Interactions between climate change and sustainable development – an introduction

Mohan Munasinghe

University of Colombo, Sri Lanka
E-mail: mmunasinghe@worldbank.org

Keywords: Sustainable development; sustainomics; environmental domain; social domain; climate change.

Reference to this paper should be made as follows: Munasinghe, M. (2001) 'Interactions between climate change and sustainable development – an introduction', *Int. J. Global Environmental Issues*, Vol. 1, No. 2, pp.123–129.

Biographical notes: Mohan Munasinghe has postgraduate degrees in economics, engineering and physics from Cambridge University (UK), the Massachusetts Institute of Technology (USA) and McGill University (Canada). At present he is Vice Chair, Intergovernmental Panel on Climate Change (IPCC), Geneva; Senior Advisor, World Bank, Washington DC; Chancellor, International Water Academy, Oslo; and Distinguished Visiting Professor of Environmental Management, University of Colombo, Sri Lanka. From 1982 to 1986 he was the Senior Energy Advisor to the President of Sri Lanka, and during 1990-92, he served as Advisor to the US President's Council on Environmental Quality.

1 Introduction

National leaders are looking for new solutions to many critical problems including traditional development issues (such as economic stagnation, persistent poverty, hunger, malnutrition, and illness), as well as newer challenges (like, worsening environmental degradation and accelerating globalisation). One key approach that has received growing attention is based on the concept of sustainable development or 'development which lasts'. Following the 1992 Earth Summit in Rio de Janeiro and the adoption of the United Nations' Agenda 21, sustainable development has become well accepted worldwide [1,2] At the same time, global climate change poses an unprecedented challenge to humanity [3–5]. The wide-ranging potential impacts of climate change on sustainable development suggest that the linkages between these two topics need to be critically analysed. Accordingly, this special issue of the journal is devoted to several papers, which seek to explore the several critical issues within the nexus of sustainable development and climate change.

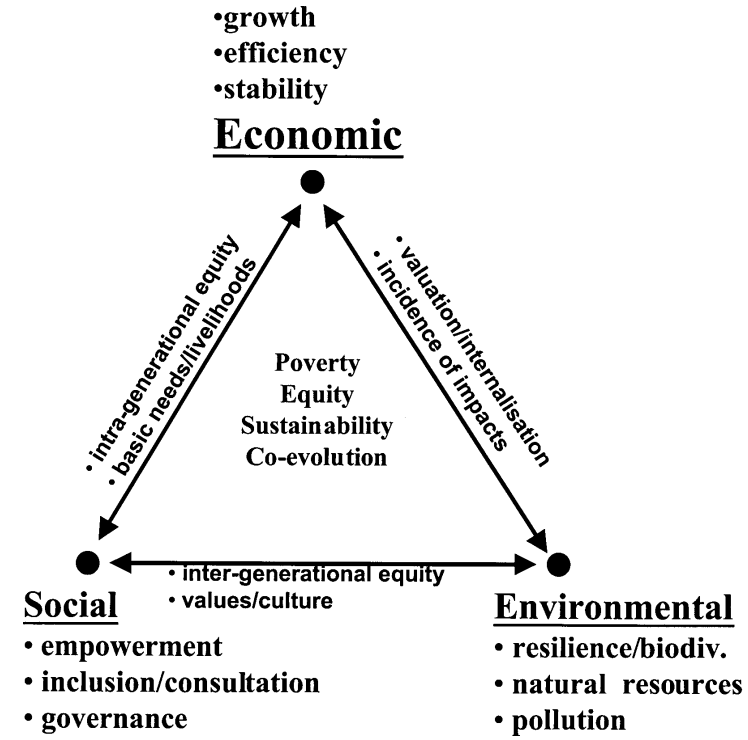
The papers in this volume were originally presented at an IPCC expert meeting on development, equity and sustainability, held in Colombo, Sri Lanka, during the period 27-29 April 1999. The meeting sought to provide a forum for discussing and elaborating how insights from the development, equity and sustainability debate might be used to frame the assessment of adaptation and mitigation options by the IPCC [6]. The gathering was the first of its kind, and included about 40 experts from 15 countries. An overview

paper on the subject of climate change and sustainable development, also presented at the IPCC meeting, was included in the inaugural issue of this journal [7].

