
Editorial: Climate change: issues and opportunities for developing countries

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1 Introduction and background

This Special Issue of the *International Journal of Global Environmental Issues* is dedicated to the issues, impacts and challenges of global warming faced by developing countries. Climate change is probably the most important threat to our global environment and future, while at the same time Greenhouse Gas (GHG) emissions are intimately linked to the way goods and services are currently produced and recycled, land is used and to our present lifestyles.

Global warming is an incredibly complex and difficult issue. It is a global environmental problem, which means that the location of emissions does not significantly affect the extent of the problem, since emissions uniformly mix in the atmosphere. However, this physical peculiarity of the problem does not imply that all countries and individuals could suffer in the same proportion. Although there are huge scientific

uncertainties regarding the global, regional and local bio-physical, health and socio-economic consequences of climate change, it is probable that countries with a lower level of development and higher dependence on natural resources could suffer more from the possible climate change impacts. These impacts thus also express cultural differences.

Moreover, global warming is characterised by cumulative and permanent effects. Since greenhouse gas may remain in the atmosphere for decades to hundreds of years, depending on the gas, climate change possesses a high degree of irreversibility. Therefore, current concentration levels of GHGs in the atmosphere strongly depends on accumulated past emissions levels, which have accrued since the Industrial Revolution in particular from the industrialised countries. Given their expected increase in economic activities and population, developing countries as a whole are, however, expected to account for the largest share of emissions in the near future.

Since the 'roots' and the possible impacts of global warming are strongly linked with the functioning and organisation of our economic activities, there are many possible actions and measures that governments, the private sector and individuals can accomplish to address climate change issues. Those actions can broadly be categorised into mitigation and adaptation measures. Mitigation activities are those that reduce greenhouse gases net emissions. The most obvious measure in this domain is to decrease GHG emissions into the atmosphere, e.g. by reducing fossil fuels use. Other mitigation activities include end-of-pipe removal of GHGs from emissions streams and sequestration of emitted carbon through e.g. forest management, afforestation and agricultural practices. Since reductions of emissions will affect GHG concentrations in the atmosphere only in the long term, it is also important to consider adaptation measures, i.e. actions that would reduce vulnerability and climate change damage. Some adaptation could be technologically driven ('geo-engineering') and may include such measures as fertilising the oceans to increase carbon capture. More fundamentally, a wide range of sectors and activities may be subject to and would need to adapt to climate changes, such as agricultural practices, water distribution systems and human settlements. Therefore, the adaptation process also implies a change in the underlying value system and is deeply rooted in our consumption patterns. One lesson learnt by past experience in implementing climate change policies is that change in lifestyles is as important as technologically driven adaptation. Of course, the possibility and the costs of adaptation will depend on whether climate change will be gradual or increasingly subject to abrupt changes, e.g. catastrophic events. In general, we may expect that poor countries would be less able and possess a lower potential to adapt, since they have less human control over infrastructures and a lower wealth level [1].

Since climate change is a global problem, adaptation, but especially mitigation measures, need to be internationally co-ordinated. More precisely, the atmosphere is a global public good, since a unit of GHG emitted anywhere in the world has the same effect on climate change and everybody benefits from global warming control, including those who have not contributed to it (free-riders). This characteristic implies that a single country has limited incentives to reduce GHGs unilaterally and that international negotiations will be influenced by strategic behaviour. In addition, the negotiation process is complicated since it is subject to analytical uncertainty (which is the same for all countries, e.g. uncertainty regarding the physical impacts of climate change) and strategic uncertainty (which is peculiar to each country, e.g. uncertainty regarding emissions). In this context, the international community negotiated the United Nation's

Framework Convention on Climate Change (UNFCCC), which came into effect in March 1994. We may interpret the UNFCCC as an effort to change the property regime of the atmosphere – from an open access to a common property resource – and establish a framework for its global management. The main elements of the UNFCCC may be summarised as follows.

Firstly, it states the general objective for global management of the atmosphere, which is “(...) stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (Article 2).

