

Contributing Paper

Climate Change and Dams: An Analysis of the Linkages Between the UNFCCC Legal Regime and Dams

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Dams and global change

For further information see <http://www.dams.org/>

This is one of 126 contributing papers to the **World Commission on Dams**. It reflects solely the views of its authors. The views, conclusions, and recommendations are not intended to represent the views of the Commission. The views of the Commission are laid out in the Commission's final report "Dams and Development: A New Framework for Decision-Making".



CLIMATE CHANGE AND DAMS

An Analysis of the linkages
between the UNFCCC Legal Regime and Dams

in cooperation with

The World Commission on Dams

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EXECUTIVE SUMMARY

1. Focus of the Study

This study looks at the linkages between dams and climate change. It analyses the climate change legal regime as represented by the UN Framework Convention on Climate Change and its Kyoto Protocol and attempts to highlight the relevance of its provisions, decisions and processes to the planning, appraisal, design, construction, operation and decommissioning of dams. Secondly, it provides some ideas into how the conclusions of the World Commission on Dams on the linkages between dams and climate change can be placed on the agenda of the Climate Change Convention process and taken on board in the deliberations.

The study concludes that a multifaceted relationship exists between dams and climate change which will need to be explored and elaborated in the coming years, and that this relationship has not been appreciated and taken on board in the UNFCCC process. It recommends therefore that the World Commission on Dams must develop a strategy of engagement with the UNFCCC process in order to bring this relationship to the attention of the UNFCCC decision-making organs. That strategy must, of necessity, be long term in nature if it is to influence the UNFCCC process in any significant way.

2. How dams and climate change relate

Remarkably little attention has been given to the relationship between dams and climate change. Indeed it is only in recent months that material has begun to come on stream on this issue, and much of it as a result of the activities of the World Commission on Dams in the course of its thematic reviews on Dams and Global Change. A workshop held in Hydro-Quebec, Montreal between 24 and 25th February 2000 under the aegis of the World Commission on Dams began the process of a serious public discussion on the relationship between dams and greenhouse gases. Consequently, knowledge on this relationship is still very limited and few firm conclusions can be drawn.

Nevertheless the few studies which have been conducted indicate relationships in a number of areas.

First, studies indicate that hydroelectric power reservoirs can emit substantial amounts of methane, which, as a greenhouse gas, is 24 times as potent as carbon dioxide. Methane is emitted from reservoirs that are stratified and where the bottom layers are anoxic, leading to degradation of biomass through anaerobic processes. Where the water is well oxygenated, degradation of biomass generates carbon dioxide, not methane. Reservoirs that risk being potent emitters of methane, therefore, are those in warm latitudes, where vegetation was cleared before flooding, and which are extensive and stratified with anoxic layers.¹

But, second, dams can, on the other hand, serve a positive role in energy policies in the context of carbon dioxide reduction programmes, as hydroelectric power offsets thermal generation. Hydroelectric power has the potential therefore to reduce the GHG emissions of the electricity sector.

Whereas hydroelectric power projects do produce some GHG from decay and from cement and steel manufacture, fossil fuel fired equivalents typically, but not always,² generate much more, although statistical information is still sketchy. This difference becomes even more marked if the development of large shallow forested reservoirs, which tend to generate the most methane, are avoided. Statistics show that GHG resulting from the manufacture of the dams cement and steel, plus the energy used in the construction amount to less than 10% of the annual carbon dioxide emissions of the fossil fuel equivalent. The largest proportion of GHG emissions from a dam is caused by the decay of flooded biomass.

¹ “Thematic Reviews: Environmental Issues” – II.2 Dams and Climate Change, World Commission on Dams, 1999.

² “Thematic Review II.2: Dams and Global Change – Summary of Private Sector Group, World Commission on Dams, 7th March 2000

Additionally, methane as well as carbon dioxide emissions tend to decline during the lifetime of a dam. But even including methane emissions total GHG per KWh generated from hydropower is still at least half that from the least polluting thermal alternatives. Thus, from the perspective of global warming mitigation, dams are the most attractive alternative to fossil fuel based energy sources.

A third area of inter-linkage is the potential of dams to offset changes in hydrological patterns, be it as storage reservoirs in regions of decreased precipitation or as flood control devices in regions of increased precipitation. Since climate change will have varying impacts in different climatic regions some areas will have to contend with decreased or more erratic rainfall while others will have to contend with increased and more intense rainfall patterns. In either case dams could serve as an adaptation as well as a mitigation strategy by the affected communities.

Fourth, the frequency and magnitude of extreme climatic events associated with global climate change has introduced a new element of risk in the planning and design of dams. The nature of hydrologic predictions is that there is an element of risk in determining the design of dams. For example, the objectives of flood control infrastructure is often couched in hydrologic terms, such as, providing protection against the 100 year flood which has a particular magnitude. Good quality data are essential to an accurate design, but the uncertainties arising from climate change make most data unreliable. This applies also to the assessment of reservoir sedimentation and other morphological factors, which can significantly influence the design life of dams, and therefore the long term sustainability of flood attenuation dams.³

Further, dam planning and operation might also be affected by the uncertainties linked to a changing climate. In areas of climate induced deforestation there may be increased soil erosion and sedimentation in reservoirs. Increased temperatures will increase evaporation from reservoirs, which could result in reduced water and energy benefits. In some regions

³ “Thematic Review II.2: Dams and Global Change – Summary of Private Sector Group, World Commission on Dams, 7th March 2000, p.2

increased precipitation infers increased energy benefits if the storage capacity exists and if annual distribution of rainfall is favourable. Otherwise increased storm events may mean higher flood flows affecting downstream populations and with potential consequences for dam safety. In some areas decreased precipitation may reduce energy benefits or provide less water for irrigation and other uses, increasing competition for a dwindling resource. Under any of these scenarios past analysis of hydrological flow patterns is not sufficient to guarantee predicted benefits over the long lifespan of some dams.⁴

Consequently, if dams are to live up to expectations in the face of a changing climate there will be need for robust hydrologic data coupled with a rigorous risk assessment of how climate change might affect run-off in future. It is possible that some projects may not generate their predicted benefits as a consequence of rainfall variations or other climatic changes. There might be need therefore for improved forecasting and monitoring technologies and techniques, variations in the design and operating rules and more integrated catchment planning and management, taking into account also the role of other economic factors, such as the growth in water and/or power demand, general national economic and population growth, and so on, in the performance of dams.

Thus, although the information is still patchy, the emerging consensus is that dams and climate change relate in a multi-faceted and complex fashion:

- (i) dam reservoirs do, through emission of methane, contribute to greenhouse gases, albeit to a small, as yet undefined, degree;
- (ii) conversely, hydroelectric power dams can contribute to climate change mitigation by providing a viable alternative source of energy to fossil fuel based sources;
- (iii) dams can constitute a form of adaptation technology in many ways, for instance, dams for irrigation can be used to promote food security for vulnerable groups,

⁴ “Thematic Reviews: Environmental Issues” – II.2 Dams and Climate Change, World Commission on Dams, 1999

- and flood protection dams can help protect floodplains and low lying areas from the effects of extreme weather; and
- (iv) The hydrological uncertainties that have come in the wake of climate change are causing a revision of the knowledge and practice relating to dams design, construction and management practice.

3. The Implications of the dams/climate change interface for the UNFCCC processes

The clear relationship between dams and climate change has a number of implications for the UNFCCC process.

The UNFCCC and its Kyoto Protocol revolves around a number of issues as follows:

- (i) the imperative to promote sustainable development of all countries, in particular developing countries
- (ii) the need to improve the information base regarding climate change and its implications
- (iii) the potential of technology transfer as a means of adapting to climate change and mitigating its consequences
- (iv) The necessity to build the capacity of developing countries in order to enable them meet their obligations under the Convention.

3.1. Sustainable development

The UNFCCC and its Kyoto Protocol are emphatic that the challenges presented by climate change must not compromise the sustainable development of countries, in particular development countries. The clear implication is that countries must continue to pursue sustainable development. However, in their choice of strategies they must be conscious of the need not to exacerbate global warming.

The UNFCCC therefore requires that, as far as possible, countries adopt non-fossil fuel based sources of energy, preferably renewable sources. This means that hydropower, as the one renewable source, except nuclear, with proven large-scale generation potential,

would be the energy of choice in those countries with unexploited potential. At the same time, however, countries would be required to opt for hydropower only if an environmental impact assessment demonstrates that other externalities arising from dams can be mitigated adequately.

The implementation of the Climate Change Convention and the Kyoto Protocol therefore might lead to a significant increase in the development of dams, particularly in developing countries.

3.2 Improving the information base

There is disconcerting dearth of information on the implications of climate change for the development and management of dams, a situation made more troublesome by the uncertainties surrounding the kinds of changes which might result from global warming. In an era of changing weather patterns dams may prove inadequate or even inappropriate.

The UNFCCC and its Kyoto Protocol impose on countries wide ranging obligations to generate and analyze data on climate change and its implications. The obligations are in the areas of:

- (i) Research and systematic observation; Opportunity should be taken to carry out research into the implications of climate change for the development and management of dams.
- (ii) National Communications; those countries with reporting obligations (Annex I countries) and even those without mandatory reporting obligations (non- Annex I countries) make reports on the whole range of national policies and measures which they are implementing to deal with the challenges presented by climate change. These could include information on population profiles as well as energy use and projections of energy demand and so on. This kind of information is vital to a country in making projection on its energy needs, and whether and how soon it may need a hydropower project. Therefore the requirement to collect and

- analyze it provides an opportunity to factor in the policies on dams to meet energy needs.
- (iii) The Convention and the Protocol both impose obligations in the area of technology development for adaptation as well as for mitigation. Dams can be used in both adaptation and mitigation, and should be examined as an option.
 - (iv) The Convention and Protocol also impose obligations on countries to promote capacity building through training, a technology transfer. One of the areas which could be given priority by countries is capacity building in the development and management of dams.

4. How to link dams and climate change.

The UNFCCC regime does not make provision in any of its processes for the relationship between dams and climate change. The issue is simply not dealt with the consequence that decisions are being made, and actions taken, in respect of climate change management, without taking into account the implications of these decisions and actions for dams, as well as the possible role of dams in the management of climate change.

The World Commission on Dams must take the strategic decision to commence a long term and continuous engagement with the UNFCCC process in order to bring about a change in this situation. There are four entry points for the World Commission on dams into the UNFCCC process: observer status, the IPCC, national communications and the clean development Mechanism.

4.1. Observer Status

The first entry point is to seek Observer Status through accreditation. Accreditation would enable the World Commission on Dams to be able to participate at sessions of the various bodies of the Climate Change Convention. These are the Subsidiary Body on Scientific and Technological Advice (SBSTA), the Subsidiary Body on Implementation (SBI), the Conference of the Parties of the Convention (COP) and the Conference of the parties acting as meeting of the Parties to the Protocol (COP/MOP). Participation

includes attendance and making interventions and submissions at the meetings on pertinent issues.

Accreditation also enables an organization to apply to hold a special event or an exhibition at the various meetings of the Convention bodies. Accredited bodies may also get an invitation to the various workshops and consultation which the Secretariat often organizes in order to promote informal discussions and explore positions.

Therefore even if the World Commission on Dams chooses not to seek accreditation in its own name, attendance at COP 6 at the Hague in November 2000 under the name of one of its sponsoring organizations would still be useful.

4.2 The Intergovernmental Panel on Climate Change (IPCC)

The World Commission on Dams should, secondly seek to introduce the issue of the relationship between dams and climate change through the reports of the Intergovernmental Panel on Climate Change (IPCC).

Since its inception the IPCC has produced assessment reports twice: in 1990 and in 1995. It is currently working on the third assessment report, which is due to be published in early to mid 2001. Significantly, these reports, including the latest IPCC report, on Land Use, Land Use Change and Forestry, do not deal at all with the link between climate change and dams. Similarly, it would appear that the draft IPCC third Assessment report which is currently out for review and will be published in 2001, also does not deal with emissions from dams.

Additionally the IPCC is often requested to provide scientific and technical advice to the Conference of the Parties and its subsidiary bodies, the SBSTA and the SBI. Consequently IPCC has prepared technical papers and special reports on a diverse range of issues at the request of the COP and its subsidiary bodies. So far none of these

technical papers and special reports have dealt with the link between climate change and dams.

The IPCC could provide an entry point for the World Commission on Dams into the Climate Change Convention process. Its focus on. Scientific assessment, adaptation and mitigation measures all have ramifications for the link between climate change and dams. Further the IPCC has a link with the organs of the UNFCCC through the SBSTA.

The specific contribution, which the IPCC could make to this process, is to include in its reports and/or technical papers a discussion of the link between climate change and dams. IPCC Reports and technical papers are considered to be authoritative and are standard reference texts for policy makers, scientists and others interested in climate change issues. A discussion of the link between climate change and dams in IPCC reports and papers would therefore contribute greatly to sensitizing the international community to this issue. The fact therefore that so far there has been no discussion of this issue in IPCC documents calls for urgent action from the World Commission of dams to recover lost ground.

