

SCOPE 5
(Second Edition)

**Environmental Impact
Assessment**
Principles and Procedures

Edited for SCOPE by
R. E. Munn

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Edited for SCOPE by
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Foreword

The Scientific Committee on Problems of the Environment (SCOPE) was established by the International Council of Scientific Unions (ICSU) in 1969 to advance knowledge of the influence of the human race upon its environment as well as the effects of those alterations upon human health and welfare. It was intended to give particular attention to those effects which are either global or shared in common by several nations. It serves as a non-governmental, interdisciplinary, and international council of scientists, and as a source of advice for governments and inter-governmental agencies with respect to environmental problems.

SCOPE seeks to synthesize environmental information from diverse scientific fields, identifying knowledge gaps and disseminating the results. During the last several years the main emphasis has been on the following topics:

1. Biogeochemical cycles;
2. Dynamic changes and evolution of ecosystems;
3. Environmental aspects of human settlements;
4. Ecotoxicology;
5. Simulation modelling of environmental systems;
6. Environmental monitoring;
7. Communication of environmental information and societal assessment and response.

A number of publications have resulted, including *SCOPE 10: Environmental Issues*, which provides an overview of the environmental challenges of the next decade.

As a part of its efforts to improve scientific methods in those directions, SCOPE has been concerned with the scientific quality of procedures to prepare alternative environmental management strategies. This was the theme of *SCOPE 5: Environmental Impact Assessment: Principles and Procedures*, published in 1975 and widely recognized as an important international synthesis of 'EIA' methods. Its analysis draws upon thinking from all of the major activities of SCOPE.

Since 1975, many countries have adopted an EIA process, and there have been significant advances in methods of preparing them. That experience has revealed important lessons to be shared and applied if the preparation of impact assessments is to be genuinely useful. The time therefore seems appropriate to produce a second edition of SCOPE publication 5. The officers of SCOPE are grateful to Dr. R. E.

Munn for undertaking this task and to those who assisted him, particularly the participants of the Working Group that met in Toronto in October 1977. Dr. Martin Holdgate, reviewer of this report for SCOPE, made many useful suggestions.

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President of SCOPE

Preface

As the term is used in this book, *environmental impact assessment* (EIA) is an activity designed to identify and predict the impact on the biogeophysical environment and on man's health and well-being of legislative proposals, policies, programmes, projects, and operational procedures, and to interpret and communicate information about the impacts. Although the institutional procedures to be followed in the assessment process have been formalized in a number of countries, the scientific basis for these assessments is still rather uncertain. The published literature on the subject is scattered through many journals, and has not been evaluated critically in ways that are useful to managers and scientists. The assessor and his advisors are sometimes unaware of the fact that their task is not to prepare a scientific treatise on the environment, but rather to help the decision-maker select from amongst several choices for development and then to consider appropriate management strategies — quite a different goal.

Recognizing the need for an international review and synthesis of current practices, SCOPE organized a Workshop on EIA, with the co-sponsorship of the Canadian National Committee for SCOPE, the United Nations Environmental Programme (UNEP), Environment Canada, and UNESCO. The Workshop was held at Victoria Harbour, Canada, in February 1974, with participants from all continents and from many different disciplines and backgrounds. The book could not have been written by a single person; the prerequisite depth of knowledge in separate fields was too great.

The first edition appeared in early 1975, with a second printing in 1977. Translations have been published in both Japanese (through the initiative of Dr. Y. Shimazu, one of the Workshop participants) and French (through the sponsorship of the Canadian Department of the Environment).

Since 1975, the number of jurisdictions requiring impact assessments has increased, as well as the literature on assessment methods. In several countries, more than five years of operational experience provide a basis for examining the merits and failures of the EIA process in a better perspective than was possible in 1974. For these and other reasons, SCOPE convened a meeting in Toronto in October 1977 to prepare a second edition. Much of the original material remains, but Chapter 6 of the first edition has been merged with Chapter 1 and a new chapter on socio-economic methods has been added. In addition, there has been a major reorganization of the Appendices. Many new literature references have been added.

As in the first edition, no attempt has been made to describe methods of undertaking the detailed calculations required to ensure that environmental standards are met, e.g., for air, water, noise, and solid waste disposal. However, a feature of the second edition is Appendix 4.4, which gives a selection of engineering references that may be of help when designing to meet environmental standards.

