

Name: Elaine Baker
Student number: 115927
Course: MSc Political Economy of Development
Module: Environmental Economics
Convenor: Dr Jonathon Pincus
Essay topic: Climate Change
Due date: 15 December 2000
Word count: 3925

An International Mechanism for addressing climate change

Introduction

I begin by outlining the reasons for which climate change is of concern to developing countries.

I illustrate the present significance of different activities in greenhouse gas emissions, and set out six types of potential policies whereby governments can influence these activities. I then discuss the appropriateness of each of these types of policies in different contexts, and outline responses to these policies.

I highlight the principles which have been agreed for an international framework under which governments can undertake these policies. I propose a scheme under which I believe developing countries would benefit; both through its progressive distributional aspects, and the incentives it would create to reduce emissions and climate change. I analyse the market power of different actors under this scheme, and the initial financial flows the scheme would generate.

I finish by setting out the present international climate change framework and the mechanisms under discussion for implementing it. I conclude that the above scheme, while imperfect, would be preferential to some of the mechanisms presently proposed.

The case for climate change concern

The effects of greenhouse gases

Greenhouse gases → heating effect

The Intergovernmental Panel on Climate Change predict that global mean surface temperatures will increase by about 1.5 to 6.0 degrees Celsius by 2100, depending on the level of human-induced greenhouse gas increases and the degree of their heating effect. Over the past 10,000 years, global temperature has not changed more than 1 degree Celsius over any century or more than 3 degrees Celsius in aggregate.ⁱ

Heating → climate consequences

Likely effects of this on climate include changing precipitation patterns (more rapid evaporation and more frequent intense rainfall), a rise in sea levels by 15-95 cm, more frequent severe floods and droughts in regions of the tropics and sub-tropics and changes in the frequency and intensity of extreme weather events such as tropical storms, cyclones, and tornadoes.ⁱⁱ However climate models can only predict continuous change, not discontinuities.ⁱⁱⁱ

Climatic change → effects on people

How changes will affect local climate systems, economies, and people's welfare is highly uncertain.^{iv} There will be consequences for water availability (through precipitation and evaporation), agricultural productivity (through temperature, precipitation, evaporation, ecosystem changes - insects, animals, plants and soil) biodiversity and its future uses, and diseases (through micro-organisms, water-borne infections and heat).^v

Effects on developing countries

Adaptation capability

The degree to which people will be able to adapt to changes in climate is highly related to poverty. High dependence on agriculture, agricultural methods and technologies based on centuries of experience of an existing climate, low nutrition and low resistance to disease, infrastructure and tools little equipped for coping with climate-related disasters and less capacity to research potential scenarios and adaptation measures are all factors which could mean more vulnerability to climate change. These factors are highly related to poverty and most prevalent in developing countries. Analyses of potential to adapt to climate change estimate that adaptation will be far more costly in developing countries than developed countries.^{vi}