In seeking to use IPCC as an entry point it is important to bear in mind certain unique features of the IPCC process which can limit its potential as a quick entry point into the discussion.

The IPCC's mandate is to assess scientific information, which is available in. published literature. The IPCC does not generate primary information. Similarly, IPCC's mandate when producing special reports and technical papers is limited to improving material and assessments contained in its reports. Its procedures require that the special reports and technical papers be based on material already present in the IPCC reports.

These features restrict the extent t which the IPCC process can be used to introduce a discussion on the link between climate change and dams. To date there is hardly any peer reviewed published material on the link between climate change and dams. The

discussion is just beginning to attract the attention of the scientific community. The approach of the WCD would therefore need to be to ensure that peer reviewed, published literature on the issue becomes available as a first step towards introducing it into the IPCC process. The sponsoring of workshops for researchers and of other studies on this issue is an important step in this direction.

A second feature of the IPCC process is that the IPCC cannot, of its own motion, commission a study into an issue, however pertinent. The IPCC is an intergovernmental process and acts on requests from the parties through the COP and the subsidiary bodies. The link between dams and climate change conceivably could be subject of an IPCC special report. In case the WCD were minded to initiate a request to the IPCC to do a special report on this issue then the WCD would have to interest a State Party to the Convention to persuade other parties that a request should be made to the IPCC to carry out a study on this issue and make a special report.

A third way in which the IPCC could include this issue in its reports would be if, following publication of literature on the subject, an expert on the issue from the WCD could participate in the production of a future IPCC report. Participation is open to a wide range of persons. One could participate as a lead author, a contributing author, a review editor or an expert reviewer. All of these offer opportunities to introduce into the report published literature on this issue.

4.3 National Communications

National Communications give details of the actions parties are taking to manage the effects of climate change, and provide the means through which Parties communicate a national inventory of emissions and removals of greenhouse gases.

National Communications are prepared according to guidelines issued by the COP. The guidelines deal among other things with the issue of national inventories, basing themselves on IPCC guidelines on this subject.

In estimating and reporting on emissions and removals parties may use different methods according to their national circumstances. However the IPCC guidelines offer a default methodology which includes default emission factors and in some cases default activity data. At present these default emissions factors and activity data do not include emissions arising from dams. Although there is ongoing work within the IPCC on emissions factors, this is geared towards improving the emission factors, which are provided for, and not towards introducing totally new ones, which is what introduction of methane emissions from dams would be. This suggests that countries are not monitoring for emissions from dams as they most likely do not consider this to be a factor.

Therefore, although parties are free to report on emissions from dams no party has done so in the absence of default emission factors in the IPCC guidelines.

However, the WCD may wish to press for a review of the IPCC default emission factors to take into account emissions from dams. Such revision is not planned soon but whenever it is undertaken, will offer an opportunity to cover the issue of the link between dams and climate change, which has so far been ignored.

4.4 The Clean development Mechanism

The Clean Development Mechanism is seen as central to the future of the Kyoto Protocol.

CDM projects will involve a life cycle analysis of environmental impact, including contribution to emissions avoidance. One of the requirements for CDM projects is to develop baselines from which assessments of emissions reductions can be measured. In respect of a hydro-power project, methane emissions from the dam would be a baseline issue to be taken into account in calculating the emissions reductions or avoidance.

The strategic decision, which the World Commission on Dams must make, is to facilitate the generation of information on this issue so that emissions from dams can be factored

into the calculations with confidence. In the absence of reliable information on this issue, whatever omissions occur would not be taken into account, leading to leakage.

1 Introduction

In recent years there has been intense debate on the costs and benefits of dams, in particular, large dams. This debate led, in April 1997, to a joint IUCN-World Bank Workshop which was held in Gland, Switzerland. The Workshop brought together leading experts and representatives of diverse interest groups on the issue of dams, and recommended the establishment of a commission on dams.

The World Commission on Dams was subsequently set up, with a Secretariat in Cape Town, South Africa. It has the following goals:

- To review the development effectiveness of dams and assess alternatives for water resources and energy development; and
- To develop internationally acceptable criteria, guidelines and standards for the planning, design, appraisal, construction, operation, monitoring and decommissioning of dams.

According to its publication, Thematic Reviews⁵ the Commission's work programme is a mixture of case studies and thematic reviews. The case studies will focus on up to ten basins, while the thematic reviews will address cross cutting issues of importance in assessing both the historical experience with dams, and in highlighting the emerging trends and the future context for water resources management involving consideration of both dam and non-dam options. The five themes selected to provide the framework for the key questions and options are: social issues, environmental issues, economic issues, options assessments and institutional processes. Among the environmental issues for study is the linkages between the United Nations Framework Convention on Climate Change and its Kyoto Protocol, and large dams.

⁵ Thematic Reviews, World Commission on Dams, 1999

In conjunction with the World Commission on Dams, the United Nations Environment Programme, through the Division of Environmental Conventions, commissioned a study on the linkages between the UNFCCC regime and the development and management of large dams.

The Terms of Reference for the Study are to:

- (1) identify and briefly describe areas of the UNFCCC and the Kyoto Protocol's legal texts, working documents, technical studies, criteria and guidelines, or Conference of the Parties guidance that may be of relevance to the planning, appraisal, design, construction, operation or decommissioning of large dams and the consideration of their impacts.
- (2) provide copies of the relevant documents to UNEP for study and subsequent submission to WCD Secretariat.
- (3) describe how the legal, policy and institutional frameworks, as well as decision-making processes of Convention signatories may be required to take account of the provisions of the UNFCCC and its Kyoto Protocol during the planning, appraisal, design, construction, construction, operation and decommissioning of large dams.
- (4) identify the mechanisms by which conclusions of the World Commission on Dams where relevant to UNFCCC and its Kyoto Protocol may be formally considered by the Conference of the Parties of the UNFCCC or Meeting of the Parties to the Kyoto Protocol through discussions with the Secretariat of the UNFCCC and with UNEP once the final report of the World Commission on Dams is available in June 2000.
- (5) consult with the Secretariat of the UNFCCC in Bonn during this process and ensure that he/she is fully aware of the manner in which the UNFCCC provisions are applied in signatory countries.
- (6) prepare a report that looks at the UNFCCC and its Kyoto Protocol through the prism of dams and that constantly relates the provisions of those accords to the planning or operation of dams and/or their alternatives.

These Terms of Reference raise the following main issues:

- (1) in what way are the climate change mitigation and adaptation measures under the UNFCCC and its Kyoto Protocol relevant to large dams?
- (2) in what ways are the planning, appraisal, design, construction, operation and decommissioning of dams relevant to the UNFCCC and its Kyoto Protocol processes and activities? and
- (3) how can the legal and institutional regimes relating to the two concerns, i.e. climate change and large dams, be linked?

2 The Large Dams Debate

The International Commission on Large Dams defines “large dams” as dams with a height of 15 metres or more. If dams between 10 and 15 metres high have a crest length over 500 metres, a spillway discharge over 2000 cubic metres or a reservoir volume of more than 1 million cubic metres, they are also classified as large dams. Using this classification worldwide there are about 40,000 such large dams and an estimated 800,000 small dams. Further, it is estimated that about 1,700 large dams are under construction world wide today.⁶

The development of large dams involves a trade-off between benefits and losses of a character and scale which does not arise from the small dams. Examples of losses include the loss of a major waterfall, the loss of bio-diversity in the area inundated with the reservoir, the disappearance of migratory fish, methane emissions from irrigated paddy fields, and so on. The perceived benefits of dams are the facilitation of irrigation, power generation, urban and industrial water supply, flood management and control, navigation and recreation.

2.1. Irrigation

⁶ Oud, E. and Muir, T., “Engineering and Economic Aspects of Planning, Design, Construction and Operation of Large dam Projects”, in Large Dams: Learning from the Past, Looking at the Future: Part II: Overview Papers. IUCN/World bank, 1997, p.19

Irrigation is an important component of agricultural production and rural systems, and globally accounts for 70% of water diverted from natural systems.⁷ The rapid development and intensification of agricultural production over the last several decades has heightened dependence on irrigation. Total global food production statistics do not reveal a significant shortage. But due to an uneven distribution, there is a growing food gap in several poor countries, and malnutrition remains a serious problem. Projections indicate that by 2010, 680 million people, or 10% of the world's population, will be suffering from chronic malnutrition. Weather and climate uncertainties arising from climate change is likely to exacerbate the problem as food production and supply become ever more unreliable.

Efforts to provide more food through irrigation systems have had to contend with increasing costs of new development, low economic and financial returns for staple crops, low efficiency in many publicly run irrigation systems, high levels of financial subsidy and low levels of maintenance expenditure, questions of sustainability (both of the land and water resources as well as the physical systems themselves), and questions over the distribution of benefits and socio-economic inequities. These shortcomings have led increasingly to the need to introduce high yielding varieties, to intensify fertilizer and pesticide use and for more efficiency in water use.

But, overall predictions indicate that the anticipated rise in food demand in the coming decades will intensify reliance on irrigation for food production as more marginal lands are converted to agricultural use. This will necessitate the construction of more dams, particularly in poor countries with rapidly growing populations, as well a redesign of dams and an improvement in dam operation with a view to achieving efficient and cost-effective water use. Consequently, a trend towards greater reliance on dams might well be matched by a trend in the opposite direction, i.e. towards the phasing out of those kinds of dams seen as being inefficient water users.

⁷ *ibid.* at fn. 1 “Thematic Review: Options Assessment: IV.2 Assessment of Irrigation Options.

2.2 Power generation

There is a strong correlation between energy use and economic development.⁸ The average per capita consumption of electricity is 7,55 kWh/yr in OECD countries as compared to 482 kWh/yr in Asia (excluding China, which is 822 kWh/yr), 49 kWh/yr in Africa, and 1,402 kWh/yr in Latin America. Stark as they are, these figures still do not give a sense of the wide variations in the number of people in a particular society with access to electricity, and actual use per person, household or industry, variations which underscore the wide “development gap” between the rich and poor countries.

Conventional electricity supply options include thermal generation (e.g. by coal, oil, gas and biomass), nuclear generation, and hydropower. Non-conventional sources include wind, solar and wastes. Thermal sources account for about 62% of installed electricity generation, hydraulic sources 20%, nuclear 17% and all other sources 1%.

Hydropower, which is based on dam projects, is the most significant of all renewable sources of energy. Currently, it accounts for about 20% of the world’s electricity supply, and for at least 50% of national electricity production in 66 countries. Current hydropower projects stand at approximately 400 projects worldwide with more than 130,000 MW of new electricity capacity.

Hydropower enjoys enormous advantage over other renewables. The dispersed nature of wind and solar sources of energy present enormous technological difficulties in large scale exploitation which limit their potential, consigning them to no more than supplementary sources of energy. The other renewable, nuclear energy, could provide an alternative to hydropower as knowledge and capacity exists for large-scale production. But nuclear energy suffers from a lack of public acceptance due to perceived safety risks which it is unlikely to overcome in the near future. Consequently, the contribution of non-hydro sources (with the exception, in a small number of industrialized countries, of

⁸ *ibid.* at fn. 1 “Thematic Review: Options Assessment: IV.1 Electricity Supply and Demand Management Options

nuclear energy) as a proportion of total electricity generation has been insignificant globally, and in almost all countries, and looks set to remain so for the foreseeable future.

The impact on energy demand of increasing populations is enormous. World energy consumption is expected to double by 2020. In many industrialized countries demand side management approaches are being implemented with a view to limiting the need for the development of new capacity. But these measures are of a relatively minor significance in the many poor countries which do not have sufficient energy to meet their development aspirations, and in which the bulk of the new capacity will be developed in future.

Consequently, while in many industrialized countries, for instance the United States, the development of large dams may have peaked, and there even be a limited trend towards decommissioning of large dams, in many poor countries hydropower, and with it dams, looks set to play an even more prominent role in the coming decades as the demand for energy intensifies.

2.3 Water supply

In terms of overall volume of water stored, municipal and industrial water supply forms a relatively minor part of multi-purpose dam development projects.⁹ But the high priority given to water supply and the high value of municipal and industrial water can form a significant element of a project's benefit stream. In addition to the provision of bulk water, other related functions of dams include augmentation of low flows and improvements in river water quality in areas of high pollution or salinity.

The challenge for the provision of water supplies in developing countries in the future is significant. More than 1 billion people do not have access to an adequate supply of water and of those that do, access is often limited in time or quality. Significant population growth compounded by urban migration will intensify the situation. Superimposed on the

⁹ *ibid.* at fn. 1 “Thematic Review: Options Assessment: IV.3 Assessment of Water Supply Options

population increase is the higher rate of per capita consumption experienced as incomes increase. It is therefore anticipated that the provision of municipal and industrial water will remain a major function of dams in the future. However, in many cases water supply dams will be multi-functional.

