For Saudi Arabia at least, a decline in economic growth has implications for unemployment given its high population growth rate, indeed Goldstone (2001) suggests that this may ultimately be a source of political instability in that country. It is these losses in revenues for which OPEC countries seek compensation. Thus OPEC’s statement to the Third Conference of Parties to the UNFCCC said that “the principle of compensation *must* be built into the protocol” that was to emerge from Kyoto (OPEC 1997: 4). At COP-4 the Secretary General of OPEC expressed their compensation/equal progress position in the following terms: “without a favourable disposition towards the compensation issue among the Parties to the Convention, how can fossil fuel producers be expected to give their wholehearted blessing to measures that could wreak havoc with their economies?” (OPEC 1998: 2).

4.1 Modelling losses to OPEC

The findings of energy/economic models which seek to estimate the economic impact on various countries and sectors if the Kyoto Protocol is implemented are integral to the compensation issue. A number of models suggest that implementation of the Kyoto Protocol will impact on energy markets and oil revenues. These models are “simplified representations of reality” developed to capture important relationships in energy markets embedded in the broader economy (Mabey et al 1997: 47). A model is “no more than a coherent set of assumptions about the structure and functioning of the economy”, and their results depend entirely on their assumptions (Repetto and Austin 1997: 5). A model’s value lies not so much in the specific numbers it delivers as these are highly uncertain, but in what it reveals about important relationships in the systems being

modelled. Thus models seek to show relevant variables much more than they seek to be realistic (Mabey et al 1997). Nevertheless, this uncertainty and the ambiguous relationship between reality and model results are not sufficiently if at all recognised in many discussions of their results.

Models are structured on assumptions about the future, these assumptions are very influential in their results yet are largely untested with no a priori validation (Mabey et al 1997: 47). Some assumptions are difficult to justify (Barker and Köhler 2001). Models assume that energy-economies are linear in nature and so the impact of the Kyoto Protocol can be predicted to some degree. This assumption is in important respects false, for the economic world is “organic” and complicated, it is a “world of evolution rather than equilibrium; a world of probability and change events” (Arthur 1994: xx). This alternative understanding of economies renders any claims to predicting the future problematic and demands that the multiple bases of uncertainty in models be explicitly acknowledged. Furthermore, even the energy markets embedded in the global economy are themselves “dynamic, complex, interdependent systems, built on massive capital investments and relying on fuel supply systems that are in part commodity markets and in part transportation and conversion systems” (Ferriter 1997: 145). Indeed, according to Austwick (1992), the complexities and uncertainties of the oil market render it too complex and contingent to model (cited in Mabey et al 1997).

Macroeconomic models are most often used to show the impacts of climate protection on sectors of the global economy (such the energy sector) and on certain regions (such as OPEC countries). Most models are of the resource allocation type, and are often referred to as ‘top-down’ models. The aggregations necessary for these models to assess regional and global futures create very high degrees of uncertainty (Barker and Köhler 2001). The alternative is ‘bottom-up’ models which are based on available and likely future technologies to reduce emissions. Much is made of the difference between these two approaches because their estimates for the impact of climate protection on the energy sector differ widely, with macro models suggesting higher costs than engineering models. However, there is increasing hybridisation of the two approaches with ‘bottom-up’ estimates of technological developments being incorporated ‘top-down’ multi-regional and multi-sectoral macro models. This is the case with most of the models listed in Table 1 (below).

4.2. Comparing model results

It is difficult to directly compare the different modelled estimates of the impact of the Kyoto Protocol on OPEC countries because of: the different dates for which the results are solved (e.g. costs at 2010 as opposed to 2020); different cost measures of impact (e.g. reductions in GDP as opposed to decline in welfare); different regional groupings in which OPEC countries are included (e.g. ‘Middle East’ which excludes 4 OPEC countries as opposed to ‘OPEC’); and different assumptions about the Protocol’s final policies and measures (e.g. the extent to which emissions trading will be permitted among Annex B parties) (on the importance of cost measures see Bernstein et al 1999). The following table seeks to show the range of estimates of impact from recent models. There has been little comparison of such models in the past (Barker and Köhler 2001). Where possible figures have been given for a scenario where full emissions trading among Annex B countries is allowed because while full trading is an unlikely outcome of negotiations (thereby understating the cost), some emissions trading seems likely. However, because most cost estimates are almost certainly overestimates (see below), the losses forecast for a full Annex-B trading scenario are seen here to be the most ‘accurate’, although this assessment of course depends on the extent of uncertainty and the influence of caveats in results.

Table 1 shows that the largest estimate of the impact of the Kyoto Protocol is a 13% reduction in oil revenues below the reference or business as usual (BAU) scenario for 2010 (McKibbin et al 1999). Perhaps the only certain outcome common to all modelling studies is that emissions trading reduces the costs of implementing the Kyoto Protocol for all Annex B and oil-exporting countries (Weyant and Hill 1999). This finding that emissions trading reduces impacts on oil exporters has been used by countries such as the United States and Australia to support their argument for a full competitive emissions trading regime that includes carbon sink activities.

All models show substantial increases in oil revenues above present levels. It is not the case that oil revenues will decline, but rather that growth will be slightly slower as a result of the Kyoto Protocol. For example, in the CLIMOX model oil revenues are expected to grow by some 65% from 1995 levels by 2010 in the BAU scenario, when in the Kyoto scenario they increase by some 49%. Further, the expected reduction in the price

of oil from the BAU as a result of the Kyoto Protocol is the order of US\$2 per barrel (CLIMOX). Pershing (2000) puts this into perspective by pointing out that the price of oil has varied by more than US\$50 per barrel in real 1990 dollars since 1970. Thus the Kyoto Protocol is likely to be a less significant factor in oil revenues than baseline fluctuations in the market. Even most recently the price of oil tripled between January 1999 and September 2000, delivering an expected 60% increase in oil revenues for the year 2000 (EIA 2001). Ironically, this price rise heavily impacted on the balance of payments in many of the African and Asian nations which then supported OPEC's demand for compensation at COP-6.