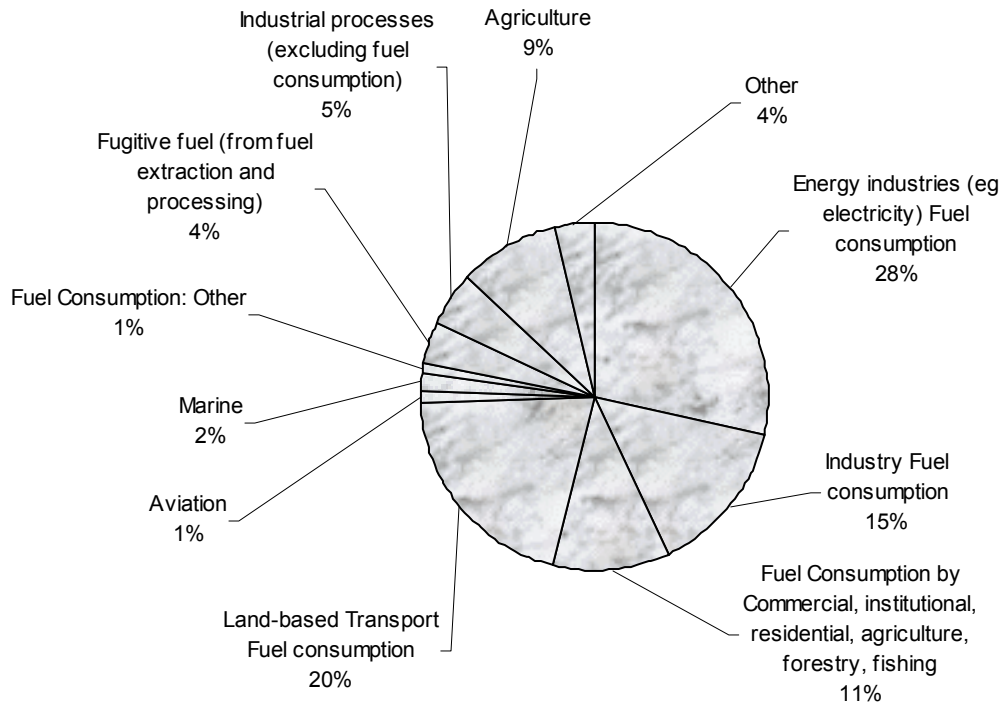
Regional effects

“Africa is the continent most vulnerable to the impacts of projected changes because wide-spread poverty limits adaptation capabilities.” In Latin America, “changes in water availability, losses of agricultural lands and flooding... would aggravate socio-economic and health problems, encourage migration of rural and coastal populations, and deepen national and international conflicts.” In the Middle East and Arid Asia, “climate change is anticipated to alter the hydrological cycle and is unlikely to relieve the limitations placed by water scarcity upon the region.” Small island states are extremely vulnerable to sea-level rise. The effects on hydrological cycles in temperate Asia and in tropical Asia are highly uncertain.^{vii}

Government policies

Activities which emit

The main greenhouse gases are carbon dioxide (82%) from fossil fuels and industrial processes such as concrete production, nitrous oxide (4%) from industrial processes and methane (12%) from fossil fuel extraction, cattle herds and rice paddies.^{viii} The following chart illustrates the degree to which different activities affect concentration of greenhouse gases in the atmosphere:



Notes:

Refers to Annex I countries in 1998. Units: gas mass weighted by Global Warming Potential (GWP)

Data sources:

- Tables A2 (country based activities) and A17 (aviation and marine) from UN Framework Convention on Climate Change Greenhouse gas inventory data 1990-1998 <http://www.unfccc.de/resource/ghg/tempemis2.html> and
- UN Framework Convention on Climate Change, Subsidiary Body for Scientific and Technological Advice <http://www.unfccc.de/resource/docs/1996/sbsta/09a01.htm> (Global warming potential weightings)

Government policies

In most cases, governments are not directly responsible for the activities which cause climate change. Governments can influence these activities in a number of ways:

1. Direct regulation of / participation in
 - the extent of these activities
 - technologies used in these activities
2. Government funding for, or participation in, research which develops new, or reduces the cost of existing, lower-emitting technologies
3. Information provision, including providing information to producers on ways to reduce emissions, and to consumers on the amount of emissions involved in production of different goods and services
4. Government subsidies on the capital costs of changeover to lower-emission technologies.
5. Pigovian taxes and subsidies which alter the incentives (costs and revenues) for these activities. These can be attached to the activity itself or to the degree of greenhouse gas emissions.
6. Tradable permit-to-emit schemes. These forbid emissions unless the emitter owns a relevant permit. Permits can be bought and sold, i.e. the initial owner can decide to emit less and sell to someone who wants to emit more.
 - Permits can be year-specific or be valid for a longer period of time. If they are year specific, trading across time is not possible, i.e. an organisation cannot emit more now by promising to emit less later.
 - Permits can be initially distributed in various ways. A government or central body can allocate permits according to given criteria, or it can sell them.
 - The quantity of permits issued can be decided in various ways.
 - Year specific permits: If the central body is selling them, it can decide the price, i.e., sell until the price drops to a particular level. Alternatively, the central body can directly decide the quantity of permits it will issue/sell.
 - Non-year-specific: The quantity available in the market can be adjusted by issuing more on an on-going basis as they are used up or as the price changes. Alternatively, permits to a percentage of each years total could be issued, and the total decided each year.