2.4 Flood control

Each year flood events result in significant loss of property, life and livelihood in many countries. But on a small scale floods can be beneficial in providing groundwater recharge, silt deposits, floodplain fisheries and so on. Floodplains have played and continue to play an important role in the economies of many countries.

Physical flood protection infrastructure in the form of embankments and storage reservoirs cannot always provide full protection, and their effectiveness change with changes in river morphology and sedimentation. Additional management effort is required involving non-structural interventions such as flood forecasting, land use zoning, flood proofing, disaster preparedness, flood insurance and so on, either in parallel or independently from structural forms of protection.

As developing countries urbanize and industrialize, the financial consequences of flood damage will increase, and the demand for flood protection will intensify, leading to the need to construct more dams. At the same time such investment in flood protection often encourages settlements in floodplains, a rise in property values and pressure to provide more flood protection. Consequently it is likely that there will be a significant increase in flood physical protection structures, particularly dams, in the coming decades, to counteract the effects of climate change as well as to meet the needs of growing urbanization.

2.5 Navigation and recreation

In many instances dams improve the potential for navigation and water transport on many watercourses, and for recreational activities, such as water sports. These have often been

seen as an integral part of multipurpose dams, and continue to provide further justification for large dams.

2.6 Dams and Externalities

It is now widely accepted that dams have many adverse impacts including environmental, social and economic impacts. These include involuntary resettlement, introduction of new diseases, increased sedimentation, loss of fish, loss of biological diversity, a decline in soil fertility from water logging and so on.

Externalities have not always been taken into account in the design and implementation of dams' projects. It is now recognized however, that they need to be mitigated through the development and implementation of criteria, guidelines and standards for the planning, design, appraisal, construction, operation, monitoring and decommissioning of dams.

The phenomenon of climate change has introduced a dimension into the dams' debate that was until recently entirely missing, that is, the linkage between dams and climate change.

3 The Phenomenon of Climate Change

3.1 Global warming and its impacts

Carbon dioxide is produced when fossil fuels as well as vegetation are burned. Methane and nitrous oxide, the other green house gases, are emitted from agricultural activities and changes in land use. By absorbing infrared radiation, these gases control the flow of natural energy through the climate system. Models predict that, due to rising levels of these greenhouse gases, the global temperatures is rising, although there are many uncertainties about the scale of the change.¹⁰

¹⁰ "An Introduction to Climate Change," Climate Change Information Sheet 1, UNFCCC, 1999

Emissions of GHG started to rise dramatically in the 1800s due to the Industrial Revolution and changes in land use involving large scale clearing of land to make way for agricultural production. Many GHG-emitting activities are now essential to the global economy and a fundamental part of modern life. Oil, natural gas, and coal furnish most of the energy used to produce electricity, run automobiles, heat houses and power factories, particularly in industrialized countries, and account for up to 62% of total supply.

Climate change is likely to have significant impact on the global environment. A rise in the mean sea level could cause flooding of low-lying areas. Climatic zones (and thus ecosystems and agricultural zones) could shift towards the poles. Forests, deserts, rangelands and other unmanaged ecosystems could face new climatic stresses. Some regions could experience food shortages and hunger. Water resources could be affected as precipitation and evaporation patterns change around the world. Physical infrastructure could be damaged, particularly by sea level rise and by extreme weather events. In sum, economic activities, human settlements, human health could experience many direct and indirect effects, with the poor being the most vulnerable.¹¹

Tackling the effects of climate change will require a good understanding of socio-economic and natural systems, their sensitivity to climate change, and their inherent ability to adapt. Reducing uncertainties about climate change, its impacts, and the costs of various response options is vital. At the same time it is necessary to balance concerns about risks and damage with concerns about economic development. The prudent response to climate change, therefore, is to adopt a portfolio of actions aimed at controlling emissions, adapting to impacts, and encouraging scientific, technological and socio-economic research and to other appropriate response options.¹²

If carbon dioxide concentrations are to stabilize – and the trend towards global warming to be halted - in the face of an expanding world economy and growing populations,

¹¹ “Agriculture and Food Security,” Climate Change Information Sheet 10, UNFCCC, 1999

¹² *ibid.* at fn 6

fundamental improvements in energy efficiency and in other economic sectors will be necessary. The Climate Change Convention and its Kyoto Protocol are the most comprehensive effort to date by the international community to come to grips with the challenges presented by the climate change phenomenon.

3.2 The UN Framework Convention on Climate Change

As indicated, the UNFCCC was the international community's response to predictions of a gradual, but significant, warming of the earth's climate. Its origins are traceable to the work of the World Climate Programme since its establishment in 1979, the establishment by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) of a scientific group - the Inter-governmental Panel on Climate Change (IPCC) in 1988 and the Second World Climate Conference in 1990.¹³

The IPCC First Assessment Report was published in 1990. Together with the conclusions of the Second World Climate Conference, it identified causes and possible effects and strategies to limit and adapt to climate change. It also, in light of UN General Assembly resolutions, it identified possible elements for inclusion in a framework convention on climate change.¹⁴

Following a short but intense period of negotiations, the Framework Convention on Climate Change, was opened for signature at Rio de Janeiro during the UN Conference on Environment and Development in June 1992. In light of the uncertainty which dogged scientific evidence on climate change the Convention required the Conference of the Parties, at its first session, to review the adequacy of the commitments which Parties had undertaken and, if need be, make appropriate amendments.¹⁵

The first Conference of the Parties (COP) was held in Berlin, Germany in 1995 following the entry into force of the Convention on 21st March 1994. The review of the Parties

¹³ Jager, J. and Ferguson, H.L., Climate Change: Science, Impacts and Policy: Proceedings of the Second World Climate Conference, Cambridge University Press, WMO 1990, foreword.

¹⁴ *Ibid.*, Ministerial Declaration, para 3.

commitments led to the adoption of “the Berlin Mandate” which set in motion negotiations for a protocol to the Convention. The Kyoto Protocol was adopted in Kyoto, Japan at the third Conference of the Parties in December 1997. It is yet to enter into force, although current thinking is that it could do so by 2002. The provisions of the Convention have, in addition, been supplemented by decisions of the Conference of the Parties which are held annually. The most recent COP, being the fifth, was held in November 1999 in Bonn, Germany.

The UNFCCC legal regime has the following components:

- (i) it requires all countries to limit their emissions by the adoption of relevant policies and programmes;
- (ii) it requires all countries to gather and exchange relevant information;
- (iii) it requires all countries to develop strategies for adapting to climate change;
- (iv) it commits developed countries to transfer technology to developing countries; and
- (v) it commits developed countries to avail funds to enable developing countries build capacity for climate change mitigation and adaptation.

The significant addition arising out of the Kyoto Protocol is the commitment undertaken by industrialized countries to take measures aimed at reducing their GHG emissions by specified percentages. This commitment will only become effective after the Protocol enters into force following receipt of the necessary ratifications. The Convention itself however does not bind parties to take action to cut back on emissions of greenhouse gases.

3.3 Climate change and dams

No express linkage has been made between climate change and dams. Neither the Climate Change Convention and its Kyoto Protocol, nor the mandate of the World Commission on Dams makes reference to any inter-relationship between climate change and dams. Nevertheless, clear linkages do exist.

¹⁵ Article 4.2(d)

First, studies indicate that hydroelectric power reservoirs can emit substantial amounts of methane, which, as a greenhouse gas, is 24 times as potent as carbon dioxide. Methane is emitted from reservoirs that are stratified and where the bottom layers are anoxic, leading to degradation of biomass through anaerobic processes. Where the water is well oxygenated, degradation of biomass generates carbon dioxide, not methane. Reservoirs that risk being potent emitters of methane, therefore, are those in warm latitudes, where vegetation was cleared before flooding, and which are extensive and stratified with anoxic layers.¹⁶

But, second, dams can, on the other hand, serve a positive role in energy policies in the context of carbon dioxide reduction programmes, as hydroelectric power offsets thermal generation. Hydroelectric power has the potential therefore to reduce the GHG emissions of the electricity sector.

Whereas hydroelectric power projects do produce some GHG from decay and from cement and steel manufacture, fossil fuel fired equivalents typically, but not always,¹⁷ generate much more, although statistical information is still sketchy. This difference becomes even more marked if the development of large shallow forested reservoirs, which tend to generate the most methane, are avoided. Statistics show that GHG resulting from the manufacture of the dams cement and steel, plus the energy used in the construction amount to less than 10% of the annual carbon dioxide emissions of the fossil fuel equivalent. The largest proportion of GHG emissions from a dam is caused by the decay of flooded biomass.

Additionally, methane as well as carbon dioxide emissions tend to decline during the lifetime of a dam. But even including methane emissions total GHG per KWh generated from hydropower is still at least half that from the least polluting thermal alternatives.

¹⁶ “Thematic Reviews: Environmental Issues” – II.2 Dams and Climate Change, World Commission on Dams, 1999.

¹⁷ “Thematic Review II.2: Dams and Global Change – Summary of Private Sector Group, World Commission on Dams, 7th March 2000

Thus, from the perspective of global warming mitigation, dams are the most attractive alternative to fossil fuel based energy sources.

A third area of inter-linkage is the potential of dams to offset changes in hydrological patterns, be it as storage reservoirs in regions of decreased precipitation or as flood control devices in regions of increased precipitation. Since climate change will have varying impacts in different climatic regions some areas will have to contend with decreased or more erratic rainfall while others will have to contend with increased and more intense rainfall patterns. In either case dams could serve as an adaptation as well as a mitigation strategy by the affected communities.

Fourth, the frequency and magnitude of extreme climatic events associated with global climate change has introduced a new element of risk in the planning and design of dams. The nature of hydrologic predictions is that there is an element of risk in determining the design of dams. For example, the objectives of flood control infrastructure is often couched in hydrologic terms, such as, providing protection against the 100 year flood which has a particular magnitude. Good quality data are essential to an accurate design, but the uncertainties arising from climate change make most data unreliable. This applies also to the assessment of reservoir sedimentation and other morphological factors, which can significantly influence the design life of dams, and therefore the long term sustainability of flood attenuation dams.¹⁸

Further, dam planning and operation might also be affected by the uncertainties linked to a changing climate. In areas of climate induced deforestation there may be increased soil erosion and sedimentation in reservoirs. Increased temperatures will increase evaporation from reservoirs, which could result in reduced water and energy benefits. In some regions increased precipitation infers increased energy benefits if the storage capacity exists and if annual distribution of rainfall is favourable. Otherwise increased storm events may mean higher flood flows affecting downstream populations and with potential

¹⁸ “Thematic Review II.2: Dams and Global Change – Summary of Private Sector Group, World Commission on Dams, 7th March 2000, p.2

consequences for dam safety. In some areas decreased precipitation may reduce energy benefits or provide less water for irrigation and other uses, increasing competition for a dwindling resource. Under any of these scenarios past analysis of hydrological flow patterns is not sufficient to guarantee predicted benefits over the long lifespan of some dams.¹⁹

Consequently, if dams are to live up to expectations in the face of a changing climate there will be need for robust hydrologic data coupled with a rigorous risk assessment of how climate change might affect run-off in future, a recommendation emerging from a recent Workshop on this issue.²⁰ It is possible that some projects may not generate their predicted benefits as a consequence of rainfall variations or other climatic changes. There might be need therefore for improved forecasting and monitoring technologies and techniques, variations in the design and operating rules and more integrated catchment planning and management, taking into account also the role of other economic factors, such as the growth in water and/or power demand, general national economic and population growth, and so on, in the performance of dams.

In conclusion, although the information is still patchy, the emerging consensus is that dams and climate change has linkages in a multi-faceted and complex fashion. A number of such linkages can be pinpointed, as follows:

- (v) dam reservoirs do, through emission of methane, contribute to greenhouse gases, albeit to a small, as yet undefined, degree;
- (vi) conversely, hydroelectric power dams can contribute to climate change mitigation by providing a viable alternative source of energy to fossil fuel based sources;
- (vii) dams can constitute a form of adaptation technology in many ways, for instance, dams for irrigation can be used to promote food security for vulnerable groups, and flood protection dams can help protect floodplains and low lying areas from the effects of extreme weather;

¹⁹ “Thematic Reviews: Environmental Issues” – II.2 Dams and Climate Change, World Commission on Dams, 1999

²⁰ Dam Reservoirs and Greenhouse Gases: Report on the Workshop held on February 24/5th, Hydro-Quebec, Montreal, WCD Thematic Reviews, II.2 dams and Global Change.

- (viii) the hydrological uncertainties that have come in the wake of climate change are causing a revision of the knowledge and practice relating to dams design, construction and management practice; and
- (ix) the interface between climate change and dams can constitute a focal point for international technology transfer and capacity building for developing countries, thereby contributing to sustainable development.