Model	Impact of Protocol on Oil Exporting Countries	Reference
G-Cubed	13% decline in oil export revenue in 2010 from BAU with trading among Annex B Parties.	McKibbin et al 1999
GREEN	3% loss in real income in a situation of no permit trading	In Pershing 2000
GTEM	0.2% decline in real GNP at 2010 with trading among Annex B Parties.	Polidano et al 2000
MS-MRT	1.15% decline in welfare in 2010 in Mexico and OPEC countries (0.45% decline in GDP) with trading among Annex B Parties.	Bernstein et al 1999
OWEM	9.8% reduction in BAU annual oil revenue with trading among Annex B Parties and assuming that oil prices remain at BAU levels.	Ghanem et al 1999
CLIMOX	10% decline in oil revenue in 2010 from BAU with 'some' trading among Annex B Parties.	Bartsch and Muller 2000a

Table 1: Summary of estimates of the Impact of the Kyoto Protocol on Oil Exporting countries (after Pershing 2000: 98)

4.3. Assumptions in the models

The most important assumptions which explain the uncertainties within and differences amongst all model results are:

- the reference or BAU (no Kyoto) scenario of future developments from which the cost of deviations due to the Kyoto Protocol are estimated. The higher the baseline, the greater the estimated cost of reducing emissions;
 - assumptions about substitution among fossil fuels, between fossil fuels and non-fossil fuels, between energy and other factors of production, and substitution among products of differing energy intensities;
 - assumptions about the availability of backstop technologies;
 - assumptions about technological innovations that both facilitate substitution and reduce energy use per unit of output, and the responsiveness of technological innovation to changes in energy prices;
 - assumptions about the rate at which energy using capital stock can be adjusted;
 - whether the model accounts for the benefits of slowing the rate of climate change (for example less impacts on agricultural productivity);
 - assumptions about the international policy regime to be pursued, including the amount of emissions trading, the use of flexibility mechanisms, and the use of sinks of CO₂;
 - assumptions about the policy mix in domestic economies. Most models use a carbon tax as a proxy for the policies and measures that might actually be pursued. Further, they assume that the tax is applied equally to carbon emissions, whereas a tax that was differentiated according to fuel content would produce vastly different results in terms of impacts on oil demand. The way models account for the use of carbon tax revenues is also important;
 - assumptions about the extent to which energy intensive industries may relocate. Some of this relocation may favour OPEC countries;
 - whether the models account for OPEC's ability to act as a cartel to control the price of oil (few do as equilibrium models assume competitive markets which clear). Cartel action by OPEC may counteract possible impacts of response measures on oil revenue (ENB 12[130]).
 - whether the model accounts for reductions of other greenhouses gases besides CO₂;
 - what assumptions are made about future availability of conventional (cheap to access) oil reserves.
- (after: Barker and Köhler 2001, Mabey et al 1997, Pershing 2000; Repetto and Austin 1997, Weyant 1999 and Hill 1999, Weyant 2000).

Some of the most important of these assumptions (baselines, policy regimes, cartel behaviour, possible benefits to oil exporters from slowing climate change) are discussed later in Section 4.4. Other important

assumptions about carbon leakage, future availability of oil reserves, and substitution, innovation and capital turnover will now briefly be discussed.

Carbon leakage

Because implementation of the Kyoto Protocol will probably involve some increase in energy prices in Annex B countries with downward pressure on the global market price of oil, energy costs in developed countries may increase at the same time as they may decrease in developing countries. Depending on the extent of this price effect, it is postulated that industrial activities for which oil costs are a significant factor of production (say, plastics manufactures) may increase in many developing countries either as Annex B producers lose advantage to developing country competitors, or because industries may choose to relocate. In so far as these and other trade-related impacts of the Kyoto Protocol may offset the amount of the intended CO₂ reduction through increased emissions in non-Annex B countries this issue is often referred as 'carbon leakage'.

The most direct form of carbon leakage will be through increased oil consumption in developing countries if the global price of oil declines. It is also thought that if the Kyoto Protocol affects a change in terms of trade then incomes in developing countries may increase and so consumption of energy products may increase above a non-Kyoto situation. Predictions of carbon leakage have varied between 3.5 and 70% of OECD targets (in Repetto and Austin 1997), but some gradual confluence in recent models puts leakage in the order of 8% to 16% of Kyoto targets in 2010 with Annex B emissions trading allowed (Polidano et al 2000, and Bernstein et al 1999 respectively). This variation reflects the substantial uncertainties associated with this issue. It is thought that emissions trading would reduce the factors that would generate carbon leakage (Barrett 1998).

The issue of carbon leakage is important in estimates of the impact of the Kyoto Protocol on oil exporting economies for two reasons. First, *no* carbon leakage implies that Annex B oil-dependent industries will remain *in situ* and depending on substitutability and innovation (see below), will continue to consume oil. So, despite price rises there may be a less than anticipated reduction in oil demand and therefore less impact on OPEC oil exports. Second, *if* oil price proves to be significant to certain industries then they may choose to relocate to places where oil is cheapest – presumably OPEC countries themselves. This may offset the GDP impact of the Protocol on OPEC countries both through increasing domestic consumption of domestically produced oil and a through a growing share of GDP coming from new or expanding industrial activity.

The extent of any industrial relocation depends on both the magnitude of change in oil prices and the degree to which the cost of oil is important to manufacturing costs and therefore comparative advantage. The problem then is essentially one of the location of economic activity in terms of the cost of oil, a factor which Mabey et al (1997) find to be insignificant. Repetto et al (1997) also find that rising energy prices are highly unlikely to lead to industrial relocation because energy accounts for only 10-20% of total input costs in energy-intensive industries in the U.S., and because international investment is not driven by differences in energy prices among countries. Other factors such as labour costs, skills needs, tax regimes, distance to markets, infrastructure costs, investment environments and technological needs all seem to be far more important in location decisions. Although highly uncertain, the Kyoto Protocol may well affect substantial changes in exchange rates, industrial activity and investment, yet there appears to be little, if any investigation of these other non-fuel price factors in discussions of carbon leakage. Finally, in practice governments will most probably act to protect sectors which will lose comparative advantage due implementation of the Kyoto Protocol, perhaps through concessions on other company taxes. Such actions may be in breach of the rules of free trade regimes (Brack et al 2000). Overall then, it seems unlikely that there will be much carbon leakage through industrial relocation as a consequence of the Kyoto Protocol.

Future availability of oil reserves

The price of oil is influenced by the amount of proven oil reserves as these determine the scarcity rent component of oil prices; less reserves means more future scarcity and therefore higher prices today. Models make assumptions about future changes in oil reserves. These assumptions must take account of potential new discoveries, changes in demand and oil price, and changes in extraction technologies as all these

determine which reserves can be profitably exploited. If long-term reserves of conventional oil are limited then this would substantially reduce if not negate the long-term impact of the Kyoto Protocol on oil exporting countries through higher scarcity rents and in the long-term complete consumption of oil reserves. Indeed this appears to be the case as production from proven reserves is expected to peak around 2020, suggesting that given the level of future demand for oil in even the most restrictive Kyoto scenarios existing proven reserves will ultimately all be consumed, albeit at a slightly lower rate (Brack et al 1997). The issue, then, is the time scale over which lost revenues will occur. Over a short time horizon revenues may be lower than BAU scenarios, but over longer periods all oil reserves are likely to be sold, and ultimate losses will be zero. Furthermore, extraction of competitor fuels from non-conventional sources such as oil shales is itself a carbon-intensive process, meaning that under a carbon-tax regime the price of these fuels will be greater again. So, in a world where the price of oil declines, extraction from non-conventional sources will become considerably less profitable, ultimately increasing demand for cheaper-to-access conventional oil, the bulk of which is located in the Middle East (Pershing 2000). These issues associated with oil reserves are highly uncertain, and are dealt with in varying ways in models (see Blank and Strobele 1997).