Contexts in which different policies are appropriate

Pigovian measures (5) and Tradable permit schemes (6)

- If people are myopic, they may not weigh future environmental costs into present decisions about their activities.
- If people are individualistic, they will not weigh environmental costs which impact on others into decisions about their activities.

Pigovian and tradable permit schemes alter the present internal cost of activities in proportion to some evaluation of their future and external costs. They allow for a total reduction of emissions at lowest cost, as those who can reduce emissions at lower costs have more incentives to do so than those for whom it is more costly.

Direct regulation and participation (1)

Direct regulation changes economic individual decisions into political social ones. In my opinion, direct regulation of large numbers of small scale decisions would not “ensure global benefits at the lowest possible cost” (principles), as one authority would need large amounts of information about the costs and benefits of many combinations of activities. However, direct regulation or decision making by the government about what and how much of an emitting activity should be undertaken can be a useful tool in the case of small numbers of large scale activities. For example, government decisions about public transport systems and the types of transport and electricity infrastructure to provide fall into this category. Direct regulation can also be effective for “no-regrets” technologies, i.e., technologies which reduce non-environmental as well as environmental costs (e.g. regulation of building insulation standards, fuel efficiency in vehicles etc.).

Information provision (2) and government research (3)

If incentives to emit less are present (Pigovian taxes and tradable permits), the way in which people will respond will depend on technologies and information available. If this information has public good characteristics, governments may have to play an active role in research and information provision.

Capital subsidies (4)

If Pigovian and tradable permit schemes alter incentives, and in cases where the costs of reducing emissions are mainly initial capital costs (e.g. investing in solar or wind power equipment) then in theory people would make the investment in the expectation of saving on taxes / permit purchases in the future. However, if credit constraints exist or if there is a large degree of risk adversity, these investments may not be widely undertaken. In these cases, the government could bear some of the risk through subsidies on the capital costs or through providing loans which are paid back to the degree savings are made.

Responses - the effects of these policies

If there is to be less emission, this will involve combinations of

- Decreasing the amount of activities involving emissions, for example using less electricity
- Increasing the efficiency of activities with respect to emissions – for example producing the same amount of electricity using less fuel, or using insulation (“no-regrets”)
- Changing the nature of the activities – for example producing electricity with solar or wind energy.

Many studies which estimate the cost of decreasing emissions focus on the cost of decreasing economic activities, which can be quite high in terms of peoples’ welfare^{ix}.

Increasing emission-efficiency, in contrast, is called a “no-regrets” solution as it decreases non-environmental as well as environmental costs. Predictions which include these measures estimate reductions in emissions of 10% to 40% from 1990 levels in the US, the highest per capita emitter, could be achieved at no net cost.^x

Changing the nature of activities can have a high initial fixed cost but low ongoing costs, relative to emitting activities. If it is accepted that such initial costs will be undertaken at some stage in order to prevent very large climate change due to future economic growth, the decision becomes whether to undergo changeover costs sooner or later. Changing later can be argued for on the basis of a social discount rate (present costs are perceived to be higher than future costs) or on the basis that future change will be cheaper due to the emergence of cheaper clean technologies. However, the concept of a social discount rate is problematic, and future cheaper clean technologies may only emerge through present implementation of clean technologies, through learning by doing.

There are different possibilities for the above types of responses for different activities and sectors.^{xi}

The International Framework

Principles

The Framework Convention on Climate Change^{xii}, signed by 166 states in 1992, is based on principles which can be summarised as follows:

- Protection of the climate system on the basis of equity, and respective responsibilities and capabilities.
- Full consideration of the circumstances of developing countries
- Precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Lack of full scientific certainty should not be used as a reason for postponing such measures. Policies and measures should be cost-effective. Consideration of different socio-economic contexts. Consideration of all relevant sources, sinks and reservoirs of greenhouse gases and of adaptation. Inclusion of all economic sectors.
- Policies and measures integrated with national development programmes. Acknowledgement that economic development is essential for adopting measures.
- International economic system that would lead to sustainable economic growth and development in all Parties, particularly developing countries. Measures taken to combat climate change should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade.

