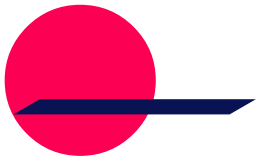


*Atmospheric
Environment
Issues
in Developing
Countries*



SEI STOCKHOLM
ENVIRONMENT
INSTITUTE

International Institute for Environmental Technology and Management



The Programme and Objectives

Atmospheric environmental problems are increasingly critical for industrialising nations in the developing world. Greenhouse gas (GHG) emissions in developing countries continue to rise as urban, industrial, and transportation sectors grow, largely based on fossil fuel energy. Dependence on natural resources underlines the need for developing nations to acquire tools and methodologies that will enable them to incorporate concerns about climate into policy plans for sustainable resource use. Air pollution problems, including acidic deposition, have become an increasingly consequential issue for the developing world: for example, twelve of the fifteen most polluted cities in the world are found in Asia. Global atmospheric transfer models indicate that if emissions rise as they are projected to do over the next decades, levels of acidic deposition similar to those found in Europe and North America are likely to become widespread. In addition, the use of ozone depleting substances (ODS) is rapidly growing in developing countries although until recently has been most widespread in developed countries. As world-wide consumption of chlorofluorocarbons (CFCs) falls due to the Montreal Protocol on Substances that Deplete the Ozone, the share of developing countries to overall consumption of CFCs increases rapidly. China is now one of the largest CFC consumers in the world.

Many developing countries are signatories to or involved in international agreements, protocols and conventions such as the Montreal Protocol and the United Nations Framework Convention on Climate Change. However, these nations have limited financial, human, technical and institutional resources to respond to their obligations in meeting these international agreements.

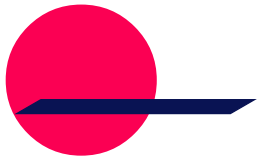
In 1992, the Swedish International Development and Cooperation Agency (**Sida**), granted responsibility to the Stockholm Environment Institute (**SEI**) to manage, develop, and monitor the projects in the *Atmospheric Environment Issues in Developing Countries Programme* (first initiated in 1990 by Sida). This is an international effort to promote new co-operation concerning trans-border environmental issues between developed and developing countries. This programme fits within the context of Sida's commitment to catalyse action on environmental issues by providing resources to developing nations.

The objective of the Programme is *to enhance the capacity of developing countries to participate locally and regionally in programmes and activities to resolve atmospheric environmental problems and to increase and facilitate the participation and involvement of developing countries in international initiatives and negotiations.*

The Programme is concerned with three key themes:

- *Phasing Out Ozone Depleting Substances: CFC use and control*
- *Global Climate Change: adaptation methodology and control of greenhouse gas emissions*
- *Acidic Depositions and Effects*

The Programme addresses the three main issues through a number of projects. All these projects are linked by a common theme of problem analysis, strategic action, and capacity building. It is the goal of the Atmospheric Environment Issues in Developing Countries Programme to creatively engage researchers and policymakers from the developing and developed worlds in co-operation. The specific components of the programme evolve over time, as developing countries take ownership of on-going processes of research, dialogue, and policy-making. This programme initiates action; project collaborators build on this genesis and sustain the innovative efforts.



Phase Out of Ozone Depleting Substances

Scientific consensus recognises that the human-made chemicals CFCs, halons, and others threaten the stratospheric ozone layer, which shields the earth from harmful ultraviolet radiation. Ozone depletion will affect food production, ecosystems and human health globally. The Montreal Protocol, established in 1987, calls for a world-wide elimination of production and consumption of ozone depleting substances (ODS) no later than January 1996. Developing countries received a ten-year grace period for ODS phase-out. A Multilateral Fund, jointly paid by the developed countries, covers the incremental costs of developing countries for investments to phase out ODS. Sweden, which advocates a faster phase-out of ODS, has long been a driving force in the international negotiations.

ODS phase-out under the Montreal Protocol contains both benefits and detriments for developing countries. On the one hand, developing countries stand to gain from the phase-out as the effects on health and environment do not affect countries in proportion to their contribution to the emissions. Developing countries with a low consumption of ODS are less prepared and able to deal with the effects of increased UV-B radiation. On the other hand, phasing out ODS has direct effects on the economies and development in these nations. A rapid elimination hinders industry in developing countries which critically depend on ODS. Limited access to alternatives, mandated retrofitting, prohibitive costs, and an increasing demand for CFCs and controlled substances all combine to form an obstacle for developing countries' compliance with the Montreal Protocol. Developed and developing countries alike face a challenge in

phasing-out ODS, substances which have deeply penetrated modern society.