OPEC's controls 77% of global oil reserves and over the next few decades, regardless of Kyoto factors, other countries' share of reserves and production seems likely to decline (Pershing 2000). This means that OPEC's power to influence the price of oil will increase in the longer term. Furthermore, some 40% of the world's proven gas reserves are also held by OPEC countries (Blank and Strobele 1997). Most models show that the Kyoto Protocol will affect a substantial rise in demand for gas particularly through switching from coal to gas use in electricity generation (but CLIMOX is a notable exception, see Bartsch and Muller 2000a). For example the US Energy Information Agency expects US Gas consumption to grow by 2-12% by 2010 (although this is unlikely to be met by OPEC sources) (EIA 1998). This means that OPEC's potential losses from oil exports can be offset through increased supply of gas at higher prices (some 19% higher according EIA 1998, but by Pershing's reckoning this is conservative). The potential exists, then, for what Blank and Strobele call "a sophisticated strategy to find the balance between oil and gas supply to maintain oil and gas prices high enough to prevent rent extracting taxes" (1997: 162).

OPEC's obstruction of progress in the UNFCCC creates uncertainties about future oil demand. Ironically, OPEC needs reliable estimates of future oil demand to make optimal investments to ensure that production capacity expands to match future demand. The final form of the Kyoto Protocol and its impact (or no) on oil demand is a very large area of uncertainty which makes present OPEC investment decisions more risky than they would otherwise be were the Protocol rapidly finalised (or abandoned). Indeed, if OPEC misreads the final outcome of Protocol negotiations (a finalisation they seek to avoid) then their losses from wrong *investment* decisions may be substantially greater than those estimated to occur as a consequence of the Protocol's impact on oil prices. Yet OPEC's current negotiation tactics prolong exactly the sort of uncertainty they need to avoid to make secure investment decisions.

Substitution, innovation and capital turnover

The policies and measures Annex B countries adopt to meet their Kyoto targets will affect the prices of energy sources differently. This might occur, for example, through a carbon tax applied differentially to the three main fossil fuels of oil, gas and coal according to their respective carbon contents. This would see coal taxed most heavily (1.04 tonnes of carbon emitted per tonne of oil equivalent [p/toe]), then oil (0.87 tonnes of carbon emitted p/toe), the natural gas (0.65 tonnes of carbon emitted p/toe). Such a tax would make gas the cheapest energy source, then oil, and would affect a substantial shift away from coal consumption. Such an approach to reducing emissions would substantially alter fuel prices and consumption where substitution among fuel sources is possible, leading to:

- substitution among fossil fuels (for example switching from coal to gas for electricity generation);
- substitution between fossil and non-fossil fuels (for example switching to solar instead of coal-fired electricity for residential power needs);
- substitution between energy and other factors of production (for example increased use of labour instead of machines);
- substitution of energy intensive products by non-energy intensive products in consumption (for example using public transport instead of privately owned vehicles) (Mabey et al 1997: 58).

It is thought that any policy and measure taken to meet Kyoto targets will affect some change in energy prices and therefore some substitution among energy sources.

The way models account for substitution matters because the extent of substitution away from or towards oil affects oil demand and therefore the extent of losses in revenues from oil exports. For example, some 56% of the final use of oil is accounted for by the transport sector, so unless there are major changes in car propulsion the Kyoto Protocol will have minimal impact on oil consumption in this sector, and therefore, by Bartsch and Muller's (2000b) reasoning at least, little impact on overall oil trade. Further, it is conceivable that oil consumption may actually increase in the electricity sector in those economies where gas is unavailable for use in electricity generation (as oil will be the only available cheap substitute for expensive coal) (Bartsch and Muller 2000b). So, a model which assumes that little substitution will transpire will show that patterns of oil consumption will not change much, and so losses to oil exporters will be minimal. Assumptions about substitution affect both reference case scenarios and Kyoto scenarios, and are influenced by a further set of assumptions about the sensitivity of substitution to changes in energy prices.

The degree to which substitution can take place is contingent upon the technologies that are presently and will be available. Assumptions about technological innovation are highly influential in both reference case scenarios and Kyoto scenarios. This innovation factor determines the extent to which substitution may not occur as price changes may stimulate technologies that deliver increased efficiency in existing consumption (making it cheaper to use the same fuel more efficiently than to substitute for it). So, models which assume large gains in efficiency will show reduced consumption of oil per unit of economic output, and therefore less oil demand, but this may imply less need to find substitutes for oil. Innovation also determines the possibilities for substitution (for example future technologies may see a switch to hydrogen-powered vehicles). Thus models which assume low rates of innovation may show little extra possibilities for substitution in the future, implying that existing patterns of oil use may not change much, and so neither will oil demand and oil export revenues. In the past changes in energy prices have stimulated innovation in energy technology, but a significant component of energy technology innovation has not been in response to price changes (Weyant 2000). Overall, the 'reality' of technological innovation and substitution is complicated and poorly understood (Barker and Köhler 2001, Bernow et al 1998).

Assumptions about substitution are also contingent upon the way models account for capital stock dynamics. Over longer periods of time old plant and equipment will be replaced with new (more efficient or substituting) technologies when they reach the end of their useful lives. However, in the short term existing plant and equipment constrain the ability of producers and consumers to substitute energy in response to price changes (Weyant 2000). 'Short term' refers to the 10-year time scale of modelled impacts on OPEC countries discussed in this paper (model results have only been shown for the year 2010 although most of the models shown in table 1 forecast for longer time horizons). Accurately estimating these capital stock dynamics is a substantial challenge to models and there are significant limitations in data which render assumptions problematic (Weyant 2000). Most models assume little accelerated change in capital stock over the short term, thereby limiting substitution and minimising losses to oil exporters. However, models vary on the degree to which existing capital stock can be changed to allow for greater efficiencies or substitution.

So, at the heart of the compensation question lies questions of belief in the methods, assumptions and results of energy-economy models. Depending on how the many uncertainties and caveats are dealt with in the models, results can substantially overstate the estimate of the impact of the Kyoto Protocol on oil exports. Indeed after reviewing these uncertainties and caveats in the models Pershing concludes that "almost all are likely to substantially overstate overall costs, and more specifically, overstate OPEC or oil exporting country costs" (2000: 99). He argues that "sufficient questions exist to question whether such impacts will indeed materialize" (85). These very substantial uncertainties in the model results matter greatly for the climate Treaty because they destabilise the bases of OPEC's claim for compensation.