Secondly, the UNFCCC outlines guiding principles to reach such an objective. As observed by Grubb [2], equity was recognised as the main principle of the UNFCCC, particularly under the pressure of developing countries and as a way for their wide participation. Of course, there are several possible interpretations of equity in the climate change debate. In the Convention, the meaning of equity is defined in Article 3.1, where responsibilities of the Parties are determined “in accordance with their common but differentiated responsibilities and respective capabilities.” Equity, through the principle of common but differentiated responsibilities, has thus enabled the establishment of different categories of countries according to their historical contributions to the problem, present and future activities and capacities. It assigns different responsibilities according to countries’ level of development. The fact that “developed countries” are responsible for the largest share of emissions, both historical and current, has justified that they “should take the lead in combating climate change and the adverse effects thereof.” (Article 3.1). In the Convention, countries have thus been formally divided into those listed in:

- Annex I: essentially developed countries and countries that are undergoing the process of transition to a market economy.
- Annex II: Annex I countries less Liechtenstein, Croatia and the countries in transition to a market economy.
- Non-Annex I: all the other countries, i.e. ‘developing countries’.

This categorisation determines countries’ commitments under the UNFCCC. In particular, Annex I countries shall adopt policies and measures to decrease their emissions and, according to Article 4.2a “(...) return by the end of the present decade to earlier levels of anthropogenic emissions of carbon dioxide and other greenhouse gases (...)”. It is important to note that the UNFCCC explicitly recognised the economic principle of cost-effectiveness in implementing policies and measures in Article 3.3 and the possibility of implementing them by international co-ordination, i.e. “jointly with other Parties (...)” in Article 4.2a. Because an operational regime for joint implementation could not be agreed upon during the negotiation of the Convention, the Conference of the Parties to the UNFCCC (CoP, the supreme decision-making body of the Convention) decided at its first session in Berlin in 1995 to launch a pilot phase for projects without crediting of the emissions reductions. Those projects are called “Activities Implemented Jointly” (AIJ). Annex II countries should further provide developing countries “(...) financial resources, including for the transfer of technology, needed by the developing countries Parties to meet the agreed full incremental costs (...)” of

implementing the UNFCCC according to Article 4.3. Finally, the commitments by the non-Annex I countries are primarily related to reporting emissions.

At the third CoP, in December 1997 in Kyoto, 160 countries reached an agreement on a Protocol to the Convention. The Kyoto Protocol is a broad international environmental agreement, but many questions were left to be resolved on how the agreement will in practice be implemented. This Protocol may be considered as the first attempt to translate the UNFCCC's general objective into a precise policy commitment, by prescribing legally binding emissions targets and timetables for countries listed in Annex B of this Protocol [3]. The aggregate commitments of those countries, if met, will result in a reduction of emissions for a basket of six greenhouse gases by about 5.2% below their 1990 levels, during the commitment period 2008–2012 [4]. These greenhouse gases are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs). Developed countries agreed to commit to differentiated targets under the Kyoto Protocol, e.g. the European Union and Switzerland are required to reduce their emissions below their 1990 levels by 8%, the USA by 7% and the Russian Federation by 0%. Developing countries do not possess any quantitative emissions target. The Protocol becomes effective only if it is *ratified* by not less than 55 countries which are Parties to the UNFCCC, representing at least 55% of the Annex I countries total 1990 CO₂ emissions.

To implement the provision of economic cost-effectiveness included in the UNFCCC, the Kyoto Protocol introduces three new International Economic Mechanisms (IEMs); namely International Emissions Trading (IET; Art. 17); Joint Implementation (JI; Art. 6); and the Clean Development Mechanism (CDM; Art. 12). Additionally, Article 4 of the Protocol incorporates the 'bubble' concept, which allows Annex I countries to jointly fulfil their commitments, provided that their total aggregated GHG emissions do not exceed their assigned amounts [5].

IEMs may provide interesting financial incentives to reduce emissions, while providing some flexibility for countries to jointly meet their commitments. Countries, in some cases through their sub-national entities or 'legal entities' (e.g. firms), may exchange their commitments through emissions trading and/or acquire credit for emission reduction projects implemented abroad through JI and CDM. As a consequence, these international 'flexible mechanisms' could create an international market, in which GHG abatement efforts will be traded. The size of this new emerging international market could be quite substantial [6]. However, the existence and functioning of this market will strongly depend on its institutional context and on the concrete definition and implementation of the flexibility mechanisms. Additionally, an important obstacle would be the absence of a worldwide competitive policy.