ODSONET/SEAP

In order to overcome these barriers and to facilitate the control of the use of ODS in developing countries, a need arose for co-operation among government officers from both developing and developed nations in charge of the daily work to eliminate ODS. For this reason, Sida and SEI established the Network for ODS Officers in the Southeast Asia/Pacific region (ODSONET/SEAP) in 1992, which is implemented by UNEP under its OzonAction Programme. This network enhances the capacity of ODS Officers to design and implement efficient phase-out strategies on ODS, well adapted to the conditions in their own countries and leading to phase out of ODS at the earliest possible date, by creating a forum for co-operation among ODS Officers in the region and with their colleagues in some developed countries which have advanced phase-out programmes.

Members of ODSONET/SEAP are ten developing countries: Brunei Darussalam, Fiji, Indonesia, Lao P.D.R., Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam and three developed countries: Australia, New Zealand and Sweden.

ODSONET/SEAP now serves as a model for similar networks in Africa and Latin America supported by the Multilateral Fund and designed to achieve similar co-operative relationships and to expedite phase-out schedules for ODS.

ODSONET/SEAP

A Model for Environmental Policy Collaboration

The Network for ODS Officers in Southeast Asia/Pacific region has become a model for informal international co-operation shown to produce tangible results on pressing environmental problems. The Swedish institutional and financial support of the network is in addition to its contribution to the Montreal Protocol's Multilateral Fund to assist developing countries in phase-out of ozone depleting substances. Drawing on its own experience of co-operation with Nordic countries on ozone issues, Sweden now facilitates a similar co-operation in Southeast Asia.

The ten participating developing countries have access to the technological expertise and phase-out strategies of the developed countries in the network. In addition, the collaboration provides an incentive to match and exceed others' efforts by expediting their own phase-out activities. Malaysia, the Philippines, and Thailand are advancing their phase-out deadlines to occur much earlier in the ten-year grace period given under the Protocol. In 1993, Thailand decided to accelerate its ODS phase-out in mobile air-conditioning units by two years,

following an example from the Philippines as reported and discussed at the 1993 ODSONET/SEAP meeting. The decision saved 200 tonnes of ODS yearly. Based on information from colleagues in Malaysia and other network countries, Vietnam has decided to ban CFC use in most sectors by 1997 instead of the year 2006 as suggested by international consultants, saving 1,800 tonnes of ODS if successfully implemented. The network has continued to tackle new facets of the phase-out strategy, holding conferences and workshops to convince private sector representatives of alternatives to halons, to determine strategies for reduction of emissions of ODS refrigerants, to develop regional strategies for the aerosol sector, and to explore methods for reducing use of methyl-bromide. An evaluation study on the financial mechanism of the Montreal Protocol recognised the success of ODSONET/SEAP due to Sida's distinctive support and recommended that UNEP "work to ensure that similar networks in Africa and Latin America are able to attain a similar level of operations."



Global Change

Climate and Responses

The UN Framework Convention on Climate Change (UNFCCC) came into force in March 1994. Article 3.3 of the UNFCCC states that:

“Parties should take precautionary measures to anticipate, prevent, or minimise the causes of climate change and mitigate its adverse effects. Where there are threats of serious irreversible damage lack of full scientific certainty should not be used as reason for postponing such measures...”

While most effort in the area of climate change has been devoted to mitigating and abating GHG emissions, it is now realised that some attention needs to be devoted to developing a capability to anticipate and respond to potential impacts. Developing countries will be more vulnerable to impacts of climate change because their economies are highly dependent on the natural resource base. The Sida-SEI Atmospheric Environment Issues in Developing Countries Programme works to address the needs of developing countries vis-à-vis global climate change.

Climate Change Adaptation Methodology and Case Studies

A significant portion of the Sida-supported work on climate change has emphasised identifying and strengthening adaptive responses to potential impacts of climate change in forest-based land use systems in developing countries. Utilising previous work completed by the International Institute for Environment and Development (IIED) and the Climatic Research Unit of the University of East Anglia (CRU/UEA), a planning framework was developed which employs climate scenarios to work out actions and programmes to reduce vulnerability to potential impacts of climate change. This framework, *Sustainable Adaptation in the Forestry Sector: A Guide to Strategy*, has served as the basis for two subsequent case studies in India in the Himachal Pradesh (temperate) and the Western Ghats (tropical) regions.