4.4. The OPEC World Energy Model (OWEM)

Because it is the model that OPEC uses to support its claim of potential losses in oil revenue an examination of the OPEC World Energy Model (OWEM) is important. At COP-6 OPEC countries made a press release describing potential losses as high as US\$63 billion per annum and this figure was derived from one of the OWEM scenarios (OPEC 2000).

OWEM is a top-down econometric model. Although no detail is provided of the internal structure of OWEM, and despite its publication in OPEC's own journal *OPEC Review*, OWEM produces results that are largely consistent with the results of other models (Ghanem et al 1999). Its business as usual (BAU) scenario sees world energy demand growing from 73.4 million barrels/day (mb/d) in 1997 to 87.9 mb/d in 2010, of this OECD demand grows from 43.6 to 48.5 mb/d, OPEC oil production grows from 29 to 39.6 mb/d with a corresponding growth in OPEC's share of world oil production from 39.5% in 1997 to 45.1% in 2010. In this scenario the real price of oil (in 1998 \$) is the range of US\$17-19/barrel in 2010. The model assumes a level of improvement in energy efficiency consistent with other models (1.5% per annum globally), no major changes in energy taxes or policies, and no major changes in the share of oil used in the transport sector. Under this reference case scenario OPEC's revenue from oil exports is expected to grow to US\$114.2 billion by 2010 (in real 1998 dollars), up from \$104 billion in 1998 (Ghanem et al 1999, EIA 2000).

OWEM's BAU scenario sees Annex B emissions grow to 5 billion tonnes of CO₂ by 2010, which is higher than most models, but within the overall band of possible future emissions in the Stanford Energy Modelling Forum (Weyant and Hill 1999). This is important because the higher the baseline emissions the greater are the reductions in energy demand to meet Kyoto targets. In this respect, while not beyond credibility, OWEM's relatively high reference case means relatively high reductions in oil demand will be necessary to meet Kyoto targets, and therefore relatively greater reductions in future oil revenues are forecast.

OWEM calculates changes from the BAU scenario as a consequence of a number of possible Kyoto Protocol scenarios. Importantly, in all scenarios it assumes that the emissions reduction targets of all Annex B countries are met solely through reductions in CO₂. This is important because Kyoto targets can actually be achieved through reductions in five other greenhouse gases as well (methane, nitrous oxide, hydrofluorocarbons, petrofluorocarbons and sulfur hexafluoride). Any policy that seeks to reduce emissions across a 'basket' of these gases will substantially reduce the emphasis on CO₂ reductions and therefore energy consumption is likely to bear a lesser burden. So, the assumption that Kyoto targets will only be met through CO₂ reductions overstates the cost to oil producers – perhaps significantly.

In all OWEM scenarios it is assumed that the only domestic measure that Annex B governments will use to reduce emissions will be a carbon tax – used as a proxy for the actual policies each country might pursue. In some OWEM scenarios surplus emissions can be traded - among OECD countries, among all Annex B countries, and among all Parties to the UNFCCC. Each of these respectively expanding trading regimes subsequently reduces the level of carbon tax imposed in OECD countries required to meet their Kyoto targets, and in turn reduces OPEC losses from the BAU scenario (less US\$23 billion in trading among OECD, less US\$14.2 billion in trading among all Annex B countries, and less US\$11.7 billion in trading among all Parties). It is important to recognise, however, that a carbon tax is highly unlikely to be the only domestic policy OECD countries use to meet their Kyoto targets, with intra-country permits and trading, as well as other forms of regulation also quite likely to be in the final policy mix. OWEM's assumption that a uniform carbon tax will be the only policy Annex B countries pursue also quite probably overstates the impact of the Kyoto Protocol on oil demand in the OECD (and therefore overstates losses to OPEC) (Weyant 2000).

OWEM makes no allowance for the use of carbon sinks as a measure to meet Kyoto targets. This is an uncertain but possible outcome of negotiations, and other models show that inclusion of sinks as a measure reduces the costs of implementing the Protocol and would also reduce the emphasis on reducing energy consumption (Weyant and Hill 1999). OWEM also shows that a cap on the use of flexibility mechanisms to meet emissions reduction targets in OECD countries affects OPEC revenues; the less emissions are able to be traded the higher the cost to OPEC. Therefore OPEC countries support the US in their negotiations to prevent any limit on the amount of national targets that can be traded as well as on the inclusion of sinks as a measure to meet Kyoto targets (contra the European Union).

One of the more interesting outcomes from OWEM is its estimate that OPEC's market share will decrease by some 2.1 - 4.5% of the market from the BAU case following implementation of the Kyoto Protocol, but that in all scenarios OPEC's share of the market increases from its present level. This implies that regardless of how the Protocol is implemented, OPEC's ability to influence the price of oil will not be diminished by the Protocol although it may decline relative to the BAU scenario. This question of OPEC's ability to influence the price of oil through restrictions in supply is critical to the question of whether they really will have less revenue as a consequence of the Kyoto Protocol. Cartel action by OPEC may be sufficient to fully counteract

possible impacts of response measures on oil revenue. OWEM shows that OPEC can maintain the projected BAU revenues by restricting production by some 26% below forecasted BAU levels. This produces an oil price of US\$22.7/barrel in 2010 as opposed to the BAU price of US\$19.4/barrel. Therefore, by exerting its cartel power OPEC need only influence the future price of oil by some US\$3.3/barrel to prevent Kyoto-induced revenue losses. This compares with OPEC's recent restrictions in production which influenced a rise in the price of OPEC oil from (the exceptional low) US\$10/barrel in January 1999 to over US\$30/barrel in September 2000. Furthermore, as of March 2000 OPEC has adopted an informal mechanism which will adjust supply to keep the price of oil in a pricing band of US\$22 - \$28/barrel, a level higher than even the price OWEM predicts will be necessary to protect OPEC revenue losses from the Kyoto Protocol (EIA 2001).

Nevertheless, there is some uncertainty about the extent of the existing and future power of OPEC to influence the oil price to protect revenue losses (Berg et al 1997, Braten and Golombek 1998, Gulen 1996). Recognising this, OWEM runs its Kyoto scenarios under an assumption that OPEC production increases at BAU levels, thereby substantially 'softening' the price of oil in a market where there will be reduced demand (so assuming OPEC will not only *not* act to influence oil price, but indeed *over-supply* despite reduced demand). It is from this 'soft' price assumption under the most unrealistic no-trading scenario that the US\$63 billion per annum in lost revenue that OPEC promoted at COP-6 is derived. Finally, OWEM also estimates that if all major developing country oil producers and the Former Soviet Union acted in a common oil-price maintenance strategy then OPEC losses would be substantially reduced, again pointing to the power of cartel behaviour to minimise losses due to the Kyoto Protocol (Ghanem et al 1999).