2 Sustainable development – basic concepts

One concise definition of sustainable development describes it as a process for improving the range of opportunities that will enable individual human beings and communities to achieve their aspirations and full potential over a sustained period of time [8]. The goal is an approach that will (inter alia) permit continuing improvements in the present quality of life at a lower intensity of resource use, thereby leaving behind for future generations an undiminished stock of productive assets (i.e., manufactured, natural and social capital) that will enhance opportunities for improving their quality of life. While no universally acceptable practical definition of sustainable development exists as yet, the concept has evolved to encompass three major points of view: economic, social and environmental, as represented by the triangle in Figure 1(a) [9]. Each viewpoint corresponds to a domain (and system) that has its own distinct driving forces and objectives. The economy is geared mainly towards improving human welfare, primarily through increases in the consumption of goods and services. The environmental domain focuses on protection of the integrity and resilience of ecological systems. The social domain emphasises the enrichment of human relationships and achievement of individual and group aspirations.

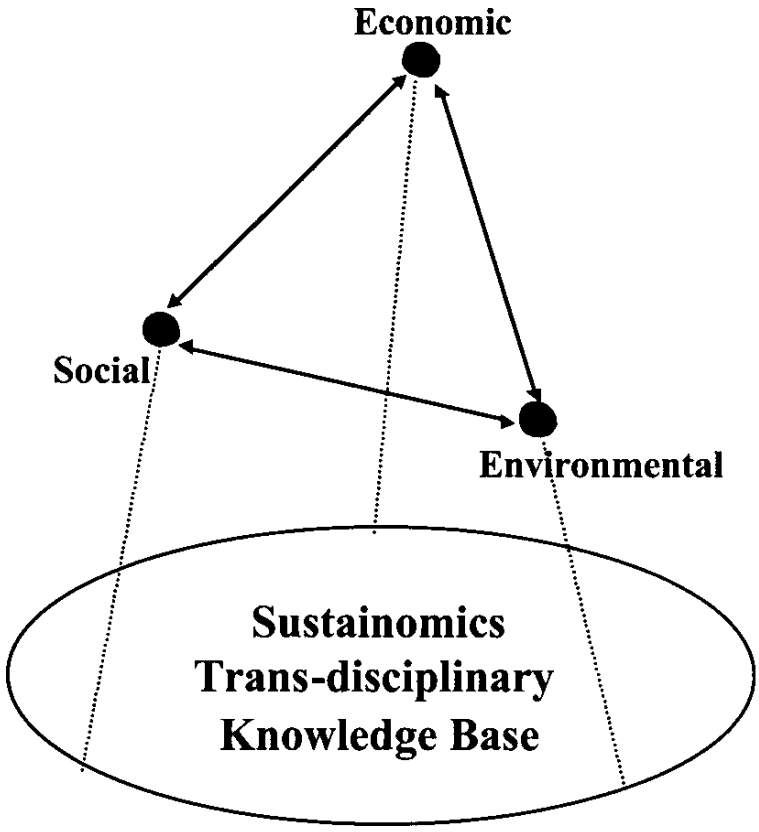
Figure 1(a) Key elements of sustainable development and their interactions



Source: Adapted from Munasinghe [8,9]

Munasinghe [8,9] proposed the term sustainomics to describe "a transdisciplinary, integrative, comprehensive, balanced, heuristic and practical meta-framework for making development more sustainable." The sustainomics approach seeks to synthesise a 'sustainability science', by weaving knowledge from existing disciplines into new concepts and methods, to build a comprehensive and eclectic knowledge base that could support sustainable development efforts, from concept to actual practice – see Figure 1(b). By focusing attention explicitly on sustainable development, sustainomics projects a more neutral image and avoids the implication of any disciplinary bias or hegemony. The approach should lead to the balanced and consistent treatment of the economic, social and environmental dimensions of sustainable development (as well as other relevant disciplines and paradigms). Although the precise definition of sustainable development remains an elusive (and perhaps unreachable) goal, a less ambitious strategy that merely seeks to make development more sustainable might offer greater promise. Such an incremental method is more practical, because many unsustainable activities may be easier to recognise and eliminate, thereby helping us to avoid sudden catastrophic ('cliff edge') outcomes.

Figure 1(b) Sustainable development triangle supported by the sustainomics framework.



Source: Adapted from Munasinghe [8,9]

3 Interactions with climate change

There will be significant mutual interaction between climate change and sustainable development. On the one hand, future patterns of development, production and consumption will affect emissions and the intensity of climate change. Furthermore, greenhouse gas mitigation and adaptation efforts will be closely linked to sustainable development strategies. On the other hand, future climate change will strongly influence sustainable development prospects.