International framework options

Climate is a global public good. As outlined above, climate change caused in one country affects people in many other countries in unpredictable and far-reaching ways. Each country alone does not have an incentive to take the negative effects of its own emission activities on people in other countries into account. Therefore international policy is needed. International policy needs to include developing countries, as while they consist of a very low proportion of emissions now, future growth could mean rapid rises in global emissions.^{xiii} Different analysts have discussed potential international frameworks.^{xiv} Below I have grouped and expanded on them.

Globally uniform policies

- Imposition of Pigovian taxes and subsidies on all emitting activities by a global body
- Tradable permits issued to individuals, organisations and firms by a global body
- Agreement by governments on a uniform level of Pigovian taxes and subsidies that they will impose in their own countries

Globally non-uniform policies

- Each government agreeing to limit emissions to a certain level and using internal policies to achieve this

Globally uniform policies have the following disadvantages:

- Lack of ability for policies and measures to be tailored according to national and local conditions.
- Would not create direct incentives for governments to play an active role in research, information provision, appropriate infrastructure provision and direct regulation where appropriate
- High administrative costs in the case of a global taxation system
- Regressive: a uniform rate of tax or price of permits would involve greater welfare reductions for developing countries and for the poorest within developed and developing countries. To offset this, the proceeds of the tax or permit sales, or the initial allocation of permits would have to be distributed equitably. This would involve a global inter-personal (as opposed to international) distribution, in effect creating the need for a quasi world government. It is unlikely that this would be politically feasible, and it would be difficult to make such a body democratically accountable.

Globally non-uniform policy has the following disadvantages

- In the absence of an equitable objective way of deciding emission reductions, governments would have an incentive to negotiate the lowest possible emission reduction for their own country. It is likely that those countries with greater political and economic power would negotiate agreements favourable to themselves.^{xv}
- There is no mechanism to allow the emission reductions to take place in the countries where it is least costly.

Proposed scheme

These disadvantages could be overcome with the following two-tier scheme, which allows governments to decide their own internal policies but creates financial incentives for governments to agree to emissions reductions.

At the global level:

- Global emission quantity agreed for each year
- This emission quantity divided up among countries in proportion to their populations
- At the start of the year, governments can trade their emission levels with each other. For example, countries such as India and China could sell part of their emission quantity to countries such as the US and the UK.
- Large punitive fines for any country exceeding its after-trade emission quantity

National level:

- Each government use internal policies (including direct regulation of and participation in the economy, research and information provision, internal taxes and subsidies, internal tradable permits) to reach its emission target. Each government would have the flexibility to decide which internal policies would be the most appropriate in its own case.

Tradable permit characteristics:

- Year-specific: To avoid myopia credibility problems of borrowing emissions now and reducing them in the future^{xvi}, and to allow greater international control over when emissions take place
- Initial distribution: equitable, according to population
- Global emission quantity decision: by a representative international body independent of governments

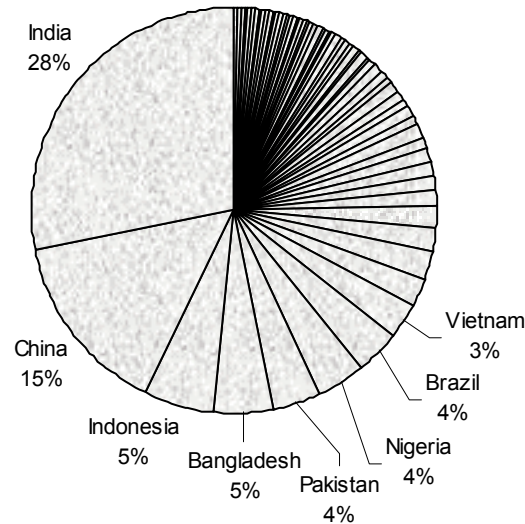
To analyse what this scheme would mean initially, I set an initial global emission target at the present level, and I set each country's emission at its present level.