4.5. The impacts of response measures and OPEC

Not all OPEC countries will be equally affected by implementation of the Kyoto Protocol, indeed the differences may be vast. Kassler and Paterson (1997) suggest that Iran and Iraq would be the worst affected of the OPEC countries. Taking OWEM's Kyoto Annex B trading scenario, which predicts a decline in annual revenue in 2010 of US\$14.2 billion below the BAU scenario for all OPEC countries, and dividing this among OPEC countries on the basis of their shares of OPEC revenue in 1999 (after EIA 2000), reveals that losses per OPEC country per annum in 2010 will be in the order of:

- \$4 billion for Saudi Arabia (28% of 1999 OPEC revenue), some 2% of GDP(1999);
- \$1.5 billion for Iran (11% of 1999 OPEC revenue), some 0.4% of GDP(1999);
- \$1.4 billion for Venezuela (10% of 1999 OPEC revenue), some 0.7% of GDP(1999);
- \$1.3 billion in Nigeria (9% of 1999 OPEC revenue), some 1.2% of GDP(1999);
- \$1.3 billion for Iraq (9% of 1999 OPEC revenue), some 2.2% of GDP(1999);
- \$1.3 billion in U.A.E (9% of 1999 OPEC revenue), some 3.1% of GDP(1999);
- \$1 billion in Kuwait (7% of 1999 OPEC revenue), some 2.2% of GDP(1999);
- \$0.9 billion in Libya (6% of 1999 OPEC revenue), some 2.3% of GDP(1999);
- \$0.7 billion in Algeria (5% of 1999 OPEC revenue), some 0.5% of GDP(1999);
- \$0.4 billion in Indonesia (3% of 1999 OPEC revenue), some 0.07% of GDP(1999); and
- \$0.4 billion in Qatar (3% of 1999 OPEC revenue), some 3.3% of GDP(1999);

This analysis suggests that declines in oil revenue will be less important to some OPEC countries than the damages of adverse effects of climate change proper on other important economic sectors such as agriculture (which accounted for over 20% of 1999 GDP in Indonesia, Iran and Nigeria). So, losses in revenue from damages in these sectors due to climate change may far outweigh losses in oil revenue due to implementation of the Kyoto Protocol. Therefore it is arguably in Indonesia, Iran, Nigeria and Venezuela's (at least) interests to support substantial emissions reduction measures and measures to transfer technologies and funding to help them adapt to climate change (on Venezuela see Cline 1992: 342). Further, the substantial non-oil overseas investments of some OPEC countries (such as Kuwait and U.A.E.) will become increasingly risky in a world where the climate is changing. The potential for losses through these investments due to the adverse effects of climate change far outweighs the potential for losses in oil revenues due to the implementation of the Kyoto Protocol. At the very least, for all of the OPEC countries a far more detailed assessment of the balance of potential losses due to the adverse effects of climate change against potential losses due to the implementation of emissions reduction responses is necessary. Such assessments may well reveal that for some OPEC countries their claim for compensation and obstruction of the UNFCCC and Kyoto Protocol are counterproductive to their future economic well-being.

There are two other reasons which suggest that the Kyoto Protocol will not impact uniformly on all OPEC countries. First, those countries such as Saudi Arabia and Kuwait which are able to produce oil at low-cost (~US\$2/barrel) will be better able to survive in a market where the price of oil has declined than those such as Nigeria (US\$9/barrel) and Indonesia (US\$13/barrel) (Pershing 2000). However, given that the world oil price is not expected to drop below production costs anywhere this factor is probably of little importance except to indicate relative profitability. Second, those countries such as Saudi Arabia which are most dependent on energy export revenue, with relatively less economic diversification, will be relatively worse affected than those which have low dependence (such as Indonesia). Offsetting this, countries with substantial low-cost gas resources such as those in the Middle East may gain through increased supply of gas to meet growing demand.

4.6 Minimising the impact of response measures

In addition to compensation, the specific impact-minimising measures that OPEC countries seek to have implemented through the Convention and Protocol include:

- removal of subsidies on coal production and of taxes on oil consumption in developed countries. This would raise the price of coal and reduce the price of oil, affecting a significant shift in fuel consumption from coal to oil. This would result in less carbon emissions per unit of output as coal is more carbon-intensive than oil;
- tax restructuring in developed countries to reflect the carbon content of fuels, thereby raising the price of coal, affecting fuel switching from coal to oil, and from oil to gas. Gas is the least carbon-intensive fuel and the bulk of long-term gas reserves are located in OPEC countries;
- measures to discourage the production of fossil fuels within developed countries;
- measures to abandon nuclear power generation;
- investment to help oil exporting economies to diversify sources of income as models results show that economies with a diverse pattern of production and exports will be least affected by the Kyoto Protocol (Polidano et al 2000);
- increased use of carbon ‘sinks’ to offset the reductions required through less fossil fuel use;
- finance and technology to support projects related to CO₂ storage and less wastage in energy extraction and delivery,

(ENB 12[159], FCCC/SB/1999/9, FCCC/SB/1999/MISC.13).

The dimensions of OPEC’s claim for compensation were outlined in the lead up to COP3 by Kuwait in the following manner:

Any developing country Party to the Convention shall have a claim against all Annex I Parties, jointly and severally, for loss of income from exports of fossil fuels, fossil fuel products ... in any given year after adoption of this Protocol” (cited in Kassler and Paterson: 99).

While monetary recompense has remained central to the compensation equation, other less direct forms of recompense such as assistance for economic diversification and energy taxes at the source of production rather than at the point of consumption have also been mentioned by OPEC. These alternative options are more likely to be accepted by the developed country Parties.

The issue of compensation is further problematised as the extent of lost revenues to be compensated would be impossible to define with certainty. This is because to ascertain how much was lost requires knowledge of how the world oil market would have operated without implementation of the Protocol – this is unknowable in detail (Kassler and Paterson 1997). One outcome of the thirteenth meeting of the subsidiary bodies is a cursory discussion of the methodology necessary for assessing the impact of response measures on oil export revenues (FCCC/SB/2000/CRP.18: 9). Assessing such an impact requires, among other things, a distinction between the impact of *other* unrelated policies and measures from those taken pursuant to the Protocol; and disaggregating the effect of climate change policies and measures on developments in technology, macroeconomic variability, structural economic changes and other exogenous changes which would have otherwise effected oil export revenues. An accurate assessment of how much oil revenue was lost due the Kyoto Protocol requires accurate understanding of these counterfactual but inescapably *hypothetical* and *unknowable* scenarios. So, if it is to be paid, the amount of compensation must for all intents and purposes be guessed.