Climate change issues may be examined in relation to the three main elements of sustainable development (economic, social and environmental). First, future economic development and the well-being of large numbers of human beings would be threatened by global warming. In its simplest form, the economic efficiency viewpoint seeks to maximise the net benefits (or outputs of goods and services) from the use of the global resource represented by the atmosphere. When considering climate change response options, several ideas and principles which are widely used in environmental economics analysis would be useful – including the polluter pays principle, economic valuation, internalisation of externalities and property rights. The polluter pays principle argues that those who are responsible for damaging emissions should pay the corresponding costs, thus providing an incentive for polluters to reduce their emissions to optimal (i.e., economically efficient) levels. Quantification and economic valuation of potential damage from polluting emissions is an important prerequisite. The notion of property rights is also relevant to establish that the atmosphere is a valuable and scarce common property resource which cannot be used freely and indiscriminately.

Second, social welfare and equity would also be undermined in an unprecedented manner, by climate change. In particular, both intra- and inter-generational equity are likely to be worsened, especially since poorer nations and disadvantaged groups within nations are more vulnerable and the costs of damage, as well as of necessary adaptation and mitigation efforts will be unevenly distributed. Sustainomics suggests that inequitable distributions are not only ethically unappealing, but are also likely to be unsustainable in the long run, because they undermine social cohesion and exacerbate conflicts over scarce resources. More attention also needs to be paid to the erosion of social capital (i.e., the basic glue that binds communities together) and the increasing vulnerability of social values and institutions, which are already stressed due to rapid technological changes.

In identifying response strategies, one starting point is the ethical viewpoint that climate change should not be allowed to worsen existing inequities – although climate change policy cannot be expected to address all prevailing equity issues. Some special aspects include:

- the establishment of an equitable and participative global framework for making and implementing collective decisions about climate change
- reducing the potential for social disruption and conflicts arising from climate change impacts and
- protection of vulnerable communities and threatened cultures and preservation of cultural diversity.

The polluter pays principle (mentioned earlier) is based not only on economic efficiency, but also on equity and fairness. An extension of this idea is the principle of recompensing victims – ideally by using the revenues collected from polluters. There is also the moral/equity issue concerning the extent of the polluters' obligation to compensate for past emissions (i.e., a form of environmental debt).

Third, the environmental sustainability viewpoint draws attention to the fact that increasing anthropogenic emissions and accumulations of GHGs might significantly perturb a critical global subsystem – the atmosphere. Changes in the global climate are likely to threaten the stability of a range of critical physical, ecological and socioeconomic systems and subsystems at all levels – regional, national and subnational.

Sustainomics draws on several concepts from contemporary environmental and social analysis to guide the development of climate change response options, including the concepts of durability, optimality, safe limits, carrying capacity, irreversibility, non-linear responses and the precautionary principle. Broadly speaking, durability and optimality are complementary and potentially convergent approaches that may be reconciled within the sustainomics framework. The focus will be on optimising economic output, subject to (secondary) constraints that ensure social and environmental sustainability, if material growth is the main issue, while uncertainty is not a serious problem and relevant data are available. Alternatively, the emphasis would be on paths which are economically, socially and environmentally durable or resilient, but not necessarily growth optimising, if sustainability is the primary objective, conditions are chaotic and data are rather weak.

It is considered important to avoid irreversible damage to bio-geophysical systems and prevent major disruption of socioeconomic systems. Finally, the precautionary principle argues that lack of scientific certainty about climate change effects should not become a basis for inaction.

4 Overview of papers

The first paper by John Robinson and Deborah Herbert is on 'Integrating climate change and sustainable development'. As the work on the IPCC Special Report on Emissions Scenarios (SRES) suggests, future emissions of greenhouse gases (GHGs) do depend to a large extent on the development path, probably as much as on explicit climate policies. This makes the dividing line between having a climate policy and having no-climate policy very elusive, as well as the difference between climate mitigation and sustainable development scenarios. The SRES scenarios also show that different combinations of driving forces can lead to similar emissions of greenhouse gases. For any analysis of costs and impacts of scenarios, the choice of a reference baseline is all-important. It is argued that much of the literature on sustainable development deals with local issues, while the literature on climate change response is dominated by analysis at the global level. Reconciliation of these scales is crucial. Finally, the authors emphasise that decreasing emissions can be achieved both by increasing resource use efficiency and by the development of less resource-intensive lifestyles.

In the paper on 'Development patterns in the North and their implications for climate change', Wolfgang Sachs places the main responsibility on the North – to reduce greenhouse gas emissions in the perspective of a limited ecospace (determined by stabilisation of GHG concentrations) and to ensure a fair distribution of the mitigation

burden. He refers to the so-called factor 10 approach that may be needed to increase resource productivity sufficiently in the next 50 years, thereby reducing emissions along with increasing income levels. Such resource productivity would have to be reached by a combination of efficiency increases in the use of resources and dematerialisation of development by decoupling quality of life from resource flows ('sufficiency'). This dual strategy would be needed because the positive effects of technological productivity increases are often negated by increased demands (growth of volume).