Both of these studies, in India fall under the heading *Identifying Strategies to Enhance Strategic Options for Adapting to Climate Change in Forest Based Land Use Systems*. The aim of the projects is to reduce the vulnerability to potential impacts of climate change. First, the research identifies current patterns of resource use and incorporates the human dimension by analysing the dependence of the local communities and national economy on different forest products. Second, the project analyses the potential impacts of climate change and socio-economic factors on forests and forest product flows. Third, the work evaluates the adequacy of current forest conservation and development programmes and policies to adapt to the potential impacts

due to climate change. This work is conducted by SEI in collaboration with the Tata Energy Research Institute (TERI) and the Centre for Ecological Sciences (CES) in India.

Tiempo

The Special Committee on the Participation of Developing Countries established by the Intergovernmental Panel on Climate Change (IPCC) has noted that five main factors have inhibited the involvement of developing nations in recent negotiations: insufficient information, insufficient communications, limited human resources, institutional difficulties and limited financial resources. In order to improve the information gap in the developing world related to climate change, the publication *Tiempo* was launched in 1991 as a joint publication of IIED and CRU/UEA with support from Sida.

Tiempo is a quarterly bulletin which promotes the awareness of the interests of southern nations in the international debate and strengthens their response to the climate change issue through the provision of topical, high-quality information. The main target groups of *Tiempo* include those directly involved in the climate negotiations (governmental and non-governmental), scientists working in the climate field or related areas, government officials responsible for developing climate-related policy, the aid community, and educators. Experts in climate change-related fields contribute to each issue, which reaches over 10,000 readers in 166 countries. *Tiempo* is also accessible to readers around the world on the World Wide Web at <http://www.cru.uea.ac.uk/> and will be available as part of an expanded electronic information service.

Alcohol as Alternative Transportation Fuel

Another component of the Global Climate Change portion of the Programme is an SEI assessment of the use of alcohol fuels to reduce GHG emissions in the transportation sector in Thailand. The aim of the project is to identify and begin to understand some of the operational issues that are important in making policy decisions concerned with implementing alternative fuel strategies. The final SEI report, *Alcohol as an Alternative Transportation Fuel*, outlines not only the impacts of emission levels but highlights some of the non-atmospheric costs and benefits that can be derived locally from opting for alternative fuels. The issues raised will aid decision makers and policy analysts in developing countries in making informed decisions when evaluating measures for reducing GHG emissions. This alcohol fuels study has since spurred other similar Sida-funded studies in African countries. Sida also directly aids other alternative fuel projects in the transportation sector.

Himachal Pradesh and the Western Ghats: Case Studies in Climate Change Research with Vertical Links

Despite inevitable change in global climate, adaptation as an issue has taken second place to emission control in the climate debate. A developing country like India is particularly vulnerable to climate change since the livelihoods of millions of people are directly dependent on forests. The studies in Himachal Pradesh (temperate Northern India) and the Western Ghats (tropical southern India) supported by Sida through SEI, aim to reduce this vulnerability by adopting an approach towards sustainable adaptation to climate change. This strategy bases climate change responses on actions that meet basic ecological and social needs now without compromising the future. The Climatic Research Unit of the University of East Anglia provide climate scenarios for their regions (the likely range within which regional temperature and precipitation will change for each year from now until 2100) so that they may link present-day development priorities with long-term impact of climate change.

The crux of the case studies lies in not only determining the ecological transition likely to occur due to climate change, but also highlighting the socio-economic implications for the com-

munities of the region which depend on the natural resources. The sustainable adaptation approach undertakes risk and impact assessment and the results are applied toward a long list of possible adaptive planning and management responses.

Planners can obtain 'win-win' outcomes if they pursue strategies which will safeguard forests in the long run and also meet the day to day needs of people. The studies recommend that policy makers consider both ecological and socio-economic factors. These include continuing to implement joint forest management programmes by giving local people a stake in the process and also by selecting 'climate-proof' species for plantation afforestation. In order to bring the research recommendations to life, SEI has engaged forestry planners and policy makers in India and neighbouring countries in a *Roundtable Policy Dialogue*. The aim is to facilitate discussion among the various stakeholders in the forestry sector about anticipating and responding to predicted climate change and to promote actions that reduce the vulnerability of land use systems to potential climate change impacts.