The rest of this paper analyses the linkage between dams and climate change which has been demonstrated above to exist in terms of its implications for:

- (i) the concept of sustainable development and its future implementation;
- (ii) research and information gathering, collation and dissemination;
- (iii) the future development of technology; and
- (iv) capacity building in developing countries;

PART II THE UNFCCC LEGAL REGIME AND DAMS: THE LINKAGES

Global warming as a result of the emission of greenhouse gases from energy generation and use goes to the very foundation of modern industrial society, and affects every aspect of modern life. Consequently, the mitigation of climate change as well as adaptation to climate change have fundamental implications for the concept of sustainable development and its future implementation, a fact well recognized by both the Climate Change Convention and its Kyoto Protocol.

1. Sustainable Development

Sustainable development is a relatively new concept in international discourse. Its modern articulation can be traced to the World Commission on Environment and Development and its 1987 report, Our Common Future. The report defined “sustainable development” as “development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.”

The concept quickly gained acceptance and was endorsed at the UN Conference on Environment and Development, 1992. It is seen as representing the middle way between the unbridled pursuit of economic growth, and pure environmentalism. It recognizes that the pursuit of economic development is legitimate, particularly for developing countries, but cautions that this must be undertaken within the bounds of the absorptive capacity of the world's natural resources.

The climate change legal regime is premised on the assumption that the management of climate change must be considered an integral component of the pursuit of sustainable development. States Parties – in particular developing countries - are not expected to forego their sustainable development aspirations in order to mitigate climate change. Rather, climate change management policies and activities must be integrated into the wider sustainable development policies and programmes which countries ordinarily pursue.

In the context of the linkage between dams and climate change, a country which sets out to meet its energy needs is expected to examine all options, fuel based sources as well as renewable sources such as hydroelectric power, based on the construction of dams. The country would consider the benefits of each option as well as its costs and implications, including for climate change. The generation of greenhouse gases by a particular energy source might tilt the balance against fossil fuel based options towards the construction of a dam for hydroelectric power. In this way the construction of a dam would enable the State Party to meet its energy needs while limiting its contribution to global warming.

Therefore, the fact that the climate change legal regime is premised on the imperative to continue the pursuit of sustainable development allows countries to opt for a development path that can achieve the twin objectives of stabilizing GHG emissions while at the same time optimizing the production and consumption of energy.

Renewables such wind and solar do not at present have the potential to provide energy on a large scale, while nuclear suffers from a public perception of being high risk. This

leaves hydroelectric power, a dams based source of energy, as the renewable energy source with the best potential to satisfy the objectives of the UNFCCC regime. It is capable of generating bulk supplies without being emitting greenhouse gases in the same order of magnitude as would a fossil fuel based energy source. The implication of this analysis is that the implementation of the climate change legal regime s likely to promote the greater development of dams.

The above interpretation of the climate change legal regime is borne out by an examination of the texts of the Convention and the Protocol, as well of the decisions of the Conference of the Parties.

The Preamble to the UNFCCC, together with Article 4.7, affirm that *the priority need* of developing countries is *to achieve sustained economic growth* and to eradicate poverty. The preamble recognizes that, in order for developing countries to achieve sustainable development, their energy consumption will need to grow even if they adopt energy efficient technologies. Article 2 states that stabilization of GHG concentrations should be achieved at a level *which enables economic development to proceed in a sustainable manner*. Article 3 states that, among the principles by which the Parties should be guided in their actions to achieve the objective of the Convention, is that “*Parties have a right to, and should, promote sustainable development.*” Article 4(2) commits Annex I Parties to adopt national policies and take corresponding measures on the mitigation of climate change, *taking into account the need to maintain strong and sustained economic growth.*

The Kyoto Protocol similarly bases its commitments of the overarching objective of the achievement of sustainable development. Article 2 states that each Annex I Party, in achieving its quantified emission limitation and reduction commitment, *in order to promote sustainable development*, shall implement and/or further elaborate wide ranging policies and measures. Article 12, which defines the Clean Development Mechanism, also states that, among its purposes, is “*to assist Parties not included in Annex I in achieving sustainable development ...*”

The UNFCCC provisions on sustainable development have been amplified by decisions of the Conference of the Parties.

At its first meeting in Berlin in 1995, the Conference of the Parties adopted the Berlin Mandate to review the adequacy of Parties commitments under the Convention.²¹ The Decision stipulated a number of principles by which the review would be guided, including the following:

- (i) the legitimate needs of developing countries for the achievement of sustained economic growth and the eradication of poverty, recognizing also that all parties have a right to, and should promote, sustainable development.
- (ii) the fact that the share of global emissions originating in developing countries will grow to meet their social and development needs.

Decision 11/CP.1²² which gave guidance to the financial mechanism (i.e. the Global Environment Facility) on the discharge of its responsibilities as the financial mechanism of the Convention stated that:

- (i) projects funded should be country driven and in conformity with, and supportive of, the national development priorities of each country;
- (ii) As far as possible activities should be:
 - (a) supportive of the national development priorities which contribute to a comprehensive national response to climate change;
 - (b) consistent with, and supportive of, the relevant provisions of internationally agreed programmes of action for sustainable development in line with the Rio Declaration and Agenda 21 and UNCED-related agreements.

In conclusion therefore, in the context of the climate change regime the development of dams for hydro electric power supply has the potential to be an environmental and a

²¹ Decision 1/CP.1, FCCC/CP/1995/7/Add.1

developmental benefit. However, as sustainable development is a holistic concept, it would still be necessary to take into consideration, and minimize, the adverse social, economic and environmental impacts ordinarily associated with of dams.²³ To fail to do so would itself undermine the concept of sustainable development.

2. Improving the Information Base

The linkage between dams and climate change is still a new concept, which has attracted only passing comment.²⁴ But, with the growing appreciation of the potential ramifications of climate change on society and on the environment, it has become imperative to unravel the full implications of climate change for, among other phenomena, dams, and of dams on climate change.

That there are serious implications cannot be gainsaid. To take one example, the design of dams is based on historic hydrologic data, and on the critical assumption that data based on past climatic patterns are a reliable guide to future climatic patterns. As global warming takes hold however, these patterns may change. Climatic variations may become more frequent, more severe and more unpredictable, with far reaching consequences for dams and other structures designed on the basis of historic hydrologic data.

Inappropriate design may lead to overtopping or breaches of dams should the magnitude of floods prove higher than previously estimated, and cause encroachment upon housing and other structures in areas subject to flooding. Conversely, drought conditions may intensify the effects of sedimentation and reduce the anticipated benefits of the dam, and its lifespan. These and other consequences can cause serious – even disastrous – damage to life and property.

²² FCCC/CP/1995/7/Add.1, “Initial Guidance on Policies, Programme Priorities and Eligibility Criteria to the Operating Entity or Entities of the Financial Mechanism.

²³ For details of these impacts and their management see Goodland, R “Environmental Sustainability in the Hydro Industry: Disaggregating the Debate” , in Large Dams: Learning from the Past, Looking at the Future: Part II: Overview Papers. IUCN/World Bank, 1997, p. 69

²⁴ See for instance, “Climate Change Dooms Dams” Earth Island Journal, Fall 1996, <http://www.earthisland.org/journal>.

These linkages and potential ramifications are at present largely speculative due to a dearth of robust and reliable data. This dearth affects not just dams and its relationship to climate change, but the entire phenomenon of climate change. The Climate Change Convention, the Kyoto Protocol and decisions of the Conference of the Parties have all recognized the need vigorously to conduct research, and to generate, collate and disseminate information on all aspects of the climate change phenomenon. This would form the basis for informed decision making and management of the phenomenon.

2.1 Research and systematic observation

The UNFCCC and its Kyoto Protocol make wide-ranging provisions for the generation of data, in particular through support for, and participation in, the programmes of the Global Climate Observing System.

The Global Climate Observing System was established (GCOS) in 1992 to ensure that observations and information needed to address climate related issues were obtained and made available to all potential users. It is co-sponsored by the WMO, the Intergovernmental Oceanographic Commission of UNESCO, UNEP and the International Council for Science.²⁵

The GCOS is intended to be a long-term system capable of providing the comprehensive observations required for:

- (i) monitoring the climate system
- (ii) detecting and attributing climate change
- (iii) assessing the impacts of climate variability and change, and
- (iv) supporting research toward improved understanding, modeling and prediction of the climate system.

²⁵ Global Climate Observing System, <http://www.wmo.ch/web/gcos/whatisgcos.htm>

The GCOS does not itself directly make observations nor generate data products. It stimulates, encourages, coordinates and otherwise facilitates the taking of needed observations by national or international organizations in support of their own requirements as well as of common goals. It provides an operational framework for integrating observational systems of participating countries and organizations into a comprehensive system focussed on the requirements of climate issues. The participating systems and organizations include:

- (i) World Weather Watch systems
- (ii) The Global Atmosphere Watch
- (iii) The Global Ocean Observing System
- (iv) The Global Terrestrial Observing System.

The GCOS's priorities are (i) seasonal to inter-annual climate prediction (ii) the earliest possible detection of climate trends and climate change due to human activities, and (iii) reduction of the major uncertainties in the long term climate prediction.

Article 4.1(g) of the Convention requires Parties to promote and cooperate in scientific, technological, technical, socio-economic and other research, systematic observation and development of data archives related to the climate system and *intended to further the understanding and to reduce or eliminate the remaining uncertainties regarding the causes, effects, magnitude and timing of climate change and the economic, and social consequences of various response strategies*. Further, Article 4.1(h) stipulates that parties shall promote and cooperate in the full, open and prompt exchange of relevant scientific, technological, technical, socio-economic and legal information related to the climate system and climate change, and to the economic and social consequences of various response strategies.

Article 5 of the Convention deals with research and systematic observation. It states that in carrying out their commitments under Article 4.1(g) the Parties shall:

- (a) support and further develop, as appropriate, international and inter-governmental programmes and networks or organizations aimed at defining, conducting, assessing and financing *research, data collection and systematic observation*, taking into account the need to minimize duplication of effort;
- (b) support international and inter-governmental efforts *to strengthen systematic observation and national scientific and technical research capacities and capabilities*, particularly in developing countries, and to promote access to and the exchange of data and analyses thereof obtained from areas beyond national jurisdiction.

The Kyoto Protocol strengthens these provisions. Article 2 states that Parties shall *research on and promote, develop and increasingly use new and renewable forms of energy, of carbon dioxide sequestration technologies and of advanced and innovative environmentally sound technologies.*

Article 10 of the Kyoto Protocol requires Parties, among other things to, *cooperate in scientific and technical research and promote the maintenance and development of systematic observation systems and development of data archives to reduce uncertainties related to the climate system, the adverse impacts of climate change and the economic and social consequences of various response strategies.* It also requires Parties to promote the development and strengthening of endogenous capacities and capabilities to *participate in international and intergovernmental efforts, programmes and networks on research and systematic observation*, taking into account Article 5 of the Convention.

An indication of the importance which the Conferences of the Parties attaches to the issue of information in the management of climate change and its impacts can be gathered by looking at its decisions. Each time it has met the COP has dwelt on information, research and data gathering.

Decision 9/CP. 2 which deals with reports of Annex I Parties²⁶ gave guidelines on national communications by Annex I Parties. It stated that Parties should communicate information on actions they have taken in relation to research and systematic observation.²⁷ The examples of the information specified by the COP as necessary all have relevance for dam design and management. They include:

- (a) research on the impact of climate change
- (b) modeling and prediction, including global circulation models
- (c) climate process and climate system studies
- (d) data collection, monitoring and systematic observation, including data banks
- (e) socio-economic analysis, including analysis of both the impacts of climate change and response options
- (f) technology research and development.

The Decision states further that a Party may wish to provide other information relevant to its greenhouse gas emission/removal profile.²⁸ The examples specified by the COP here are particularly important for projections on energy needs and are necessary in enabling Parties decide whether and when they might need to construct a dam for energy supply. They include:

- (a) population profile, for example growth rates, population density and distribution, and greenhouse gas emission per capita.
- (b) Geographic profile
- (c) Climate profile, for example, data on heating and cooling degree days and rainfall
- (d) Economic profile
- (e) Energy profile, for example energy prices, energy taxes, energy subsidies, vehicle taxes, fuel taxes, electricity prices, information on the market structure of electricity,

²⁶ FCCC/CP/1996/15/Add.1, “Communications from Parties included in Annex I to the Convention: Guidelines, Schedules and Process for consideration”

²⁷ *ibid.* at para 54 of the Annex.

²⁸ *Ibid.* at para 50 of the Annex.

natural gas, coal and oil markets, energy consumption, domestic production of energy as a proportion of total domestic energy consumption, energy intensity.