Starting from the politically-determined domestic commitments under the Kyoto Protocol, IET, JI and CDM represent different means to re-allocate domestic commitments with respect to cost considerations. In other words, these IEMs may provide the means by which countries may meet their domestic commitments abroad and, for this reason, they are called 'flexible' mechanisms. IEMs may generate important cost savings since they exploit the fact that, although location of the emissions do not matter for global warming, abatement costs are indeed different from one country to another [7]. Therefore, a given abatement effort can be reached at a lower cost if it is done where it is cheapest to do so. Of course, this economic property of the IEMs implies that, although financially compensated, the abatement efforts would be made abroad, leaving Western lifestyles fundamentally unchanged.

From an economic point of view JI, CDM and IET are similar instruments, i.e. a specific form of a tradable emissions system. However, although the three mechanisms are based on the same economic rationale, they possess distinguishing institutional features. In particular, JI and CDM are project-based and may explicitly involve private entities (e.g. firms). Projects may be related to emissions reduction or sink enhancement activities, “additional” to any that would otherwise occur. However, JI (as IET) is allowed only between countries with commitments under the Protocol, while CDM is allowed between Annex I and non-Annex I Parties (i.e. developing countries). Moreover, the purpose of CDM is more general since, in addition to assisting Annex I Parties to achieve compliance with ‘part’ of their commitments, it should promote sustainable development in developing countries. Contrary to JI, the CDM will be supervised by an executive board, emission reductions have to be certified and, according to Article 12.8, “a share of the proceeds from certified project activities is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation”. Although the generated ‘certified emission reductions’ should similarly be ‘additional’ to any reductions that would otherwise occur, the kind of projects that may be included under the CDM could thus be restricted, compared to JI. Indeed, in addition to contributing to sustainable development, Article 12 explicitly mentions that projects should give rise to “real, measurable and long-term benefits related to the mitigation of climate change”. Finally, certified emission reductions obtained with the CDM during the whole period 2000 up to the beginning of the first commitment period can be used to assist in achieving compliance in the first commitment period. On the other hand, emissions reduction credits generated through JI and trading of assigned amounts within IET will accrue only during the commitment period (2008–2012).

The fourth session of the CoP was held in Buenos Aires in November 1998 and the Parties adopted the so-called ‘Buenos Aires Plan of Action’, which set out a program of work covering both the ‘unfinished business’ of the Kyoto Protocol and on-going implementation issues under the Convention, such as financial assistance and technology transfer. The deadline for negotiations under the Buenos Aires Plan of Action was set at CoP-6 in The Hague (November 2000). However, at that session, Parties were unable to agree on several important topics and decided to continue their negotiations at a resumed session of CoP 6 in Bonn in July 2001.

In the meanwhile, in March 2001, the US Administration announced it would not ratify the Kyoto Protocol. The decision of the USA puts under pressure the whole international negotiation process relating to climate change. Indeed, the entry into force of the Kyoto Protocol is conditional on the ratification of countries representing at least 55% of the Annex B countries total 1990 CO₂ emissions. Given that the US emitted about 36% of CO₂ in 1990, in the negotiations it was necessary to avoid a country or group of countries counting more than 9% of 1990 Annex B emissions leaving the negotiation table [8]. Of course, under those conditions, the negotiations became quite difficult and the need to make compromises even more acute. However, quite unexpectedly, a political consensus on the so-called ‘Bonn Agreements’ was finally reached, on key issues under the Buenos Aires Plan of Action.