Leena Srivastava and Sharmila Srikanth's paper on 'How development patterns in the South will affect climate change' reiterates that while the emissions of GHGs from developing countries must grow, their ability to contain these emissions is limited by several factors. In an effort to address their developmental needs, countries of the South are already implementing a number of policies and measures that are lowering their emissions growth path. Project based activities, such as those defined by the clean development mechanism (CDM), may bring about short-term reductions in the rate of growth of GHG emissions. However, a truly long-term solution both to reduce emissions from developing countries, and facilitate their participation in the global efforts to reduce adverse climatic impacts, would be to invest in raising the level of social and economic infrastructure in these countries. Paradoxically, Official Development Assistance that would facilitate such a transition is on the decline.

Steve Rayner in his paper on 'Climate change, poverty, and intra-generational equity: the national level' discusses seven propositions:

1 climate change and poverty are linked by the issue of vulnerability

2 the hardest equity issues arise because of qualitative differences in the nature of climate change and policy impacts on the poor and those who are better off

3 poverty cannot be understood in terms of lack of goods or income, or even basic needs, but must rather be understood in terms of people's ability to participate in the social discourse that shapes their lives

4 emerging multi-dimensional measures of poverty are much better than those based on income or needs, but may continue to underestimate socio-cultural factors

5 eliminating poverty and developing societal resilience require building social diversity

6 climate change and policy impacts on the poor do not conform very well to analytic dichotomies of national and international, or intragenerational and intergenerational equity

7 in the final analysis climate protection and poverty elimination may be most effectively achieved through local-level actors and their global networks.

The paper by Irving Mintzer and David Michel on 'Climate change, the rights of future generations and inter-generational equity: an in-expert exploration of a dark and cloudy path' stresses that the impacts of climate change would be distributed unevenly over future generations in a yet unknown way. Mainstream economics has serious problems dealing with issues of intergenerational equity, including the uncertainties about an appropriate discount rate. The authors look into ways that international law defines intergenerational equity. Weiss' three basic principles: conservation of options, conservation of quality, and conservation of access, may be used to implement a system

of 'planetary rights'. Finally, there is a discussion of different methods of operationalising the concept of common, but differentiated responsibilities from the perspective of ethics – utilitarian, realist (power relations), equitable commons, fiduciary trust, and earth rights.

Toth's paper on 'Development, equity and sustainability concerns in decision analysis for climate change' provides an overview of the various decision analysis frameworks (DAFs) that may be used in climate change policy analysis. The process that is described helps to organise climate relevant information within the DAF, apply appropriate decision criteria and determine the strategic options which are most suitable. A wide range of DAFs are available. The simpler ones are 'what if' type studies (e.g., simulation models or basic scenario analyses) that examine the outcomes of alternative courses of action, according to some basic selection criteria. The more sophisticated approaches, including cost-benefit analysis, cost effectiveness analysis, or formal decision analysis, use rigorous decision criteria to identify preferred options, on the basis of quantitative data.

To conclude, the papers in this volume provide a range of rich and rewarding insights into some of the critical linkages between climate change and sustainable development. The ideas set out here constitute a valuable step towards addressing these issues in the coming years.

References

1 WCED (World Commission on Environment and Development) (1987) *Our Common Future*, Oxford University Press, Oxford, UK.

2 UN (1993) *Agenda 21*, United Nations, New York.

3 UNFCCC (United Nations Framework Convention on Climate Change) (1993) *Framework Convention on Climate Change: Agenda 21*, United Nations, New York, NY, USA.

4 IPCC (1996) *Climate Change 1995: Economic and Social Dimensions of Climate Change*, J.P. Bruce, *et al.*, (Eds.) Cambridge University Press, London..

5 IPCC (1996) *Climate Change 1995: Impacts, Adaptations and Mitigation of Climate Change*, , R.T. Watson *et al*., (Eds.) Cambridge University Press, London.

6 Munasinghe, M. and Swart, R. (Eds.) (2000) *Climate Change and its Linkages with Development, Equity and Sustainability*, Intergovernmental Panel on Climate Change (IPCC), Geneva, Switzerland.

7 Munasinghe, M. (2001) 'Sustainable development and climate change: applying the sustainomics transdisciplinary meta-framework', *Int. J. of Global Environmental Issues*, Vol. 1, No. 1.

8 Munasinghe, M. (1994) 'Sustainomics: a transdisciplinary framework for sustainable development', *Keynote Paper, Proc. 50th Anniversary Sessions of the Sri Lanka Assoc. for the Adv. of Science (SLAAS)*, Colombo, Sri Lanka.

9 Munasinghe, M. (1993) *Environmental Economics and Sustainable Development*, World Bank, Wash. DC, USA.