- (f) Social profile for example the average dwelling size
- (g) Which level of government has responsibility for implementing policies and measures that have an impact on GHG emissions
- (h) Information indicating performance in GHG mitigation.

Additionally, Decision 10/CP.2²⁹ of the second Conference of the Parties stated that Parties' initial communication should seek to include information which might be vary useful in designing dams as adaptation measures in flood prone regions. These include information on:³⁰

- (a) programmes related to sustainable development, research and systematic observation, education, public awareness, training etc
- (b) Policy options for adequate monitoring systems and response strategies for climate change impacts on terrestrial and marine ecosystems
- (c) Policy frameworks for implementing adaptation measures and response strategies in the context of coastal zone management, disaster preparedness, agriculture, fisheries and forestry, with a view to integrating climate change impact information into national planning.

The third Conference of the Parties also dwelt on the issue of research and systematic observation. Decision 8/CP.3³¹ urged parties to provide the necessary resources to reverse the decline in existing observational networks and to support the regional and global observational systems being developed through appropriate funding mechanisms. In the same vein, COP 4 directed the GEF to provide funding to developing country Parties to build capacity in systematic observation networks to reduce scientific

²⁹ (FCCC/CP/1996/15.Add.1) "Communications from parties not included in Annex I to the Convention: guidelines, facilitation and process consideration"

³⁰ see para 15 of the Annex

³¹ FCCC/CP/1997/7/Add.1, "Development of observational networks of the climate system"

uncertainties relating to the causes, effects, magnitude and timing of climate change in accordance with Article 5 of the Convention.³²

COP 4 provided the most comprehensive treatment so far of this issue. Its Decision 14/CP.4³³ dealt comprehensively with this issue. The COP:

1. urged Parties to undertake programmes of systematic observation , including the preparation of specific national plans based on the information developed by the Global Climate Observing System.
2. urged Parties to actively support capacity building in developing countries to enable them to collect, exchange and utilize data
3. urged parties to strengthen programmes assisting countries to acquire and use climate information
4. urged parties to actively support national meteorological and atmospheric observing systems in order to ensure that the stations identified as elements of the GCOS are fully operational and use best practice
5. requested parties to submit information on national plans and programmes in relation to their participation in global observing systems for climate, in the context of reporting on research and systematic observation, as an element of national communications from Parties included in Annex I and, as appropriate, from Parties not included in Annex I.
6. invited agencies participating in the climate agenda to initiate an intergovernmental process for addressing the priorities for action to improve global observing systems for climate in relation to the needs of the Convention and for identifying options for financial support.

Finally, most recently, Decision 5/CP.5³⁴, recognized the need to identify the priority capacity building needs related to participation in systematic observation. It invited the secretariat of the GCOS to organize regional workshops on this issue and urged parties to

³² FCCC/CP/1998/16/Add.1 Additional guidance to the Operating Entity of the Financial Mechanism

³³ FCCC/CP/1998/16/Add.1, Research and Systematic Observation

³⁴ FCCC/CP/1999/6/Add.1, Research and Systematic Observation

support and participate in these workshops. It also invited the secretariat to continue to assist and facilitate the establishment of an appropriate intergovernmental process to identify the priorities for action to improve global observing systems for climate and options for their financial support. It urged Parties to address deficiencies in the climate observing networks and invited them to bring forward specific proposals for that purpose and to identify the capacity building needs and funding required in developing countries to enable them collect, exchange and utilize data on an continuing basis in pursuance of the Convention.

Clearly, great emphasis is placed on research, scientific observation and data gathering as an important activity in the management of climate change. The research, observation and data will reduce considerably the uncertainty surrounding the phenomenon of climate change. This will facilitate more accurate projections and extrapolations in designing dams, and enable measures to be taken to counteract adverse effects of climate change on dams. It will also facilitate the building of more appropriate dams as both a mitigation and an adaptation measure in addressing climate change.

The promotion of research on the linkage between climate change and dams is therefore an important activity which should be engaged in by an institution like the World Commission on Dams. This would have practical implications in the design, development, management and decommissioning of dams. The recommendation by COP 5 that Parties should organize Workshops and other for a to consider this issue should be taken up and acted on as one way of facilitating the generation and dissemination of information, and of capacity building.

2.2 National Communications

National communications are reports to the Conference of the Parties giving details of the actions States Parties they are taking to manage the effects of climate change. They constitute a second important source of information on climate change, its effects and the

actions which parties are taking to manage it. National communications are required by the Convention³⁵ and the Protocol.³⁶

According to Article 4.2(b) of the Convention, Annex I Parties must submit a national communication within six months of the entry into force of the Convention for the party concerned. Decision 3/CP.1³⁷ requested Annex I parties to submit a second national communication by 15th April 1997, while Decision 9/CP.2³⁸ decided that the second national communication by parties with economies in transition should be submitted not later than 15th April 1998. Finally, Decision 11/CP.4³⁹ requested Annex I Parties to submit to the Secretariat a third national communication by 30 November 2001 and subsequent national communications on a regular basis at intervals of three to five years.

On the substance of the national communications, developed country parties and other Annex I parties are required under Article 4.2 to report on:

- (a) the policies and measures the country has adopted to implement its commitments, and
- (b) an estimate of the effects that the measures will have.

The Kyoto Protocol echoes these reporting obligations. Article 10(b)(ii) states that Parties included in Annex I shall submit information on action under the Protocol, including national programmes, and other Parties shall seek to include in their national communications information on programmes which contain measures that the party believes contribute to addressing climate change and its adverse impacts, including the abatement of greenhouse gas emissions and enhancement of and removals by sinks, capacity building and adaptation measures.

³⁵ (Article 4.1.(j))

³⁶ (Article 10.b(2)).

³⁷ FCCC/CP/1995/7/Add.1, Preparation and submission of national communications from the parties included in Annex I to the Convention

³⁸ FCCC/CP/1996/15/Add.1, Communications from Parties included in Annex I to the Convention: guidelines, schedule and process for consideration

³⁹ FCCC/CP/1998/16/Add.1, National communications from parties included in Annex I to the Convention

Decision 9/CP.2⁴⁰ states that a communication should address the full range of a Party's actions to implement all its Convention obligations, including those relating to adaptation, research, education, and other actions, in addition to those to limit emissions and enhance sinks. This would include measures to provide new and additional financial resources, meeting the costs of adaptation and facilitating the transfer of technology. Clearly measures to facilitate research and information generation and analysis on the linkage between dams and climate change would fall under the measures to be reported in a Party's national communication.

This conclusion is borne out by further guidance in the Guidelines that national communications should describe *all* of a Party's policies and measures that the party believes contribute significantly to its efforts to reduce emissions and enhance sinks of GHG. *The actions need not have as a primary objective the limitation of greenhouse gas emissions* (emphasis added).⁴¹ Thus, clearly, mainstream sustainable development projects, such as dams projects to meet energy needs, would form part of a Party's national communication.

Decision 10/CP.2⁴² focuses on developing country parties. It observes that there is still great uncertainty associated with net anthropogenic emissions resulting from activities other than combustion of fossil fuels. Such activities include methane emissions from agriculture and waste sectors, coal mining, biomass burning, carbon dioxide from land use change and forestry; and nitrous oxide emissions from all sectors. Since the emissions resulting from these activities depend on local circumstances, and make up a large proportion of the national emissions of non-Annex I Parties, such Parties should

⁴⁰ FCCC/CP/1996/15/Add.1, Communications from Parties included in Annex I to the Convention: guidelines, schedules, and process for consideration. This contains, in an Annex to the Decision, "Revised Guidelines for the Preparation of National Communications by parties Included in Annex 1 to the Convention.

⁴¹ Ibid. at para 20.

⁴² (FCCC/CP/1996/15/Add.1 "Communications from Parties not included in annex I to the Convention: guidelines, facilitation and process for consideration." See its Annex "Guidelines for the preparation of initial communications by parties not included in Annex I to the Convention. Para 11

make efforts to obtain field observation data to decrease the uncertainties associated with the inventory of these emissions.

It states further that such improvement of the quality of emission data improves knowledge of the relationship between global emissions and resulting atmospheric concentration of GHG, and therefore aids significantly the task of estimating the emission limitations or reductions required to achieve a given concentration level of GHG, the ultimate objective of the Convention. Non-Annex I parties are thus encouraged to formulate cost effective national, and where appropriate regional, programmes aimed at the improvement of the quality of local emission factors and appropriate data gathering.

The Decision states that each non-annex I Party should communicate a general description of the steps taken or envisaged by the Party to implement the Convention. Again, the nature of information expected to be supplied by developing country Parties relate directly to the kind of information needed to enable a country decide on the appropriateness or otherwise of dams projects as a sustainable means of meeting energy supply needs, and as flood control adaptation measures, and if so, on the particular kind of dam to be built. The information to be supplied includes:⁴³

- (a) programmes related to sustainable development, research, systematic observation, education and public awareness, training etc;
- (b) policy options for adequate monitoring systems and response strategies for climate change impacts on terrestrial and marine ecosystems
- (c) policy frameworks for implementing adaptation measures and response strategies in the context of coastal zone management, disaster preparedness, agriculture, fisheries, and forestry with a view to integrating climate change information as appropriate into national planning processes.

⁴³ *ibid.* at para 15.

- (d) In the context of undertaking national communications, building of national, regional and sub-regional capacity to integrate climate change concerns into medium and long term planning.
- (e) Programmes containing measures that the party believes contribute to addressing climate change and its adverse impacts, including the abatement of increase in GHG emissions and enhancement of removals by sinks.

The utility of the national communications as a mechanism for information generation on the basis for projections on the likely scenario in future of climate change can be seen from the conclusions of the synthesis reports of the national communications undertaken by the Secretariat to the Convention. On the basis of information provided in Parties national communications,⁴⁴ the fourth Conference of the Parties concluded that:

- (a) Annex I parties collectively had by 1995 reduced their GHG emissions from 1990 levels by about 4.6%; aggregate GHG emissions by Annex I parties are projected to be approximately 3% below 1990 levels in the year 2000 and about 8% below 1990 levels in 2010.
- (b) GHG emissions from Annex I Parties with economies in transition declined 28% while Annex II Parties as a whole exhibited growing aggregate GHG emissions , with an increase of 3.5% from 1990 to 1995
- (c) Annex I parties are fulfilling their commitments to implement national policies and measures to mitigate climate change but according to available information many Annex I parties will not return GHG emissions to 1990 levels by 2000

In conclusion therefore national communications can play a crucial role in providing important data on which to base decisions about climate change management, and mitigation and adaptation policies. To the extent that dams can provide one way of mitigating GHG emissions and adapting to climate change, the information so generated would be important in the decision making process for dams related actions.

3. Climate change, dams and the development of technology

The phenomenon of climate change has far reaching ramifications for the development of technology. This is due to the fact that Parties are required by the Convention, the Protocol and decisions of the Conference of the Parties to make a fundamental restructuring of their economic systems through a series of mitigation and adaptation measures. It is likely that many of these measures will involve the technological and management systems relating to dams.

Article 3 of the Convention sets out the principles which are to guide the actions of Parties in their efforts to achieve the objectives of the Convention. They require Parties to “*take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse impacts.*” Further, the principles caution that where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost effective.

Given the paucity of concrete information on the phenomenon climate change, its management and its linkages with dams, the precautionary principle is particularly apt in this context. Its inclusion in the Convention indicates that action to resort to dams as an adaptation as well as a mitigation measure may proceed notwithstanding the many uncertainties still prevailing.

Paucity of concrete data must not, however, lead to aggravation of environmental damage, by way of further emissions of GHG or in other ways. Article 4(1)(f) of the Convention requires Parties to “employ appropriate methods, for example *impact assessments*, with a view to minimizing adverse effects on the economy, on public health

⁴⁴ The second compilation and synthesis report, see Decision 11/CP.4, FCCC/CP/1998/16/Add.1, National communications from Parties included in Annex I to the Convention

and on the quality of the environment , of projects or measures undertaken by them to mitigate or adapt to climate change.”

Therefore, Article 4.1(f) makes it mandatory to carry out an environmental impact assessment of dams – if developed as mitigation or as adaptation measures - for two reasons. First, to ensure that they contribute to a net saving in greenhouse gases since dams do generate methane, a greenhouse gas, and therefore contribute to global warming. Second, to ensure that the potential adverse impacts caused by dams on the economy, public health or the quality of the environment, including to global warming, are minimized through appropriate measures.

This provision thus acts as a caution against putting forward mitigation and adaptation measures on the basis of one criterion only, climate change mitigation or adaptation. Each measure must be evaluated comprehensively in terms of its contribution to climate change mitigation or adaptation, but also in terms of its impact on the economy and the environment.

3.1 Adaptation measures

Adaptation measures are measures taken to reduce vulnerability and to moderate the adverse effects of environmental impacts, for example climate change.