Notes

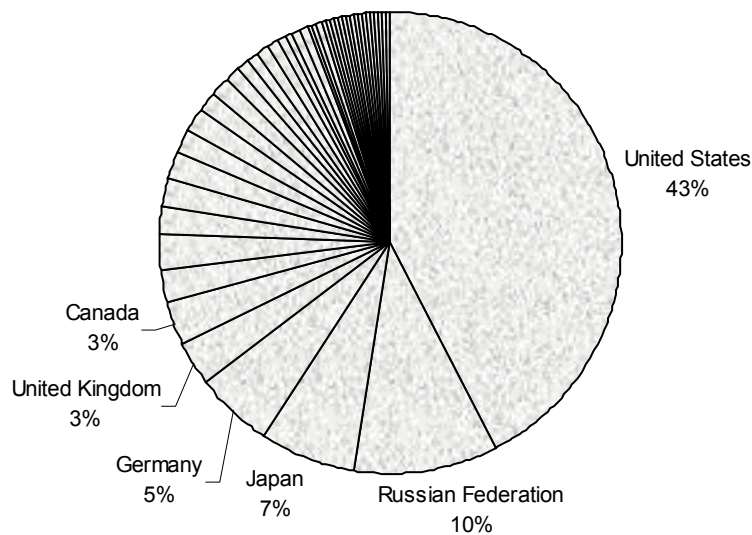
All the following charts all use data on industrial emissions of CO₂ in 1996 for all countries from World Bank Development Indicators. Definition of series: "Carbon dioxide emissions from industrial processes are those stemming from the burning of fossil fuels and the manufacture of cement. They include contributions to the carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring." This data is not as up-to-date or as accurate (due to likely estimation errors for developing countries) as the UNFCCC 1998 data, which covers Annex I countries only (developed countries who collect and submit detailed emission data). However, I calculated correlation coefficient between the World Bank Annex I 1996 data and the UNFCCC Annex I 1998 data to be 0.98.

Market shares

The following chart indicates market shares in the permit selling market. The chart shows the quantity of emissions each country would sell as a proportion of the total emissions sold.



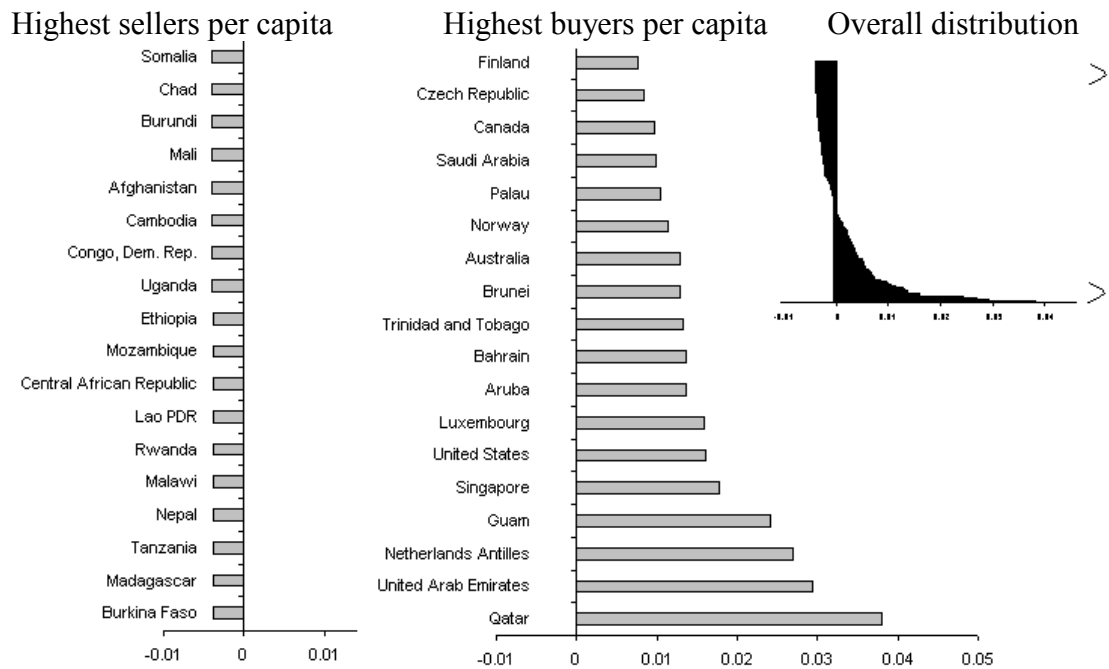
The following chart indicates market shares in the permit buying market. The chart shows the quantity of emissions each country would buy as a proportion of the total emissions bought.