5. Equity

Much of the social science literature on climate change directly or indirectly addresses issues of fairness and equity in terms of both winners and losers as climate changes, and winners and losers from measures to reduce emissions (see Toth 1999a). Equity in international law is a synonym for justice (Kokott 1999). In the adverse effects/impacts problem the issue is one of relative negative impacts as both OPEC countries and SIDS stand to lose from response measures and a changing climate respectively. AOSIS argues in terms of intergenerational and intra-generation justice, whereas Saudi Arabia has argued that it “is not prepared to assume a burden which is more than its fair share” (al-Naimi 2000). In all likelihood implementation of the Kyoto Protocol with no further reduction in emissions will do little to alleviate the adverse effects on SIDS, and as discussed above may or may not have a negative impact on OPEC countries. Both therefore bear a burden under the Kyoto Protocol, although in very different ways as discussed in the following section. The issue in terms of resolving the adverse effects/impacts issue is whose burden is relatively greatest. At least part of the problem for the UNFCCC is that there is no universal concept of justice or equity in international law, let alone one which is so prescriptive as to guide some resolution of the adverse effects/impacts impasse (Biermann 1999).

In seeking to understand the climate regime equity can also be seen as a discourse rather than a literal concern. Countries may advance equity arguments to disguise deeper interests to do with economic advantage or simply to delay progress on the Treaty. Thus negotiations often appear to a “battlefield of competing interests” where “fairness concerns offer almost unlimited possibilities to support diverse camps” (Toth 1999b: 8). The unspecified nature of references to equity in Article 3 of the UNFCCC gives license to diverse and competing discourses on equity (Biermann 1999, Rayner et al 1999). This understanding of equity as *discourse* has more explanatory power for the adverse effects/impacts issue than seeking to compare relative losses among SIDS and OPEC countries.

Nevertheless, it is possible to compare monetary estimates of damages from climate change on SIDS with estimates of lost oil revenue in OPEC countries. Consider, for example, Hoegh-Guldberg et al’s (2000) estimate that coral bleaching in the Melanesian countries will reduce future GDP by some 15-20% in 2020, and by some 40-50% in Polynesia and Micronesia. These losses are relatively far greater than those anticipated to occur in OPEC countries as a result of the Kyoto Protocol. The sum of these losses in 2020 across only the Pacific Islands (not all SIDS) is estimated to be US\$5.9-7.5 billion in late 1990 dollars, remembering that these losses are those expected to occur only as a result of coral bleaching and its knock-on effects. Further, the World Bank estimates the losses due to climate change in Kiribati to be in the order of 17-34% of current GDP by 2050 (an absolute loss rather than a reduction in GDP growth) (World Bank 2000: 7). Finally, UNEP estimates GDP losses in low-lying island states to be in the order of 10% by 2050 (UNEP 2001).

Despite these relatively greater financial losses to SIDS, to reduce the adverse effects that concern them to monetary measures is to effectively devalue their special circumstances. The issue for SIDS is that climate change puts the habitability of homelands and the cultures they support at risk. These sovereignty and cultural values are fundamentally incommensurable with the reduced rates of economic growth that concern OPEC countries.

Three further points are worth making with respect to these comparative economic impacts. First, both are highly uncertain, and pitting uncertain estimates of losses due to adverse effects against uncertain losses due to impacts of response measures may well lead to repeating debates about uncertainties. Nevertheless, in that at present the uncertainties in the impacts of response measures are greater than the uncertainties in the adverse effects of climate change on SIDS, the AOSIS case rests on a more solid empirical foundation. Second, on the basis of these no less uncertain estimates of future monetary losses in SIDS AOSIS could equally insist on compensation. Finally, while the loss of oil revenue affects OPEC economic development, its impact will fall most heavily on that smaller part of the population engaged in or profiting from the oil industry. In SIDS climate change will affect the natural resource base upon which the majority depend for subsistence – its impact is thus on the human development of the many.

6. Incommensurability

In as much as the adverse effects for AOSIS countries are a function of physical impacts undermining human development, cultural integrity and ultimately sovereignty, they cannot be measured on a single scale of value with the reductions in GDP growth that concern OPEC countries. In this respect these competing positions are incommensurable. Understanding of the problem in this way - as a problem of incommensurability - casts it in a different light, and leads to alternative solutions beyond conventional rational and utilitarian decision-making frameworks. In this paper incommensurability is understood to mean that there is no common measure by which to compare two or more values (O'Neill 1993: 103).

In economics incommensurability refers to the inability to translate certain non-market values into monetary units. Techniques to price environmental values include the travel-cost method, hedonic pricing and contingent valuation, but all have considerable limitations (Common 1995). The problem for environmental economics is less one of method and more one of philosophy: people cannot accept that love, justice and existence values can be priced, with justice and utility being perhaps the most incommensurable of values (Griffen 1996). However, neo-classical economics and its environmental component of environmental economics cannot accept incommensurability as they hold strongly to the utilitarian assumption that there is an ultimate value – utility – to which all other values can be reduced. According to this view, because all values can be measured against this common standard of utility, the optimal choice among values is the one where utility is maximised. Further, reducing all values to a common standard in this way renders all items of value ultimately substitutable, and therefore losers from decisions can presumably be satisfactorily compensated.

In moral philosophy incommensurability refers to the irresolvable nature of certain moral problems – say the choice between love and justice - on the grounds that these cannot be related to any higher value, raising the possibility that there may be no right course of action (Gowans 1987). The notion of incommensurability therefore rejects the deep-seated modern utilitarianism that pervades modern decision making as exemplified in neo-classical economics. This is pertinent to the adverse effects/impacts issue as it reveals that the competing values of SIDS and OPEC countries can not be reduced to a common metric of money, and therefore subjected to the economic analyses of climate change mitigation decisions that is currently in vogue.

So this incommensurability renders decision-making problematic. Cost-benefit analysis applies more for micro-level decisions and requires standard metrics of value, and in so far as the sovereignty of SIDS cannot be ascertained through contingent-valuation (at least in any morally acceptable manner), then conventional environmental economics has little to offer in this respect. Multi-criteria evaluation may be a better tool for those seeking to find the most efficient solution to the problem, for this at least is capable of accommodating diverse and irreducible values (Omann 2000). However, even the ordinal approach that multi-criteria evaluation requires presupposes some strong comparability between values (O'Neill 1993). Because it is possible to see the competing claims of AOSIS and OPEC as being quite incomparable the issue defies such ordinal ranking. Certainly, AOSIS could argue that to place OPEC's demands on any scale with AOSIS' would be to do damage to the more fundamental rights of SIDS that are at risk. Indeed, it is true that the impacts of response measures on OPEC countries can be exactly substituted because money is not unique, but that lost homelands and the cultures they sustain are unique and cannot be in any way replaced: their loss constitutes a 'tragedy' (Gowans 1987, Sunstein 1994). All this is to say, then, is that to reduce the adverse effects/impact problem into a utilitarian decision-making framework which seeks to allocate satisfactions is to try and fit fundamentally philosophically incomparable values into overly rational calculations; subjective differences cannot be reconciled through objective processes.