Decision 11/CP.1⁴⁵ identified three stages in the adaptation process as follows:

(1) Stage I: *planning*: this includes studies of possible impacts of climate change, to identify particularly vulnerable countries or regions and policy options for adaptation and appropriate capacity building. Thus, Stage I consists predominantly of vulnerability studies and the assessment of available adaptation options. According to this Decision, Stage I activities may be incorporated into, and become part of, a country’s national communication. Where this is the case, Stage I measures are eligible for GEF funding. This was reaffirmed by Decision 8/CP5.

(2) Stage II: *measures, including further capacity building, which may be taken to prepare for adaptation, as envisaged by Article 4.1(e)*. Article 4(1)(e) requires Parties to cooperate in preparing for adaptation to the impacts of climate change, develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods (measures which could include the building of dams).

Stage II measures were not, initially, eligible for GEF funding. However, Decision 2/CP.4⁴⁶ stipulated that the GEF should provide funding to developing country parties to implement adaptation response measures under Article 4.1 in particularly vulnerable countries, and especially in countries vulnerable to climate related natural disasters. Capacity building measures related to the development and operation of dams as an adaptation measure may therefore be funded under the GEF.

(3) Stage III: *measures to facilitate adequate adaptation, including insurance, and other adaptation measures as envisaged by Article 4.1(b) and 4.4*. These provisions require States parties to “formulate, implement and publish and regularly update national and where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases and measures to facilitate adequate adaptation to climate change (for instance dams projects). These activities are not yet eligible for GEF funding.

The Kyoto Protocol, in Article 10, also requires all parties to formulate, implement, publish and regularly update national, and where appropriate, regional programmes containing measures to mitigate climate change and measures to facilitate adequate adaptation to climate change. Such programmes would concern the energy, transport and industry sectors as well as agriculture, forestry and waste management. Additionally,

⁴⁵ (FCCC/CP/1995/7/Add.1, Initial guidance on policies, programmes priorities and eligibility criteria to the operating entity or entities of the financial mechanism

⁴⁶ FCCC/CP/1998/16/Add.1 “Additional guidance to the operating entity of the financial mechanism

under the CDM, adaptation costs may be met partly from a share of the proceeds from certified project activities.

In conclusion therefore, adaptation activities as provided for under the Convention, Protocol and COP decisions are activities which concern the whole range of sustainable development activities in the fields of energy, transport, industry, agriculture, forestry, coastal zone management and waste management. Dams would serve a very useful role in facilitating adaptation in most of these fields. Thus, as an adaptation measure, dams might be constructed to enable low lying coastal areas better cope with increased flooding, or to enable countries irrigate more land to cope with food deficits and so on.

Therefore it is necessary to develop, improve and modify the technology on the building, management and decommissioning of dams to take account of the changes arising from climate change, and to minimize the adverse impacts that dams might have on climate change, such as the production of GHG emissions. In this respect, the Convention on Climate Change and its Kyoto Protocol will galvanize technological change.

4.2 Mitigation measures

Mitigation measures are activities which aim at a reduction of the net amount of greenhouse gases released into the atmosphere, and thus help slow down the process of anthropogenic climate change. They include both emission abatement and sink enhancement measures, and cover all greenhouse gases, as well as all economic sectors and activities where emissions occur. Dams projects therefore, clearly, fall within the scope of mitigation measures, in particular hydroelectric power generation dams which would be emission abatement in nature.

Mitigation measures undertaken in developing countries are eligible for incremental funding under the financial mechanism of the Convention.⁴⁷ Annex I countries, on the other hand, may take advantage of certain measures (“flexibility measures”) allowed for

in the Convention and the Protocol to make compliance with their GHG reduction obligations more cost effective. These include emissions trading, joint implementation and the Clean Development Mechanism. Emissions trading is not project based and therefore is not directly relevant to the development of dams related technologies.

4.2.1 Joint implementation

The concept of joint implementation first appeared in Article 4.2(a) of the Convention. This required Parties to adopt national policies and take corresponding measures on the mitigation of climate change, but stated that Parties may implement such policies and measures *jointly with other Parties and may assist other Parties in contributing to the achievement of the objective of the Convention*. Recognizing that this provision was rather bare, Article 4.2(d) provided that the Conference of the Parties, at its first session, would take decisions regarding criteria for joint implementation.

The decision came during the first Conference of the Parties. Decision 5/CP.1⁴⁸

- (a) established a pilot phase for activities implemented jointly (AIJ) among Annex I parties and, on a voluntary basis, with non-Annex I Parties that so request;
- (b) decided that AIJ between Annex I and non-Annex I countries would not be seen as fulfillment of current stabilization commitments of Annex I parties, but they could contribute to the achievement of the objective of the Convention and to fulfillment of commitments of Annex II parties under Article 4.5 [on technology transfer];
- (c) decided that AIJ should be compatible with and supportive of national environment and development priorities and strategies, contribute to cost effectiveness in achieving global benefits and could be conducted in a comprehensive manner covering all relevant sources, sinks and reservoirs of greenhouse gases
- (d) that AIJ should bring about real, measurable and long-term environmental benefits related to the mitigation of climate change that would not have occurred in the absence of such activities.

⁴⁷ Operational Guidelines for Expedited Financing of Initial Communications from Non-Annex I Parties,” GEF 1997

Joint implementation is further dealt with in the Kyoto Protocol, where, however, is it restricted to Annex I Parties alone, presumably because projects involving developing country Parties will be undertaken under the Clean Development Mechanism. Article 6 states that Annex I Parties may transfer to, or acquire from, any other such Party emission reduction units resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing anthropogenic removals by sinks of greenhouse gases in any sector of the economy, provided that:

- (1) any such project has the approval of the Parties involved;
- (2) any such project provides a reduction in emissions by sources, or an enhancement of removals by sinks, that is additional to any that would otherwise occur

Originally due to end in 2000, Decision 13/CP.5⁴⁹ decided to “continue the pilot phase of AIJ beyond the end of the present decade; during the continuation of the pilot phase the issue of geographical imbalance, in particular the lack of projects in Africa and small island developing states, should be addressed.”

Only three AIJ projects have so far been adopted which involve dams projects for hydroelectric power generation or for other uses.⁵⁰ One other one is on offer.⁵¹ The most likely reason is that dams have a long gestation period, and are expensive to undertake. Additionally, their emissions reduction benefits are not yet fully understood. In light of these considerations it was in any case unlikely that many Parties would undertake a dams project during the experimental phase of the AIJ, during which no emission reduction credits may be earned by the investing Party. This is likely to change under CDM when more hydropower projects are likely to be accepted.

4.2.2 The Clean Development Mechanism

⁴⁸ FCCC/CP/1995/7/Add.1, “Activities implemented jointly under the pilot phase”

⁴⁹ FCCC/1999/6/Add.1 “Activities implemented jointly under the pilot phase”

⁵⁰ Activities Implemented Jointly: List of Projects, <http://www.unfccc.de/program/aij/aijproj.html>

⁵¹ Activities Implemented Jointly: Offers of Activities, <http://www.unfccc.de/program/aij/aijoff.html>

Article 12 defines the Clean Development Mechanism (CDM). Under it parties not included in Annex I will benefit from project activities resulting in certified emission reductions, while Parties included in Annex I may use the certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emission limitation and reduction commitments.

Article 12(5) states that emission reductions resulting from each project activity shall be certified on the basis of:

- (a) voluntary participation approved by each Party involved
- (b) real, measurable and long term benefits related to the mitigation of climate change;
and
- (c) reductions in emissions that are additional to any that would occur in the absence of the certified project activity.

The CDM offers a lot of opportunities for investments in dams' projects. The reasons are that the majority of potential dams' projects are in developing countries which are not yet required to undertake mandatory mitigation measures. At the same time these countries often lack the capital to undertake ambitious dams projects even though their energy needs would suggest that such a project would be useful. Compounding the situation, at times the dams' project is more expensive than a fossil fuel based option, leading investors to shy away from it. The additional benefit of being able to earn emission reduction credits would probably tip the balance in favour of the dams project, and so lead to greater attraction of the financially more marginal projects.

The CDM therefore is likely to lead to increased research and innovation into the technology related to dams and their linkages with climate change with the aim of making such projects attractive to potential investors from Annex I countries.

4. Capacity Building

“Capacity building” refers to a wide range of measures relevant not only to global environment issues but to development activities in general. It has been defined as the

process of creating or enhancing indigenous capacities to perform specific tasks on an ongoing basis in order to attain a given development objective.⁵²

Clearly, capacity building activities are directly applicable to dams projects. They are aimed at facilitating the ability of developing countries, and countries with economies in transition, to engage in mitigation measures as well as adaptation measures. To that extent, the countries engaging in capacity building will be well placed to move towards a sustainable development path, both in respect of climate change issues, but also more generally. Therefore, through capacity building, the ability of countries to plan, design, appraise, construct, operate, monitor and decommission dams will be enhanced.

Discussion on capacity building often identifies as its components the following:

- (i) human resource development (training, education)
- (ii) institutional strengthening (improved organizational methods, administrative procedures), and
- (iii) creation of a receptive environment (increased public awareness, creation of a regulatory framework, and socio-interactive processes conducive to development.

In the context of the management of climate change, Decision 10/CP.5⁵³ listed the capacity building needs of developing country parties. Some of these needs are directly related to managing the linkage between climate change and dams. They include:

- (i) Institutional capacity building: i.e. strengthening national focal points and relevant academic and research institutions (relevant for climate change related research and observing systems, among others).
- (iii) Capacity building under the CDM: i.e. establishment of institutional linkages required for implementation of the CDM, specifically, project identification, formulation and design; monitoring, verification, auditing and certification of

⁵² “The Operational Guidelines for Expediting Financing of Initial Communications from Non-Annex I Parties,” (GEF, 1997)

project activities; development of criteria, including for sustainable development indicators, e.g. for adaptation; development of baselines; project negotiation skills; CDM demonstration projects to enhance capacity building, including assessment of costs and risks; data acquisition and sharing. All of these activities, undertaken in the context of climate change mitigation and adaptation, would be relevant to dams projects.

- (iv) Human resource development: fellowships and scholarships for formal training at higher levels; development of a pool of expertise and skills; studies such as climate change detection and climate variability, impact assessment, vulnerability and adaptation studies, and policy analysis; exchange programmes among parties; integration of climate change into educational curricula; networking and co-ordination at local, national, regional and international levels.

Although the COP decision does not refer to the linkage between climate change and dams as one of areas of training and study, that is more an indication that it is a field of study that until recently was not thought about, than that it is not pertinent.

- (v) Technology transfer: identification and assessment of appropriate technologies; appropriate technology information needs, including support for office and other relevant equipment.
- (vi) National communications: development of local emission factors; data collection, analysis and archiving; establishment of a technical assistance group, such as a non-Annex I party expert group.
- (vii) Adaptation: development of adaptation project guidelines; case studies of extreme weather events, documentation and dissemination of study reports; capacity building and enhancement in the marine sector, such as coastal zone management; identification and promotion of traditional knowledge, skills and practices which enhance adaptation, another area which is directly related to the development and management of dams.

⁵³ FCCC/CP/1999/6/Add.1, capacity building

- (viii) Public awareness: development of public awareness programmes, development and production of public awareness material, workshops, involvement and consultation.
- (ix) Coordination and cooperation: coordination programmes at the individual, community, local, government, non-government, national and regional levels, involvement and consultation, linking and learning;
- (x) Improved decision-making: awareness and knowledge; research, data and information, technical and policy, integrating climate change policies into national development strategies and plans.

4.1 Human resources and institutional development

Both the Convention and its Kyoto Protocol both make provision for capacity building, particularly for developing countries, as an integral part of climate change mitigation and of adaptation.

Article 4.1(i) of the Convention urges parties to promote and cooperate in education, training and public awareness related to climate change and encourage the widest participation in this process, including that of NGOs. Article 5 of the Convention states that, in carrying out their commitments under Article 4.1(g) [i.e. to promote research and systematic observation], Parties shall take into account the particular concerns and needs of developing countries and co-operate *in improving their endogenous capacities and capabilities to participate in research and systematic observation.*

Article 6 deals with education, training and public awareness, and requires Parties to promote and facilitate:

- (i) the development and implementation of educational and public awareness programmes on climate change and its effects;
- (ii) public access to information on climate change and its effects;
- (xi) public participation in addressing climate change and the development of adequate responses;

- (xii) training of scientific, technical and managerial personnel; and
- (xiii) cooperation in the development and exchange of educational and public awareness material and the strengthening of national institutions and the exchange of personnel.

Finally, under the Convention, Article 9.2(d) provides that the Subsidiary Body of Scientific and Technical Advice shall provide advice on ways and means of supporting endogenous capacity building in developing countries.