Climate change sensitivities, Himachal Pradesh, northern India.

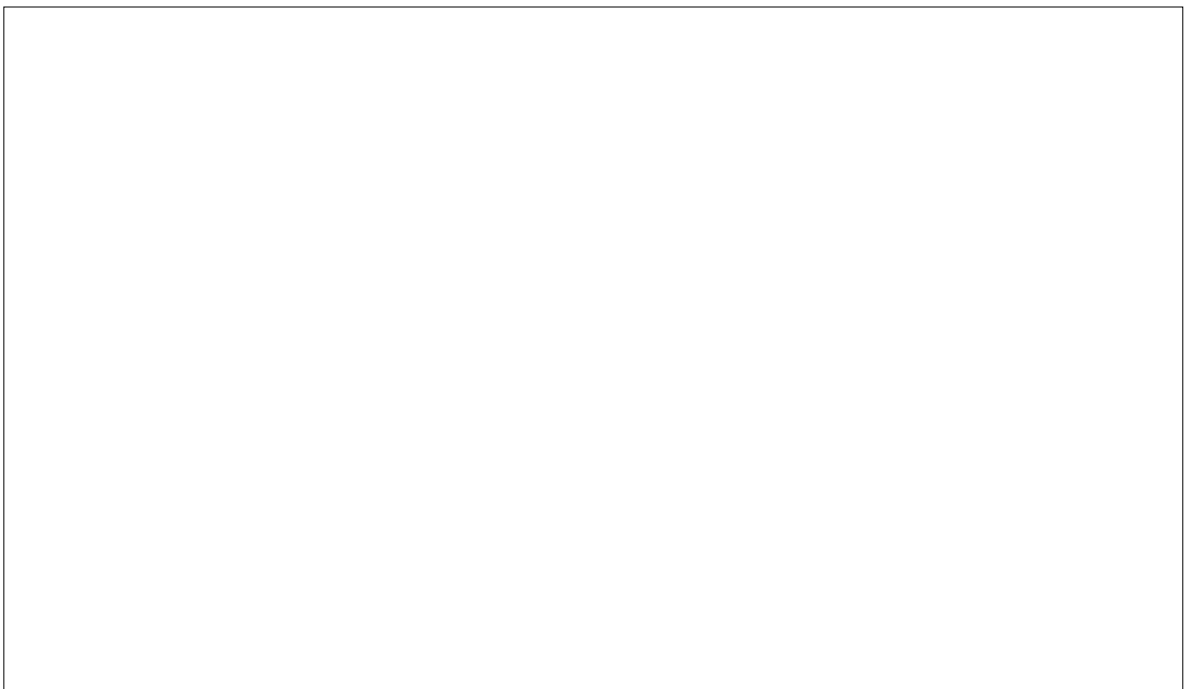
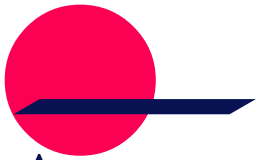


Photo: Heli Pohjolainen



Acidic and Depositions Effects

Acidification problems in developing countries are expected to become more prevalent in the coming decades as anthropogenic sulphur emissions increase substantially. The initial phases of the *Atmospheric Environment Issues in Developing Countries Programme* have endeavoured to produce the information required for informed policy discussions and long-term planning regarding emission abatement strategies for acidic deposition. The project is a collaborative effort between Stockholm University, the Swedish Meteorological and Hydrological Institute (SMHI), and SEI in consultation with groups in developing countries.

Acidification Problems in South Asia

The project draws on work done by the Meteorological Department of Stockholm University (MISU) in measuring acid precipitation in Asia as part of the Composition of Acidity of Asian Precipitation (CAAP) activity of the International Global Atmospheric Chemistry Activity (IGAC), which in turn is part of the International Geosphere and Biosphere Programme (IGBP). Seven sampling stations in India, Thailand and Nepal have been set up to measure acid precipitation rates and calibrate chemical analyses. Project collaborators train local people to conduct the day-to-day measurements and operations of the stations. In

general, the data indicate a growing influence of pollution sources in the region. In addition, workshops have been arranged to facilitate the exchange of data and methodology development in Asian countries. This has allowed many developing country scientists to become more involved in international discussions on the acidification problem.