To say that the sovereignty and cultural values of SIDS are fundamentally incommensurable and strongly incomparable with the economic concerns of OPEC countries is not to say the decision-analysis of the problem must be 'irrational', nor that choice is impossible (Raz 1996). Rather, it is to say that the economically-informed algorithmic conceptions of decision-rationality that neo-classical economics and environmental economics considers to be rational have little purchase in such essentially political problems. In these frameworks rationality is pegged to an algorithmic episteme which requires technical rules and mechanical procedures to deliver determinate decisions (O'Neill 1993: 115). The incommensurability of values in the adverse effects/impacts issue renders such forms of reason indeterminate (Raz 1996). This has implications for OPEC's solution that compensation be paid, for compensation is a principle common to a

rational environmental economics approach which assumes the possibility of substituting losses and the allocation of satisfaction – a premise that only holds if all the values to be reconciled are indeed merely ‘preferences’ which can be more or less reduced to money (Foster 1997, Martinez-Alier 1999). But it should be clear that the instrumental, money-value of OPEC is of a more philosophically utilitarian plane than that of the intrinsic, moral rights of SIDS to sovereignty and cultural sustainability. So, instead of looking to rational decision-making frameworks, political solutions are required. As Rayner et al argue, there is a need to move from the “technocratic goal of providing decision makers with the best possible prescription for fairness towards the more modest goal of providing decision makers with the best tools for essentially political negotiation among competing prescriptions” (1999: 36). It is to this political process that the discussion now turns.

7. Solutions

Practical conflicts attend the problem of value-plurality and this is true no more so than in the adverse effects/impacts problem (O’Neill 1993). Practical problems require practical (and non-technical) institutions through which conflicts can be mediated and, failing a resolution, judgements passed. Given the deadlocked nature of the adverse effects/impacts problem and the unwillingness of Parties to give ground on the compensation issue, it seems that the UNFCCC needs some alternative capacity to mediate and if necessary pass judgements to resolve this and other conflicts. That this capacity for conflict resolution and judgement is presently lacking is perhaps a reflection of general lack of sustained attention on incommensurability in law (Sunstein 1994).

7.1. New institutions in the UNFCCC?

Institutions capable of good conflict resolution seek to do more than merely ‘negotiate’ outcomes as the COP seeks to do (O’Neill 1993). Negotiation, O’Neill argues, is reason blind, it is appropriate for conflicts of interests but not in instances where judgements are required. Negotiation delivers compromise but leaves ‘truths’ behind. In the adverse effects/impacts issue any compromise on compensation entails one side conceding on what is an otherwise irreducible issue – compensation is either included as a response measure or it isn’t – so either OPEC countries give way or AOSIS countries and Annex B countries do. There is little to be negotiated here and there is no ‘compromise’ as understood in the sense of mutual concessions. Negotiation, O’Neill goes on to argue, is essentially bargaining rather than reasoned discussion, and bargaining frequently is a process where those who lack power concede to those who do (O’Neill 1997: 84).

Reasoned dialogue is a crucial part of modern liberal politics (O’Neill 1997). Dialogue can deliver a fuller appreciation of the conflicting values shared by all parties so that all can see the reason (or unreason) in each party’s position. Indeed this is precisely what is required in the adverse effects/impacts issue which requires not more negotiation at COP, but ventilation and dialogue in a more discursively tolerant institutional setting. This suggests the need for a second track forum to COP where substantive issues are sidelined, clarified and talked over at length. Indeed, this has transpired (informally) in the wake of COP-6 with meetings between the EU and the U.S.-lead ‘umbrella group’ countries to resolve outstanding differences on the Kyoto mechanisms – differences which in themselves can be seen as incommensurable values as the former seeks environmental integrity while the latter wants economic efficiency. This is not to suggest that dialogue has no limits, but it may lead to greater tolerance, the subjection of positions to the test of discursive reason (can they be sustained when subjected to scrutiny?), greater understanding of what is stake, the clarification of positions, and a more informed basis upon which a judgement, if necessary, can be passed. This is necessary in the adverse effects/impacts issue. The principle of equitable burden sharing upon which OPEC countries depend to advance their claims for compensation demands rational dialogue to determine the bases by which burdens are more or less equal (after Kokott 1999). At present such a sustained rational dialogue about the respective bases for AOSIS’ and OPEC’s positions is lacking, rendering all claims arbitrary, negotiation irrational, and solutions improbable. A key obstacle to such a process is the financial and human resource capacity of G77-China countries to participate. It may therefore be necessary for Annex-I countries to fund the participation of G77-China countries in second-track processes. This may occur under the ‘Convention fund’ proposed by the President of COP-6 at the end of the meeting (FCCC/CP/2001/2/Rev.1).

Even were a second track process created which seeks to mediate conflicts among Parties to the UNFCCC, not all conflicts may be resolved. If necessary, then, the end-point of such a second track process may be an

adjudication of some kind, ultimately requiring some change in the Rules of Procedure of the Convention. Foster (1997) identifies a form of 'practical judgement' that is consistent with the second track reasoned dialogue process described above. Such practical judgement is an alternative to the economic-algorithmic approach to decision making, depending instead on "the reasoned consideration of alternatives and resolution of differences within a discursive framework" (p.13), where "the heart of judgement is not quantified criteria but dialogue: empirical clarification followed by ethical debate" (p. 15). Such reasonable choices among incommensurable options based on practical reason is the very stuff of law and indeed everyday life, and the adverse effects/impacts impasse suggests that some capacity for choosing among competing values in the UNFCCC may well be necessary (Sunstein 1994).