Similarly, Article 10 of the Kyoto Protocol requires Parties to:

- (i) promote the development and strengthening of endogenous capacities and capabilities to participate in international and inter-governmental efforts, programmes and networks on research and systematic observation, and
- (ii) cooperate in, and promote at the international level, and, where appropriate, using existing bodies, the development and implementation of education and training programmes, including the strengthening of national capacity building, in particular human and institutional capacities and the exchange or secondment of personnel to train experts in this field, in particular for developing countries, and to facilitate at the national level public awareness of, and public access to, information on climate change.

The Conference of the Parties has stated that capacity building activities qualify for funding from the GEF. Decision 11/CP.1⁵⁴ set out the funding priorities as follows:

- (i) in the initial period, emphasis should be placed on enabling activities undertaken by developing country Parties, such as planning and endogenous capacity building, including institutional strengthening, training, research and education, that will facilitate implementation of effective response measures; and
- (ii) the formulation by developing country parties of nationally determined programmes to address climate change issues which are in accordance with national development

⁵⁴ FCCC/CP/1995/7/Add.1, “Initial guidance on policies, programme priorities and eligibility criteria to the operating entity or entities of the financial mechanism”

priorities, and that, to facilitate the formulation of these programmes, *it should finance capacity building* and all other activities related to the formulation, management and regular updating of these programmes.

3.2 Technology transfer

A second aspect of capacity building is technology transfer. Capacity building thus connotes human resources and institutional development as well as technology transfer. All these components are necessary if countries are to take measures of adaptation and mitigation, understand and utilize beneficially the linkage between climate change and dams, and avoid possible pitfalls from that linkage, such as the aggravation of the greenhouse effect through from dam induced methane.

Technology transfer is central to the scheme of things in the UNFCCC regime. In fact Article 4.7 of the Convention makes transfer of technology to developing countries a precondition, along with the transfer of financial resources, to the fulfillment of their obligations under the Convention.

Article 4.1(c) of the Convention commits Parties to promote and to co-operate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases in all relevant sectors, including energy, transport, industry, agriculture, forestry and waste management. Article 4.5 states that developed country Parties shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of or access to, environmentally sound technologies and know-how to other parties to enable them to implement the provisions of the Convention. An obvious of such environmentally sound technology would be the technology related to the construction and management of dams.

Article 9 makes it SBSTA's duty to identify innovative, efficient and state-of-the-art technologies and know-how, and advise on ways and means of promoting development and/or transferring such technologies. It is clear that technologies in these fields would cover also technology on dams.

The Kyoto Protocol similarly provides comprehensively for technology transfer. Article 10(c) requires parties to cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all practical steps to promote, facilitate and finance, as appropriate *the transfer of, or access to environmentally sound technologies, know-how, practices and processes pertinent to climate change*, in particular, to developing countries. This would include the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector to promote and enhance the transfer of, and access to, environmentally sound technologies.

The Conference of the Parties has also dealt repeatedly and in detail at each meeting with the issue of technology transfer.

Decision 11/CP.1⁵⁵ decided that that technology which is transferred must be environmentally sound and adapted to suit local conditions. This calls for the evaluation of the technology in light of the linkage between climate change and dams, among other criteria, prior to transfer. Decision 13/CP.1⁵⁶ requested the Convention Secretariat to:

- (i) prepare an itemized progress report on concrete measures taken by the Parties with respect to their commitments related to the transfer of environmentally sound technologies and know how *necessary to mitigate and facilitate adequate adaptation to climate change*; and
- (ii) collect information from relevant sources and to prepare an inventory and assessment of environmentally sound and economically viable technologies and know-how *conducive to mitigating and adapting to climate change*. This inventory should also include an elaboration of the terms under which transfers of such technologies and know-how could take place.

⁵⁵ FCCC/CP/1995/7/Add.1, “Initial guidance on policies, programme priorities, and eligibility criteria to the operating entity or entities of the financial mechanisms

The Decision also decided to support and promote the development of endogenous capacities and appropriate technology relevant to the objectives of the Convention in developing countries.

Decision 7/CP.2⁵⁷ requested the Secretariat to give high priority to the development and completion of a survey of the initial technology needs of Parties not included in Annex I. It urged the Secretariat to initiate action to identify existing technology information activities and needs with a view to developing options for building on specialized information centres and networks to provide fast and one stop data bases relating to state of the art, environmentally sound and economically feasible technology and know how in a manner that would be readily accessible to developing countries. Such options would need to consider the need and resources required for improving existing, and setting up additional, technology information centres and networks. The Decision also urged Annex I Parties to improve the enabling environment, including the removal of barriers and establishment of incentives, for private sector activities that advance the transfer of technologies to address climate change and its adverse impacts.

Decision 9/CP. 3⁵⁸ requested the Secretariat to:

- (i) consult with GEF and other international organizations and solicit information on their capabilities and abilities to support the work of international technology information centres as well as national and regional centres, and
- (ii) consider specific case studies, including demonstration projects with the aim of evaluating barriers to the introduction and implementation of environmentally sound technologies and know-how, and of promoting their practical application. The case studies which the World Commission on Dams is conducting at present would providing an opportunity to introduce issues related to the linkage between dams and climate change and generate valuable insights into this relationship.

⁵⁶ FCCC/CP/1995/Add.1, "Transfer of technology"

⁵⁷ FCCC/CP/1996/15/Add.1, "Development and transfer of technologies"

Decision 2/CP.4⁵⁹ decided that the GEF should:

- (i) provide funding to developing countries to enable them, in light of their social and economic conditions and taking into account state of the art environmentally sound technologies, to identify and submit to the COP their prioritized technology needs, especially as concerns key technologies needed in particular sectors of their national economies conducive to addressing climate change and minimizing its adverse effects; under this a country could introduce the issue of the relationship of dams technology to climate change.
- (ii) Support capacity building for the assessment of technology needs to fulfil the commitments of developing countries, the identification of sources and suppliers of these technologies, and the determination of modalities for their acquisition and absorption.
- (iii) Support capacity building for facilitating national/regional access to the information provided by international centres and networks and for working with those centres for the dissemination of information and transfer of environmentally sound technologies and know how.

Decision 4/CP.4⁶⁰ encouraged all relevant international organizations to mobilize and facilitate efforts to provide financial resources needed by developing countries to meet their agreed incremental costs, including development and transfer of technologies, enhancement of endogenous capacities, implementation of such measures as improving energy efficiency, *exploiting renewable energies*, enhancing sinks and *preparing for adaptation to adverse effects of climate change*. Thus, under these provisions developing countries could receive funding to meet the costs of exploring the linkages between dams and climate change and adapting their technologies appropriately.

Thus, great stress is laid on technology transfer as an important means of mitigating climate change, and taking adaptation measures. This includes tackling longstanding

⁵⁸ FCCC/CP/1997/Add.1, “Development and transfer of technologies

⁵⁹ FCCC/CP/1998/16/Add.1, “Additional Guidance to the Operating Entity of the Financial Mechanism”

⁶⁰ FCCC/CP/1998/16/Add.1, “Development and transfer of technologies

technology transfer problems such as intellectual property rights and the rules of the international trade regime. The Climate Change Convention regime therefore could play a critical role in facilitating technology driven sustainable development. In this respect the development and management of dams would be a beneficiary of more accessible state-of-the-art technology. The stress on environmentally friendly technologies would also add to the attraction of dams for hydroelectric power supply, which, in the context of global warming, is an environmentally friendly technology.

PART III LINKING INTO THE UNFCCC PROCESS

Dams are quite clearly an integral aspect of the management of climate change in terms both of mitigation and of adaptation options. But, surprisingly, dams rarely form part of the climate change discussions. In fact the link between dams and climate change is not often made. This is because dams have, up till now, not been consciously brought into the discussion on climate change. The reason, most probably, is that there has not been an agency with the mandate to pursue this issue.

It is imperative that the World Commission on Dams commence an engagement with the climate change discussion immediately. This is because the climate change discussion is an evolutionary process with decisions on specific issues constantly being made at the various fora. Some of these decisions foreclose discussion on certain aspects of the dams/climate change inter-linkage. At the same time because of the evolutionary nature of decision making in the climate change process the engagement must be long-term and consistent. It cannot be a one-off input, as this will hardly make an impression, given the diverse range of pertinent issues that of the climate change process.

The World Commission on dams would need to take a strategic decision to be at the forefront of placing the dams issue firmly on the climate change agenda. A number of entry points are suggested below.

3.1 Observer Status

The first entry point is to seek Observer Status through accreditation. Accreditation would enable the World Commission on Dams to be able to participate at sessions of the various bodies of the Climate Change Convention. These are the Subsidiary Body on Scientific and Technological Advice (SBSTA), the Subsidiary Body on Implementation (SBI), the Conference of the parties of the Convention (COP) and the Conference of the parties acting as meeting of the Parties to the Protocol (COP/MOP). Participation includes attendance and making interventions and submissions at the meetings on pertinent issues.

Participation at meetings of the COP and the subsidiary bodies offer an unrivaled opportunity to influence thinking on climate change issues. The COP holds annual sessions over a period of two weeks. Parallel sessions of the SBSTA and the SBI are also held at the time, in addition to quarterly sessions. Thousands of participants attend these sessions including governmental, intergovernmental and non-governmental representatives. A list of participants at the 12th session of the SBSTA/SBI held in Bonn between 12 to 16th June 2000 is annexed as an indication of the range of attendants at these meetings, and the kind of audience to whom the WCD would have access by making it a point to be at these sessions.

The COP is a formal decision-making process at which key decisions on interpretation of the Convention (and later, the Protocol) and its implementation are taken. Prior to an item being presented to the COP it is considered by one of the two the subsidiary bodies: SBSTA or the SBI which tries to facilitate some agreement and forwards a draft decision to the COP. The decisions of the COP make up a detailed “rule book” for implementation of the Convention and are included in formal COP reports.⁶¹ The aim of the WCD therefore should be to bring to the COP’s attention the neglected issue of the link between climate change and dams. This would enable the issue to become part of the agenda of the UNFCCC process.

⁶¹ @A Guide to the Climate Change Process” Climate Change Secretariat, June 2000.

Accreditation also enables an organization to apply to hold a special event or an exhibition at the various meetings of the Convention bodies. This is done by prior arrangement with the COP Secretariat, through the NGO or IGO Liaison officer as appropriate. As slots are limited, it is important to notify the intention to hold an event early. "Side events" are an important opportunity to canvass an emerging issue, such as the link between climate change and dams by making presentations on it and trying to interest the audience who attend the event to examine the issue more closely. The WCD should look into the possibility of holding a side event at a COP meeting.

Accredited bodies may also get an invitation to the various workshops and consultations which the Secretariat often organizes in order to promote informal discussions and explore positions. Participation in these meetings is important since they help to concretize Parties' thinking on various issues, and provide a forum at which the link between dams and climate change can be canvassed in a non-negotiating atmosphere. An issue such as the link between dams and climate change would be well suited to initial discussion at a workshop.

Accreditation as an observer may be granted to intergovernmental organizations (IGOs) as well as to non-governmental organizations (NGOs). Currently, about 400 non-governmental organizations and 35 intergovernmental organizations are accredited to the UNFCCC⁶²

The WCD is in a somewhat unique position in so far as its sponsors are an intergovernmental organization (the World Bank) as well as a non-governmental organization (IUCN). Therefore it is not entirely clear whether it should apply for accreditation as an intergovernmental organization or a non-governmental organization. The procedure to be followed in applying for accreditation is largely comparable for both organizations although the contact persons at the Secretariat are different. However, intergovernmental organizations have slightly better standing in the Convention process than non-governmental organizations and if it is at all possible the WCD should seek

⁶² "A Guide to the Climate Change Process," Climate Change Secretariat, Bonn, June 2000, p. 12.

accreditation as an intergovernmental organization. But should this not be possible accreditation as a non-governmental organization offers all the opportunities to participate in the Convention process and discussions which the WCD needs to enable it place dams on the agenda.

To attain accreditation as an observer WCD would need to apply to the Climate Change Secretariat in Bonn with the following information:

1. copies of the WCD's constitutive document (e.g. its constitution or other governing instrument)
2. evidence of non-profit or tax-exempt status
3. information on the activities undertaken by the WCD which are relevant to the Convention on Climate Change
4. Information on the affiliation with other organizations which are involved in climate change activities
5. Main funding sources
6. Brochures and publications related to the Convention process produced by the WCD
7. WCD's contact information.

Applications for accreditation are considered by the Secretariat and, if successful, the applicant may be granted provisional admission to the next meeting of the Convention bodies. Thus, for instance, the WCD can receive provisional accreditation at the 13th Subsidiary bodies meeting to be held in Lyon, France from 11 to 15 September 2000. To do so it must apply by 4th August 2000. Failing that the WCD can make an application for accreditation at the sixth COP to be held from 13 to 25th November 2000 at The Hague, The Netherlands. Organizations provisionally admitted by subsidiary bodies are considered for final admission at the following session of the COP where full accreditation is granted.