Although some countries still opposed a treaty that did not include the USA, the Bonn agreement opened the door to another agreement at CoP-7 in Marrakech in November 2001. The result of CoP-7 is that, after four years of difficult negotiations, the Kyoto

Protocol has been modified one last time, but is now finally fit for ratification and entry into force. Important features of the Protocol have been clarified. In particular, non-compliance will have legally binding consequences, including ineligibility to use the international economic mechanisms. Rules and caps set limits on the extent countries can use forestry and agricultural sinks to comply with their commitments. Some fundamental rules for the flexible mechanisms have been decided, while some international funds have been established to help the least developed countries to adapt to the impacts of global warming. However, when entered into force, the Kyoto Protocol will not imply a reduction of GHGs by 5.2% below 1990 levels by 2008–2012, as was originally foreseen, because the USA will not participate but also because of the difficulties in measuring precisely the forestry and agricultural sinks [9]. However, the real importance and effective impact of the Kyoto Protocol will be judged by looking at its capacity to implement an international architecture that will lead to further and much stronger emissions reduction in the future. This will be achieved only if all the relevant stakeholders and countries, including the developing countries, are willing to implement climate change policies and measures. It is nevertheless unlikely that greater and generalised emissions reductions in future commitment periods would be accepted, without a deep discussion of the actual international economic order.

2 The papers in this special issue

The papers included in this Special Issue focus on climate change issues and opportunities, which are particularly relevant for developing countries.

The paper by José Goldemberg discusses the positions of developing countries in the climate change international negotiations. He shows that, to most developing countries, climate change is not considered a major issue but that negotiations were used as an instrument for leveraging claims for a better distribution of wealth among nations and an increase in development assistance. However, the CDM encouraged a greater participation in the negotiation process, since this mechanism could imply an increase in financial resources and clean technologies available to the developing world. The author also points out that, although developing countries do not have emission commitments under the Kyoto Protocol, they are achieving reductions in CO₂ emissions that are greater, in relative terms, than in industrialised countries.

The subsequent three papers are all concerned with the impacts of climate change in developing countries, but from different perspectives.

The paper by Bettina Menne, Nino Künzli and Roberto Bertollini focuses on the health impacts of climate change and variability in developing countries. They observe that long-term changes in world climate may affect many requisites of good health through a variety of mechanisms, such as the availability of fresh water supply and food security. Climate change may also affect the distribution and seasonal transmission of several vector-borne infectious diseases, as well as an increase in the frequency and severity of extreme weather events, with severe impacts on health. In urban areas, the possible increase in heatwaves may imply a serious threat, since excess mortality and morbidity is currently observed during hot weather episodes. However, the authors point out that the health community has difficulty in clearly attributing changes in ranges of diseases or mortality to climatic change. The main reasons are the gradual process and the lack of retrospective and prospective studies from developing countries. Menne,

Künzli and Bertollini observe that adaptation is a key response strategy to minimise the potential impacts of climate change and that the ability to adapt to climate change impacts, and specifically of health, will depend on many factors including; existing infrastructure, resources, technology, information and the level of equity in different countries and regions.

The paper by Wendy Annecke is concerned with the social impacts of climate change, particularly those on women in developing countries. The author attempts to draw links between climate change, energy-use, gender relations and the impacts on every-day lives of poor women in Africa. Water resources, agriculture, human health, forestry, rangelands, biodiversity fishing, forestry and tourism are all sectors that women are engaged in and that will be affected by climate change. Annecke points out that gender, the socially constructed relationships between men and women, plays a part in vulnerability. In the paper, the author examines women's susceptibility to changes in the above-mentioned sectors and concludes with some recommendations.

Asbjørn Aaheim analyses monetary impacts of climate change and the application of cost-benefit analysis in the context of developing countries. The author shows why developing countries are more reluctant than developed countries to determine climate policy based on monetary estimates of the impacts of climate change. Many limitations of cost-benefit analysis become even stronger when applied to economies with distorted markets and limited abilities to adapt to new economic conditions. In addition, the influence of income distribution on monetary values also means that estimates of costs and benefits are less applicable for policy-making in developing countries. However, Aaheim points out that a main advantage of cost-benefit analysis is that it allows data for the impacts of climate change to be systematised, evaluated and aggregated in a common measure in accordance with well-defined principles.

The remaining papers in the Special Issue concentrate on different elements related to CDM, the only international economic mechanism that contemplates the participation of developing countries.

The paper by Sujata Gupta presents the debate on key CDM issues, from the perspective of developing countries. The author discusses key issues such as baselines, additionality, supplementarity, application of the sustainable development criteria and the inclusion of sinks as CDM projects. CDM is also compared with JI and IET, the other international economic mechanisms included in the Kyoto Protocol. Finally, Gupta analyses the developments at CoP-6 and their impacts on CDM and points out some suggestions for proceeding beyond the current scenarios.