Should the UNFCCC develop some capacity for adjudication in the event that negotiations and then second-track dialogue processes fail to resolve conflicts, then two criteria for decisions are necessary. First, in the adverse effects/impacts issue the value dimension needs to be explicitly addressed; decisions must refer to the value judgement rather than hiding moral expressions in technical justifications. Sunstein (1994) calls this the expressive function of law, it pertains to the way rules and judgements reflect and communicate ways of valuation. In other words, a decision on the adverse effects/impacts issue must both reflect the values of the UNFCCC, and presumably the majority of Parties, as well as be cognisant of the effect of this expression on future instances where judgements on incommensurable values is necessary. Second, and related, the judgement should pay attention to its consequences for the continuation of the Treaty, and its consequences in terms of the objectives of the Treaty. To this latter end the possibility of adjudication can be seen to fundamentally threaten the Treaty by providing an exception to the consensus mode of decision making. The consequences of this may be dire not least because it infringes on the principle of sovereignty which undergrids the regime and its consensus approach. Yet in a situation where progress is impossible due to a fundamental deadlock - such as will continue to be the case with Article 4.8/4.9 and 3.14 if G-77-China continues to support OPEC, and if AOSIS and Annex B countries do not give ground - then some form of circuit breaker will be preferable to the total failure of the regime to progress. In other words a second track process for dialogue with the penultimate option of adjudication may risk regime collapse, but the risk is less than the certainty of collapse if the present state of no-progress continues. Furthermore, if adjudications are fair and conform to the reasoned values of the majority of Parties then they may not pose much of a problem to the regime, for fairness is integral to the solidarity of institutions, and a concern for fairness is indeed evident in the UNFCCC (and COP negotiations), albeit in an ill-defined form. Finally, the very existence of the Treaty suggests that states can tolerate some infringements on their sovereignty in the name of problems of common concern (see Biermann 1999). Ultimately the issue boils down to the striking the right mix of sovereignty and the common good which states are willing to accept. To propose a second track process and a penultimate adjudication capacity is to argue for an incremental shift in this mix.

7.2. More immediate steps

Regardless of these proposed additions to the UNFCCC, there are some more immediate steps that might be taken to breach the adverse effects/impacts impasse. In the first instance there needs to be some consideration by the COP as to the way the ultimate aim of the Convention and its principles might inform the adverse effects/impacts problem. That both kinds of adverse effects are mentioned in Articles 4.8 and 3.14 does not necessarily mean that they are of equal importance. The ultimate aim of the convention is to stabilise greenhouse gas concentrations to avoid danger – it is therefore ultimately about emission reductions to avoid 'adverse effects'. So, while it is reasonable that Parties give full consideration to minimise the impacts of such action on energy exporters as Art.4.8 requires, this is secondary to the Convention and Protocol's ultimate objective. Furthermore, Articles 4.4 of the Convention and Article 12 of the Kyoto Protocol both recognise the special position of small islands states with respect to climate change whereas there is no comparable recognition of OPEC countries (Yamin 1998). So, while not discounting the impacts of response measures on OPEC countries, this recognition of the exceptional inequity of climate change's adverse effects on SIDS is a de facto prioritisation of SIDS' needs above those of energy exporters. This reasoning applies more broadly to all the vulnerable country types named in Art.4.8 and least developed countries as mentioned in Art. 4.9, all of who's needs for funding and technology to assist with adaptation is at present held hostage by OPEC demands for compensation.

A principle that informs the UNFCCC is that more capable states shall accept more duties (Biermann 1999). This principle stems from the desire of developing countries for Annex B countries to accept more of the

mitigation burden because they are more capable of doing so (let alone more responsible for the problem – the principle of polluter pays). However, the principle might also be applied to the adverse effects/impacts issue where it might be taken to mean that relative to SIDS' capabilities to manage the adverse effects of climate change, OPEC countries are more capable of coping with the impacts of response measures. Whereas SIDS have little financial and technological capacity to manage the effects of rising sea-levels and increased climatic variability on both their natural and social systems, OPEC countries have the means to manage the impacts of response measures on their social systems largely through their ability to act as a cartel, and the potential for economic diversification to ease losses in the oil sector. Pershing (2000) offers the example of the Kuwait Investment Authority which has invested in a fund which presently delivers more national income than oil revenues (although in a world with a changing climate the risk associated with such a revenue source may be increased). So, the principle of more capable states might be applied to situations where there is a deadlock between Parties in negotiations over equity issues, meaning that in the adverse effects/impacts case OPEC countries' greater capabilities to manage its burden implies that they might give ground to accommodate progress on issues of concern to SIDS.

There are four practical steps towards a solution in the negotiation process. In the first instance progress on the text of Art.4.8 is critical. Second, negotiation and decisions on Art.4.9 should be separate from Art.4.8, freeing the way for least developed countries to receive transfers of technology. Third, there should be a separate decision on Art.3.14 as suggested by UN legal advisers and consistent with the separate legal status of the UNFCCC and the Kyoto Protocol. Because of the similarity between them, negotiation of Art.3.14 will be easy once negotiations on the most difficult Article – Art.4.8 - have concluded. These three steps are contingent upon some willingness on OPEC's part to relax its demand for 'equal progress on all issues' in the negotiation process. Given that the Convention gives special recognition to the Situation of SIDS, and that their interests are more representative of the interests of the majority of developing and least developing countries, it is incumbent upon the OPEC countries to review their position, particularly in light of the substantial uncertainties associated with the results of energy models. All OPEC country demands for activities to minimise effects could probably be accepted by all Parties to the Convention save for the demand for compensation. Ultimately it is the support that OPEC countries receives from G77-China on this issue that, in a consensus based regime, adds considerable legitimacy and power to OPEC's stance. So, solution of the adverse effects/impacts problem ultimately rests with G77-China. In the light of the uncertainties of evidence for OPEC losses, and considering that the equal progress ploy blocks action on adaptation for developing and least developed countries, G77-China might consider revising its position on the adverse effects/impacts issue. A fourth important step is for the EU and Umbrella Group countries to deliver on their commitment to assist developing countries with adaptation. Progress on this front will offer real financial inducements to G77-China countries to resolve the adverse effects/impacts of response measures impasse.

8. Conclusions

OPEC's demand for an enforceable payment of compensation for lost oil revenues and their strategy of equal progress on all issues under negotiation impedes progress on adaptation in developing and least developed countries, as well as progress on the Kyoto Protocol. The claim for compensation rests on very uncertain results from simplified models of the effect of the Kyoto Protocol on world energy trade. Modelled results are likely to be substantially overstated. Indeed, sufficient uncertainties exist to question whether any impacts from response measures will materialise. Should there be some reductions in GDP growth, this will not affect all OPEC countries equally. Most OPEC countries may experience larger economic losses due to climate change *per se* rather than from the impact of response measures. To get beyond the adverse effects/impacts impasse new institutions for conflict resolution through dialogue, and perhaps ultimately adjudication may be required in the UNFCCC process. Without the support of G77-China for the OPEC countries' position, the deadlock can be overcome, clearing the way for assistance for developing and least developed countries to receive assistance for adaptation should the developed countries make such assistance available, and resolving one outstanding impediment to implementation of the Kyoto Protocol and subsequent reductions in emissions.

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