However, in view of the fact that the WCD is due to expire early in 2001, it may choose not to seek observer status in its own right. In that case it could still attend the meetings of the Climate Change Convention bodies under the sponsorship of one of its sponsoring

organizations, the World Bank or the IUCN. In this case the WCD delegates would wear the badge of the sponsoring organization at the meeting. The disadvantage with this option is that the WCD would be unable to project a distinct identity, but would be assumed to be speaking on behalf of its sponsoring organization. Therefore whereas it might be logistically an expedient way of dealing with the situation at hand, it might create an unintended impression in the minds of those not familiar with the WCD.

3.2 The Intergovernmental Panel on Climate Change (IPCC)

The Inter-governmental Panel on Climate Change (IPCC) was established in 1988 jointly by the United Nations and the World Meteorological Organization. Its mandate was to assess available information on the science, impacts and the economics of climate change and of mitigation options to address it. The IPCC works through three Working Groups: The Scientific Assessment Working Group; the Impacts Assessment Working Group; and the Response Strategies Working Group.

Since its inception the IPCC has produced assessment reports twice: in 1990 and in 1995. It is currently working on the third assessment report, which is due to be published in early to mid 2001. Significantly, these reports, including the latest IPCC report, on Land Use, Land Use Change and Forestry, do not deal at all with the link between climate change and dams. Similarly, it would appear that the draft IPCC third Assessment report which is currently out for review and will be published in 2001, also does not deal with emissions from dams.

Additionally the IPCC is often requested to provide scientific and technical advice to the Conference of the Parties and its subsidiary bodies, the SBSTA and the SBI. Consequently IPCC has prepared technical papers and special reports on a diverse range of issues at the request of the COP and its subsidiary bodies. So far none of these technical papers and special reports have dealt with the link between climate change and dams.

The IPCC could provide an entry point for the World Commission on Dams into the Climate Change Convention process. Its focus on scientific assessment, adaptation and mitigation measures all have ramifications for the link between climate change and dams. Further the IPCC has a link with the organs of the UNFCCC through the SBSTA.

The specific contribution, which the IPCC could make to this process, is to include in its reports and/or technical papers a discussion of the link between climate change and dams. IPCC Reports and technical papers are considered to be authoritative and are standard reference texts for policy makers, scientists and others interested in climate change issues. A discussion of the link between climate change and dams in IPCC reports and papers would therefore contribute greatly to sensitizing the international community to this issue. The fact therefore that so far there has been no discussion of this issue in IPCC documents calls for urgent action from the World Commission of dams to recover lost ground.

In seeking to use IPCC as an entry point it is important to bear in mind certain unique features of the IPCC process which can limit its potential as a quick entry point into the discussion.

The IPCC's mandate is to assess scientific information, which is available in published literature. The IPCC does not generate primary information. Similarly, IPCC's mandate when producing special reports and technical papers is limited to improving material and assessments contained in its reports. Its procedures require that the special reports and technical papers be based on material already present in the IPCC reports.

These features restrict the extent to which the IPCC process can be used to introduce a discussion on the link between climate change and dams. To date there is hardly any peer reviewed, published material on the link between climate change and dams. The discussion is just beginning to attract the attention of the scientific community. It is therefore not surprisingly that the IPCC reports have not dealt with the issue to date. The approach of the WCD would therefore need to be to ensure that peer reviewed, published

literature on the issue becomes available as a first step towards introducing it into the IPCC process. The sponsoring of workshops for researchers and of other studies on this issue is an important step in this direction.

A second feature of the IPCC process is that the IPCC cannot, of its own motion, commission a study into an issue, however pertinent. The IPCC is an intergovernmental process and acts on requests from the parties through the COP and the subsidiary bodies. Thus, to give a few examples, the IPCC Special report on Methodological and Technological Issues in Technology Transfer (IPCCC, 2000) was the result of a request of the first COP in Bonn.⁶³ The IPCC Special report on Land Use, Land Use Change and Forestry followed a request from the SBTA at its eight session in Bonn on 2-12 June 1998.⁶⁴ The IPCC on Emissions Scenarios followed a request of COP 2 in 1996.⁶⁵

The link between dams and climate change conceivably could be subject of an IPCC special report. In case the WCD were minded to initiate a request to the IPCC to do a special report on this issue then the WCD would have to interest a State Party to the Convention to persuade other parties that a request should be made to the IPCC to carry out a study on this issue and make a special report.

A third way in which the IPCC could include this issue in its reports would be if, following publication of literature on the subject, an expert on the issue from the WCD could participate in the production of a future IPCC report. Participation is open to a wide range of persons. One could participate as a lead author, a contributing author, a review editor or an expert reviewer. All of these offer opportunities to introduce into the report published literature on this issue.

Given the state of literature on the subject at present, it is probably too late to introduce this issue into the IPCC third assessment report which is due to be published by mid

⁶³ Preface, IPCC Special Report: Methodological and Technological Issues in Technology Transfer, IPCC, 2000.

⁶⁴ Preface, IPCC Special Report on Land Use, Land Use Change and Forestry, IPCC 2000.

⁶⁵ Preface, IPCC Special Report on Emission Scenarios, IPCC 2000

2001. The draft report is presently out for review, and will be submitted for approval by the IPCC plenary meetings in February 2001. The review process presents an opportunity to close gaps and omissions by drawing attention to issues, which have not received adequate treatment, and supplying supporting published literature.

Despite these unique features and limitations the IPCC offers an important entry point for introducing the discussion on the linkage between climate change and dams into the climate change process in an authoritative manner. The WCD should therefore consider adopting this as one strategic long term objective.

3.3 National Communications

National Communications are discussed in detail in Part 2.2 of this Report. They are reports of by Parties to the COP giving details of the actions parties are taking to manage the effects of climate change. They provide the means through which Parties fulfil their obligation under Article 12.1(a) to communicate a national inventory of emissions and removals.

Annex I parties have been submitting National Communications, and their third National Communications are due by 30th November 2001 and further National Communications on a regular basis at intervals of three to five years.

Non-Annex I Parties submit National Communications but are not held to particular deadlines. So far 27 non-Annex I countries have submitted National Communications.

National Communications are prepared according to guidelines issued by the COP. The operative guidelines are “UNFCCC guidelines on reporting and review.”⁶⁶ This contains guidelines on the preparation of national communications by Annex I parties. The guidelines deal among other things with the issue of national inventories. The guidelines on this issue are based on IPCC guidelines.

⁶⁶ FCCC/CP/1999/7

The guidelines require reporting to be transparent, consistent, comparable, accurate and complete. Completeness means that an inventory must cover all sources and sinks, as well as all gases whether or not included in the IPCC guidelines.

In estimating and reporting on emissions and removals parties may use different methods according to their national circumstances. However the IPCC guidelines offer a default methodology which includes default emission factors and in some cases default activity data. At present these default emissions factors and activity data do not include emissions arising from dams. Although there is ongoing work within the IPCC on emissions factors, this is geared towards improving the emission factors, which are provided for, and not towards introducing totally new ones, which is what introduction of methane emissions from dams would be. Wetlands are however mentioned in the IPCC default emission factors, but this does not focus on dams specifically, and it is clear that dams were not intended to form part of wetlands. This suggests that countries are not monitoring for emissions from dams as they most likely do not consider this to be a factor.

Therefore, although parties are free to report on emissions from dams no party has done so in the absence of default emission factors in the IPCC guidelines. The Secretariat anticipates that Brazil will report on emissions from dams in its national communications once studies into this issue which are currently ongoing in Brazil are complete.⁶⁷ This is likely to be in a few months time. Should that happen it would mark the first time that a country has reported on emissions from this activity, and might spur other countries to look into this issue more closely.

However, the WCD may wish to press for a review of the IPCC default emission factors to take into account emissions from dams. Such revision is not planned soon but whenever it is undertaken, will offer an opportunity to cover the issue of the link between dams and climate change, which has so far been ignored. The studies being carried out by

⁶⁷ Personal interview with Martha Perdomo, UNFCCC Secretariat during the week of June 6th to 10th 2000 in Bonn.

Brazil will no doubt spur this process forward. The WCD needs to follow developments on this issue over the next several years.

3.4 The Clean Development Mechanism

The Clean Development Mechanism is seen as central to the future of the Kyoto Protocol. It was discussed fully in section 4.2.2 above where the utility of CDM for hydropower projects was discussed. In light of its centrality to the Kyoto Protocol, the WCD needs to take the strategic decision to ensure that the link between dams and climate change is fully elaborated and taken into account in the design of the CDM.

The predecessor to the CDM are projects undertaken under the umbrella of Activities Implemented Jointly, which is discussed in section 4.2.1. The list of AIJ projects as at April 2000 shows that three of these projects involve hydro-power development.⁶⁸ These are the Dona Julia Hydroelectric Project between Costa Rica and the United States, the Matanzas Hydroelectric Project between Guatemala and the United States and the Santa Teresa Hydroelectric Project between Guatemala and the United States. Of the AIJ projects on offer, the Stori Hydro-electric power project is on offer by Georgia.

These projects are all over 15 years in duration. lessons learnt in terms of the link between dams and climate change will therefore take time to concretize. Nevertheless these projects show that there is potential for hydro-electric power projects to be put forward under the CDM. This is so because countries are at liberty to use whatever mitigation measures they think will prove viable and beneficial.

CDM projects will involve a life cycle analysis of environmental impact, including contribution to emissions avoidance. One of the requirements for CDM projects is to develop baselines from which assessments of emissions reductions can be measured. In respect of a hydro-power project, methane emissions from the dam would be a baseline issue to be taken into account in calculating the emissions reductions.

⁶⁸ Activities Implemented Jointly, <http://www.unfccc.de/program/aij/aijproj.html>

The strategic decision, which the WCD must make, is to facilitate the generation of information on this issue so that emissions from dams can be factored into the calculations with confidence. In the absence of reliable information on this issue, whatever omissions occur would not be taken into account, leading to leakage. Arising from the data, criteria and guidelines can be developed on the factors to be taken into account in developing dams projects under the CDM. Again the WCD can take the strategic decision to participate in the development of these criteria and guidelines by providing the necessary technical and expert input as the guidelines and baselines are elaborated and developed.

ANNEX I

The Consultant visited the UNFCCC Secretariat in Bonn, Germany between 4th and 10th June 2000. The visited coincided with the first week of informal meetings preceding the session of the subsidiary bodies (SBSTA and SBI). The Secretariat staff were at the time at the Hotel Maritim where the SBSTA/SBI meetings were being held and therefore the Consultant met the Secretariat staff at that same venue.

The Consultant held discussions with the following Secretariat staff:

1. Mr. Dennis Tirpak
2. Mr Seth Osafo, Legal Officer
3. Ms Barbara Black, NGO Liaison Officer
4. Ms Hanna Hoffman, IGO Liaison officer
5. Ms Olga Pilifosova, Programme Officer, Methodologies
6. Ms Martha Perdomo, Programme Officer, National Communications
7. Mr Kai-Uwe Barani Smith, Programme Officer, Clean Development Mechanism
8. Yousseff Nasseff, Programme Officer, Implementation.

The Consultant also held discussions with the following members of the Intergovernmental Panel on Climate Change who were in Bonn at the time.

1. Mr Ogunlade Davidson, Co-Chair, IPCC Working Group III
2. Mr Taka Hiraishi, Co-Chair of IPCC Task Force on National Greenhouse Gas Inventories.

ANNEX II - LIST OF ANNEXED DOCUMENTS

1. A Guide to the Climate Change Convention Process, Climate Change Secretariat, Bonn, June, 2000
2. “Accreditation to Sessions of the UNFCCC” Climate Change Secretariat, Bonn, 2000
3. “Provisional List of Participants, FCCC/SB/2000/Misc.3, 6th June 2000
4. Activities Implemented Jointly: Offers of Activities,
<http://www.unfccc.de/program/aij/aijoff.htm>
5. Activities Implemented Jointly: List of Projects,
<http://www.unfccc.de/program/aij/aijproj.html>
6. UNFCCC Guidelines on reporting and review, FCCC/CP/1999/7
7. Decision 1/CP.1, FCCC/CP./1995/7/Add.1, |Initial guidance on Policies, Programmes Priorities and Eligibility Criteria to the Operating Entity or Entities of the Financial Mechanism”
8. FCCC/CP/1996/15/Add.1, “Communications from Parties included in Annex I to the Convention: Guidelines, Schedules and Process for Consideration.”
9. FCCC/CP/1998/16/Add.1, “Additional Guidance to the Operating Entity of the financial mechanism.”
10. FCCC/CP/1999/6/Add.1, “Capacity Building”
11. FCCC/CP/1997/Add.1, “Development and transfer of technologies.”
12. FCCC/CP/1998/16/Add.1, “Development and transfer of technologies.”