These charts indicate that the US and Russia (as sellers) and India and China (as buyers) would have considerable market share. This means that the relative bargaining power of these countries would have a significant effect on the price of emissions, and could have negative implications for the efficiency of the scheme.

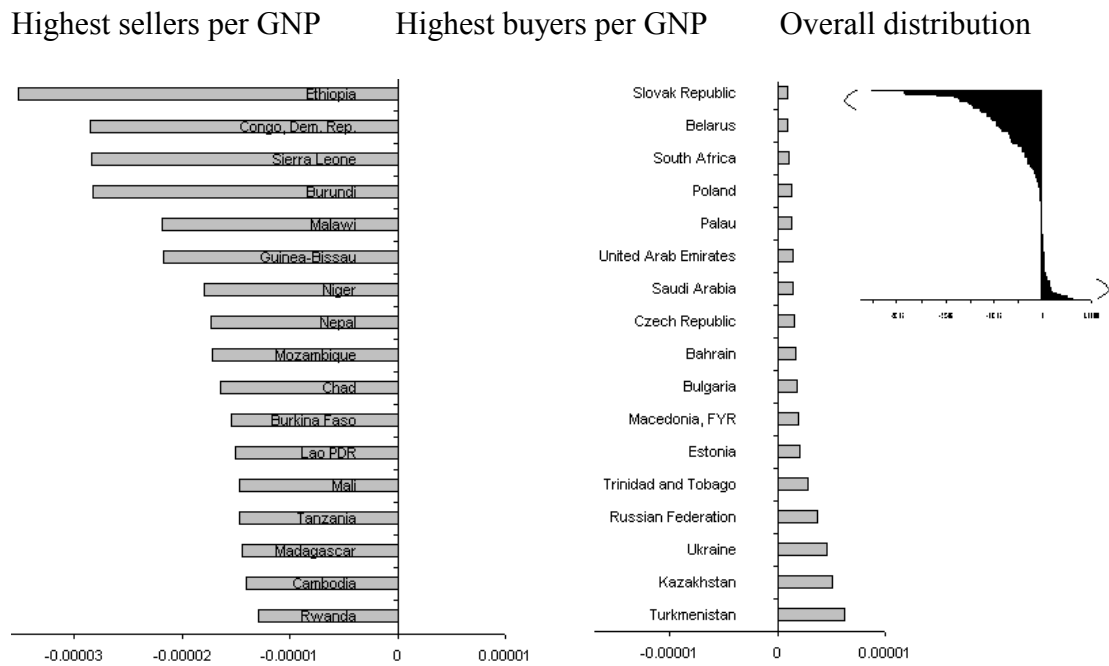
Initial financial impact on countries

The following shows the highest emission sellers (gain financially) and emission buyers (pay financially) as a ratio of population.



Units: Kt of CO₂ bought per person

The following shows the highest emission sellers (gain financially) and emission buyers (pay financially) as a ratio of GNP (1998).



Units: Kt of CO₂ bought per \$GNP

These charts show that if there was little initial change in worldwide emissions after setting up the scheme, money would be transferred from Western, Middle Eastern and some countries of the former USSR to African countries, South Asia and China, indicating a broad, if uneven, positive effect on income distribution.