I am indebted to the participants who offered consistently relevant and constructive comments and text. Special thanks must be given to Professor Frank Fenner for his help as Chairman of one of the Working Group Committees and for his advice as General Editor of SCOPE publications.

The intended readers fall into three main classes:

- (a) the decision-makers, as well as their policy and management advisors, in both the public and the private sectors;
- (b) the assessors, the reviewers, and their technical staffs and advisors who have responsibility for preparing and reviewing impact assessments;
- (c) the layman with an interest in environmental quality.

The principles embodied in this book are equally valid for both developing and developed countries. This is, in fact, one of the unique features of the publication.

January 1979

R. E. MUNN
Editor

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Summary

1. Definitions

An *action* is used in this text in the sense of any engineering or industrial project, legislative proposal, policy, programme or operational procedure with environmental implications.

An *environmental impact assessment* is an activity designed to identify and predict the impact of an action on the biogeophysical environment and on man's health and well-being, and to interpret and communicate information about the impacts.

2. Operational Procedures

- (a) Environmental impact assessments should be an integral part of all planning for major actions, and should be carried out at the same time as engineering, economic, and socio-political assessments.
- (b) In order to provide guidelines for environmental impact assessments, national goals and policies should be established which take environmental considerations into account; these goals and policies should be widely promulgated.
- (c) The institutional arrangements for the process of environmental impact assessment should be determined and made public. Here it is essential that the roles of the various participants (decision-maker, assessor, proponent, reviewer, other expert advisors, the public, and international bodies) be designated. It is also important that timetables for the impact assessment process be established, so that proposed actions are not held up unduly and the assessor and the reviewer are not so pressed that they undertake only superficial analyses.
- (d) An environmental impact assessment should contain the following:
 - (1) a description of the proposed action and of alternatives;
 - (2) a prediction of the nature and magnitude of environmental effects (both positive and negative);
 - (3) an identification of human concerns;
 - (4) a listing of impact indicators as well as the methods used to determine their scales of magnitude and relative weights;

- (5) a prediction of the magnitudes of the impact indicators and of the total impact, for the project and for alternatives;
 - (6) *recommendations for acceptance, remedial action, acceptance of one or more of the alternatives, or rejection;
 - (7) recommendation for inspection procedures.
- (e) Environmental impact assessments should include study of all relevant physical, biological, economic, and social factors.
 - (f) At a very early stage in the process of environmental impact assessment, inventories should be prepared of relevant sources of data and of technical expertise.
 - (g) Environmental impact assessments should include study of alternatives, including that of no action.
 - (h) Environmental impact assessments should include a spatial frame of reference much larger than the area encompassed by the action, e.g., larger than the 'factory fence' in the case of an engineering project.
 - (i) Environmental impact assessments should include both mid-term and long-term predictions of impacts. In the case of engineering projects, for example, the following time-frames should be covered:
 - (1) during construction;
 - (2) immediately after completion of the development;
 - (3) two to three decades later.
 - (j) Environmental impacts should be assessed as the difference between the future state of the environment if the action took place and the state if no action occurred.
 - (k) Estimates of both the *magnitude* and the *importance* of environmental impacts should be obtained. (Some large effects may not be very important to society, and *vice versa*.)
 - (l) Methodologies for impact assessment should be selected which are appropriate to the nature of the action, the data base, and the geographic setting. Approaches which are too complicated or too simple should both be avoided.
 - (m) The affected parties should be clearly identified, together with the major impacts for each party.

3. Research

Research should be encouraged in the following areas:

- (a) Post-audit reviews of environmental impact assessments for accuracy and completeness in order that knowledge of assessment methods may be improved. (No systematic post-audit programme has as yet been initiated in any country with experience in impact assessment.)

*Optional. In some jurisdictions, the environmental impact assessment process may stop short of making recommendations.

- (b) Study of methods suitable for assessing the environmental effects of social and institutional programmes, and of other activities of the nonconstruction type.
- (c) Study of criteria for environmental quality.
- (d) Study of quantifying value judgements on the relative worth of various components of environmental quality.
- (e) Development of modelling techniques for impact assessments, with special emphasis on combined physical, biological, socio-economic systems.
- (f) Study of sociological effects and impacts.
- (g) Study of methods for communicating the results of highly technical assessments to the non-specialist.

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