The paper by Axel Michaelowa analyses some of the issues presented by Gupta in the light of the experience gained during the pilot phase of the Activities Implemented Jointly (AIJ). The author observes that most of the 150 projects in the AIJ program are rather small and many of them have been only partially implemented due to the lack of finance, related to lack of emissions credits. Michaelowa reports that most of the implemented projects are commercially viable, unless they have been financed by an investment subsidy. The problems of additionality and baseline determination lead to a lot of research and proposals for methodologies, it has not been possible to get quick decisions on baseline rules for the CDM. The author points out that reporting has shown to be one of the weak points of the AIJ regime, as its quality is highly variable and data are not comparable, especially concerning costs.

Glenn Wiser discusses the new opportunities for international trade introduced by the CDM. The author supports that 'Certified Emissions Reductions' (CERs) generated by CDM projects should not be subject to regulation by the World Trade Organisation (WTO), because they will share the qualities of licenses and not products or services. However, Wiser maintains that the services related to CDM project development, and financial services rendered in the CER trading system, may fall within the scope of the General Agreement on Trade in Services (GATS). While the GATS are not likely to interfere with the international rules related to CDM, it could sometimes have a 'chilling effect' on individual countries as they implement their domestic CDM systems. Wiser points out that clear CDM rules promulgated at the international level may help minimise potential conflicts.

The paper by Ronaldo Seroa da Motta analyses the social and economic aspects of the Brazilian options for projects under the CDM. The author shows that the CDM may theoretically be an efficient instrument to minimise the global control costs of GHG emissions: However, Seroa da Motta points out that the CDM will not necessarily maximise welfare of the countries where these carbon saving investments are applied. The author assesses the financial profitability rates for the major Brazilian CDM investment options, which are then discussed in line with their expected social and environmental development benefits.

Joyotee Smith analyses the social and environmental implications of plantations in CDM projects. Implications for timber rich, timber depleted and inherently timber poor regions are assessed. Smith notices that social risks of industrial plantations cannot be fully addressed under CoP-7 rules and are likely to be highest in timber rich regions under repressive regimes or where politics dominate the forestry sector. However, the author points out that risks could be reduced through minimum standards for stakeholder consultation and favourable legal institutions. Smith observes that low cost opportunities with multiple benefits exist and require information dissemination, but some opportunities for biodiversity benefits will need financial support. Reduction of transaction costs would increase the participation of smallholder plantations but their role is likely to remain limited. The author maintains that inclusion of assisted natural regeneration opens up opportunities for options with multiple benefits.

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References and Notes

- 1 Kolstad, C.D. and Toman, M. (2001) 'The economics of climate policy', *Resources for the Future, Discussion Paper 00-40REV*, Washington, DC.
- 2 Grubb, M.J. (1995) 'Seeking fair weather: ethics and the international debate on climate change', *International Affairs*, Vol. 71, No. 3.
- 3 Annex B countries include the entire Annex I Parties with the exception of Belarus and Turkey.
- 4 A Party's assigned amount is equal to its 1990 base-year level of carbon dioxide equivalent emissions of the six GHGs listed in Annex A of the Protocol, multiplied by five (i.e., for the five-year commitment period 2008–2012). The base-year differs from 1990 for certain Parties with economies in transition.
- 5 For the moment, only the European Union has negotiated a joint target and distributed it to its member states.
- 6 Hamwey, R. and Baranzini, A. (1999) 'Sizing the global GHG offset market', *Energy Policy*, Vol. 27, No. 3, pp.123–127.
- 7 Abatement costs include all the costs related to emissions reduction activities, e.g. fuel switching, technology change, output reduction, reforestation.
- 8 In this context, for instance, the agreement of Russia is indispensable, since its emissions represented about 17% of Annex I 1990 CO₂ emissions.
- 9 Legge, T. and Egenhofer, C. (2001) *After Marrakech: The Regionalisation of the Kyoto Protocol*, The Centre for European Policy Studies (CEPS), CEPS Commentary.