Dynamically, emission-buying countries would work to reduce their emissions in order to reduce their payments. Emission-selling countries would receive less payment as they increase their emissions (during development). They would face high incentives, and have the financial means, to follow a “Clean development” path where this is feasible, in order to retain their payments for longer.

This analysis can't predict the price permits would reach on the market – that depends on the elasticities of demand and supply for permits and non-emitting technologies, which requires detailed research. If, on a global scale, reducing emissions turned out to be less costly than anticipated, the price of emissions would fall. Conversely, if reducing emissions turned out to be more costly than anticipated, the price of emissions would rise. The price would determine the magnitude of financial flows.

Deciding the annual global emission ceiling

If this decision is made politically, it would be in the interests of countries with high present emissions and fewer cheap ways of reducing them to negotiate a high global emission ceiling so that the price of permits would fall.

Making this decision in a completely objective way by comparing the costs of reducing emissions to the costs of climate change, is impossible. Even if the costs of reducing emissions were estimated using the price of permits, evaluating the benefits of reducing emissions (i.e. the costs of emissions) is near to impossible due to high levels of uncertainty about the relationships between greenhouse gases, heating, climate, ecosystems and people's activities.

The global emission ceiling could be made more objective through a global decision making body independent of governments and made up by elected representatives of groups likely to be affected in different ways. For example, representatives of those most likely to be affected - island inhabitants, farmers in drought prone areas and so on, together with representatives of those likely to be least negatively affected.

The present international framework

The following comprises the present international framework for dealing with climate change.^{xvii}

- Several **Intergovernmental World Climate Conferences** have taken place since the first one in 1975.
- In 1988 the UN Environmental Programme and the World Meteorological Organisation established the **Intergovernmental Panel on Climate Change (IPCC)** to study climate change. The IPCC released assessment reports reviewed by 2,000 scientists and experts in 1990, 1995 and 2000.
- UN General Assembly approved treaty negotiations took place in 1991 and 1992 and the **Framework Convention on Climate Change (FCCC)** was one of the five environmental treaties signed by 154 states at the Rio Earth summit in 1992. It entered force after ratification in 1994. It comprises broad principles for future action, and commitments by industrialised countries to submit detailed data on emissions and their policies.
- There have been six **Conferences of the Parties (COP)** between 1995 and the most recent in The Hague in 2000.
 - **COP-3** adopted the **Kyoto Protocol in 1997** where industrialised countries undertook legally binding commitments to reduce emissions by various percentages by 2010. However, this protocol has not been ratified by many key countries and so has not entered into force.
 - **COPs 4, 5, and 6** (The Hague) have failed to agree on the details of the Kyoto protocol, it's mechanisms or how it is to be enforced.

Mechanisms for implementation

The following are some of the cross-border mechanisms already discussed for encouraging clean technologies in developing countries:

Under FCCC:

- Global Environmental Facility (GEF) uses voluntary donations from developed governments and other organisations to fund more climate-friendly technologies in developing countries. This scheme is already in operation.
- Activities Implemented Jointly (AIJ) involves attracting private sector funds for clean technology projects in developing countries. This scheme is in a pilot phase at present. Proponents argue that in order for it to be effective, companies must receive “emission credits” for participating.

Under the Kyoto protocol:

- Clean Development Mechanism (CDM) allows countries to substitute reducing their own emissions with funding greenhouse gas reduction schemes in other countries, including the growing of forest “sinks” for carbon dioxide. The details of this scheme have not been agreed.^{xviii}

These schemes are problematic and raise controversial questions:

- Could companies and countries fund projects involving “not doing something” (i.e. pay people not to burn coal) as well as projects involving “doing something” (i.e. convert an activity to renewable energy)?

If not, this severely limits the ways of reducing emissions. If so, people would have an incentive to falsely claim they would do something in order to be paid not to do it.^{xix}

- Can companies and countries fund forests as “carbon sinks” instead of emission reductions?