Modelling Acidic Depositions in Developing Countries

Acidic deposition levels are estimated using atmospheric transfer models. SMHI in collaboration with MISU has used the MATCH (Meso-Scale Atmospheric Transport and Chemistry) model to investigate the atmospheric transport of sulphur emissions supplied by the Global Emission Inventory Activity (GEIA). From this work, deposition maps for sulphur have been produced on a 1x1 degree grid for Africa, Asia and South and Central America.

Assessing Ecosystem Sensitivity to Acidic Deposition

The distribution of acidic deposition does not suffice to assess the risk of ecosystem damage as different sites have different sensitivity. For this reason SEI has produced a preliminary assessment of the sensitivity of terrestrial ecosystems on a global

scale. This map has been produced by linking digital datasets of soil type, vegetation cover and climate within a Global Information System (GIS) on how the different layers influence buffering of the acidic depositions. By assigning critical loads that represent damage thresholds to the sensitivity classes, the deposition estimates can be compared to the sensitivity map to identify areas at risk from acidification related damage. The sensitivity map represents the first stage in a process to increase awareness of the potential for acidic deposition related damage in developing countries. As part of this process meetings have been held in Zimbabwe and Thailand where experts from twelve

countries were able to assess the initial results of the programme. In the autumn of 1996 another meeting was held in Costa Rica together with Latin American scientists. The methods used will then be adjusted to take into account the comments received. The next stage of the work is to use the information from the initial phase to discuss policy alternatives for abatement. Roundtable policy dialogues will be held to discuss the nature and extent of acidic deposition-related problems and to appraise potential national and regional policy and strategy alternatives. These dialogues will also discuss the transboundary nature of the problem as no country can hope to entirely solve its problems without regional co-operation.



Evaluation of NGO Participation in GEF

The Global Environment Facility (GEF) was set up as a pilot programme in 1991 to provide grants and concessional funding to developing countries for projects and programmes that protect the global environment and promote sustainable economic growth. An independent evaluation of GEF in 1994 recommended that country and community participation in the GEF programme needed to be improved and that mutually beneficial collaboration with NGOs should be established. Climate Network Europe, an NGO supported by SEI, joined together with other NGOs to evaluate whether climate-related GEF projects were participatory and responded to the needs of local communities. This evaluation project, funded by Sida, DANIDA (Danish International Development Agency) and the European Commission, forms a part of the Atmospheric Environment Issues in Developing Countries Programme due to its relevance to the

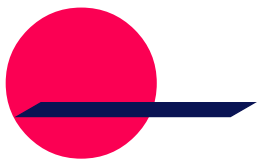
overall goal to enhance local capacity and engage developing nations in international initiatives.

The project selected eleven GEF projects in Africa, Asia, South America and Eastern Europe for a comparative analysis. Results indicated that bottom-up participation which engages stakeholders in the evolution of the project and a country-driven approach which allows institutions in the country to identify the project were important factors in successful implementation of GEF projects. As a result, the NGOs involved in the study have become part of a newly established network of NGOs working on the GEF. In the report *Getting the Right Mix: Participation in GEF Climate Change Projects*, the project team outlines a systemic framework for stakeholder participation and another publication *Letter to Nanig Oruga: A NGO Guide to GEF* provides guidelines for consulting NGOs and local communities.

A Model of Development Assistance

The *Atmospheric Environment Issues in Developing Countries Programme* has established a model of development assistance based on the goals of co-operation and long-term efforts. It has begun to fill an information gap in developing countries by disseminating relevant material and site- and issue-specific research. The programme works to produce a cyclical methodology of research: one that incorporates academics, communities, NGOs and governments in all stages of the research. The products of the research are policy tools which can be used to promote effective action

on pressing atmospheric issues. In addition, the *Programme* works to create a network of communication which facilitates technology transfer, information sharing and access to peer expertise and experience on relevant issues. The collaboration occurs not only between North and South, but among developing countries facing similar challenges. Step by step, the programme assists developing nations to undertake action on atmospheric environmental problems and to participate effectively in international initiatives and negotiations.



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The Stockholm Environment Institute (SEI) is an independent, international policy research institute specialising in environment and development issues. It works mainly at the regional and global policy levels on issues such as energy use, climate change, urban environments, biodiversity, clean technologies and management regimes for common property resources.

The Institute, with a base in Stockholm, has a network structure with permanent and associated staff world-wide (including developing countries) and centres in Boston (USA), York (UK) and Tallinn (Estonia). The collaborative network consists of scientists, research institutes, project advisors and field staff in 15-20 countries.

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