Preliminary Guidelines for Assessing Impacts of Climate Change

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PREFACE

When the Intergovernmental Panel on Climate Change (IPCC) completed its first Impacts Assessment in 1990 it became clear that much more work was needed if a credible global picture was to be drawn of the potential effects of climate change. In particular, the Assessment revealed how difficult it was to compare impacts in different regions and economic sectors that had been assessed using different methods. A compatible set of methods was needed to yield comparable regional and sectoral impact assessments.

Working Group II of the IPCC therefore established an expert group to develop some guidelines for the assessment of impacts of climate change. This report is the outcome of the work of the expert group. It is a preliminary report which the IPCC intends to develop and improve. It does not seek to prescribe a single preferred method but a range of methods, some of which may be more suitable than others to the task in hand, but which can yield broadly comparable results.

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1.1 Introduction

Variations in seasonal weather patterns are as much a feature of the modern world as they were in historical times and the effects of such variability are manifest across a range of natural systems and human activities. Until recently, these variations have been assumed to represent natural fluctuations about an essentially stable average climate. However, the observation that concentrations of certain trace gases in the atmosphere have been increasing rapidly, primarily as a result of human activities, has led to the realisation that changes in atmospheric composition are capable of affecting the surface climate of the earth.

The trace gases, especially carbon dioxide, methane, chlorofluorocarbons (CFCs) and nitrous oxide, have the property of permitting the fairly free passage of short wavelengths solar radiation from the sun through to the earth's surface, but absorbing the re-radiated radiation (at lower temperatures and higher wavelengths) from the earth. With the exception of CFCs, which are man-made, the natural occurrence of these gases in the atmosphere (along with water vapour, another strong absorber of terrestrial radiation) has maintained the earth's surface at average temperatures some 33 °C higher than would have been the case in their absence. Analogous to the effect of glass in a greenhouse, this mechanism has become known as the 'greenhouse effect', and the gases as greenhouse gases (GHGs).

Observed increases in GHG concentrations are thought to be altering the radiation balance of the earth, warming the surface and affecting the atmospheric circulation. It is this anticipated global warming of climate, the 'enhanced greenhouse effect', that has recently become the subject of great concern both locally and internationally. At a global scale, the rate and magnitude of predicted changes in climate are unprecedented in historical times, thus raising the question of their likely effects on physical processes, natural ecosystems and human activities and what, if any, measures there are for preventing or mitigating the more serious impacts.

1.2 Origins of this Report

In an attempt to clarify the issues and to identify the possible policy implications of the enhanced greenhouse effect at international level, the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO)established the Intergovernmental Panel on Climate Change (IPCC) in 1988. The IPCC was charged with assessing the scientific information relating to three aspects of the climate change issue:

(a) changes in climate arising from increasing greenhouse gas concentrations in the atmosphere;
(b) the environmental and socio-economic consequences of climate change; and
(c) the formulation of response strategies.

These three tasks were assigned respectively to three Working Groups: I, II and III.

The IPCC published its First Assessment Report in 1990. One component of this, 'The IPCC Impacts Assessment', was contributed by Working Group II (IPCC, 1990b). The IPCC agreed to continue its work within a long term framework, and entered a new phase, using the First Assessment Report as the starting point.

In August 1991, Working Group II, in its Fourth Plenary, agreed to establish an expert group to develop some guidelines for the assessment of impacts of climate change. A summary of those deliberations forms part of the Working Group II contribution to the IPCC 1992 Supplement (1992b). This report is the full version of the guidelines document, including background information on climate impact assessment, reference to further literature, and a number of examples of case studies and methods. While it has undergone peer review, it has not been formally approved by the IPCC.

1.3 General Objectives of Climate Impact Assessment

Climate impact assessment has two mutually-dependent objectives: first, to construct a firm scientific basis for evaluating the interactions of climate, environment and society, and second, to provide the best possible information not only to policy-makers but also to decision-makers and managers in all levels of government and in industry to enable them to predict future environmental impacts and socio-economic consequences and to formulate and implement appropriate responses.

The general responsibility of science is to expand the knowledge base for the common benefit. This should be achieved by developing the research methodology for assessment, collecting information on trends in the environment and in society, developing predictive tools for evaluating impacts, forging scientific links across disciplinary, institutional and political boundaries and communicating results objectively to other scientists, decision-makers and the public.

Policy-makers require climate impact assessments to provide them with the necessary scientific information for policy decisions. These decisions include considering the options for mitigating climatic change and/or adapting to it either by coping with, mitigating or exploiting its projected impacts. Assessments are required for different time and space scales, reflecting the time horizons and areas to which planning and decision-making apply. They could also provide a basis for negotiating global and transnational protocols for addressing climatic change issues, which lie outside the jurisdiction of individual policy-makers.

1.4 Scope of the Report

This report aims to provide preliminary guidelines on methods of climate impact assessment. It outlines a basic framework for the study of climate-environment-society interactions, with a particular emphasis on assessing the impacts of possible future changes in climate due to the enhanced greenhouse effect. Experience with evaluating the social and economic impacts of climatic change is at present limited. This report is therefore a preliminary one. It is desirable that future versions address these topics in more detail. The report does not aim to prescribe a single preferred method, but provides an analytical outline that comprises seven steps. A range of methods is identified at each step. Where possible the merits and drawbacks of different methods are discussed briefly, with some suggestions on their selection and use. Guidance is also offered on the organization of research and the communication of results.