The extent to which forests act as reservoirs (store carbon) and sinks (absorb carbon) is not well understood, especially the relative merits of different types of forests and vegetation. Including incentives to create carbon sinks could mean the replacement of native forests by young high carbon absorbing forests. However, this could have other far-reaching environmental effects on local ecosystems.^{xx}

Conclusion

The country-based tradable permit scheme based on population as I have outlined above would benefit most developing countries by initiating financial resource flows towards them, enabling them to finance clean development strategies where feasible, while allowing them the flexibility to increase emissions and forgo the payments when this is necessary for development.

Developing countries may encounter opposition from developed countries in arguing for this type of scheme. However, it must be noted that this scheme does not account for the emissions of the past for which developed countries didn't pay, and therefore developed countries are in fact obtaining a clean slate as a starting point.

As a complement to country-based emission targets and planning, domestic policies and continued international research and co-operation, I argue that the scheme I have outlined above would be preferential to presently proposed CDM and AIJ cross-border mechanisms in providing incentives for clean development.

Bibliography

Barett, S 1998 “The Political Economy of the Kyoto Protocol” in Oxford Review of Economic Policy 14, 4

Chichilniksy, G and Heal, G 1993 “Global Environmental Risks” in Journal of Economic Perspectives 7 pp65-86

Dinar, Mendelson 1999 “Climate change, agriculture and developing countries, does adaptation matter?” in World Bank Research Observer vol 14 no 2 pp 277-293
<http://www.worldbank.org/research/journals/wbro/obsaug99/climate.htm>

Dougher, Rayola The Impact of the Kyoto Protocol on Allied Industry Output, Employment, and Trade American Petroleum Institute Policy Analysis and Strategic Planning Department

Friends of the Earth International 1998 Climate Change Briefing: Can't see the wood for the trees? Uncertainties of accounting biological sources and sinks
http://www.foei.org/campaigns/ClimateChange/cc_sinksbriefing.htm

IPCC Working Group II 1997 Summary for Policymakers The Regional Impacts of Climate Change: An Assessment of Vulnerability Published for the Intergovernmental Panel on Climate Change November 1997 ISBN: 92-9169-110-0
<http://www.ipcc.ch/pub/sr97.htm>

Perring, Charles (ed) 1998 “Policy Forum: Global Climate Change and the Economics of Development” in Environment and Economic Development 3, pp347-409

Reilly, John 1999 “Comment on Medelsohn & Dinar” in World Bank Research Observer vol 14 no 2 pp295-305

Schelling, Thomas “Some Economics of global warming” in American Economic Review 82, 1-14

United Nations Environmental Programme 1999 Climate Change Information Sheets
<http://www.unep.ch/iuc/submenu/infokit/factcont.htm>

United Nations Framework Convention on Climate Change
<http://www.unfccc.de/resource/conv/conv.html>

UNFCCC Greenhouse gas inventory data 1990-1998
<http://www.unfccc.de/resource/ghg/tempemis2.html>

UNFCCC 1992 The United Nations Framework Convention on climate change
<http://www.unfccc.int/resource/conv/index.html>

Watson, Robert 2000 (Chair Intergovernmental Panel on Climate Change)
Presentation at the Sixth Conference of Parties to the United Nations Framework Convention on Climate Change <http://www.ipcc.ch/press/sp-cop6.htm>

References

- ⁱ Watson, Schelling
- ⁱⁱ Watson
- ⁱⁱⁱ Schelling
- ^{iv} Reilly, Chichilnisky & Heal
- ^v Watson
- ^{vi} Dinar, Reilly, World Bank World Development Report
- ^{vii} IPCC working group II
- ^{viii} UNEP Climate Change information sheet 20
- ^{ix} Dougher
- ^x Schelling
- ^{xi} Bolin in Perring ed
- ^{xii} UNFCCC
- ^{xiii} World Bank World Development Report
- ^{xiv} World Bank World Development Report, Schelling, Barrett, Parikh in Perring ed
- ^{xv} Barrett
- ^{xvi} Barrett
- ^{xvii} UNEP Climate Change information sheets 17-19
- ^{xviii} UNEP Climate Change information sheet 29
- ^{xix} Barrett
- ^{xx} Friends of the Earth