CONF-8910325--2

DE92 017826

The Scientific Challenges of NEPA: Future Directions Based on 20 Years of Experience

Edited by

Stephen G. Hildebrand
Associate Director
Environmental Sciences Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee

Johnnie B. Cannon
Associate Director
Energy Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee

Proceedings of the Ninth Life Sciences Symposium
The Scientific Challenges of NEPA:
Future Directions Based on 20 Years of Experience
Knoxville, Tennessee
October 24–27, 1989

PREFACE

January 1, 1990, marked the 20th anniversary of the signing of the National Environmental Policy Act (NEPA). Since this law was enacted, numerous institutions have assisted federal agencies in the implementation of NEPA, including the preparation of environmental impact statements and environmental assessments. The Ninth Oak Ridge National Laboratory Life Sciences Symposium was dedicated to the celebration of this anniversary. The symposium was held October 24–27, 1989, in Knoxville, Tennessee. The intent of the symposium was (1) to review what has been learned while performing NEPA assessments, (2) to summarize the state-of-the-art in methods and approaches, and (3) to define future opportunities and new approaches required to link high quality science to the decision-making process. The conference consisted of invited papers, contributed papers, and a poster session that maximized participation. Plenary sessions addressed the future of science in environmental policy, environmental impact assessment abroad, the integration of NEPA with other environmental laws, and the future challenges of NEPA. Technical sessions addressed the NEPA process, assessing impacts to ecological resources, assessing social impact, advanced assessment techniques, quantifying sources and fate of environmental pollutants, regional and global issues, cumulative impacts, state environmental policy act experience, NEPA follow-up studies, the role of public involvement, international experience, and impacts to human health.

Financial sponsors of this symposium included the Oak Ridge National Laboratory and the Hazardous Waste Remedial Actions Program (managed by Martin Marietta Energy Systems, Inc., for the U.S. Department of Energy under contract

DE-AC05-84OR21400); the U.S. Environmental Protection Agency; the U.S. Fish and Wildlife Service; and the Electric Power Research Institute. We are grateful for the resources that provided support for both the conference and the preparation of this book.

We express sincere gratitude to Sandy Bell, Rita Wadlington, Jennifer Seiber, Bonnie Reasor, and Joy Lee for their assistance in preconference arrangements and their logistic support during the conference. Joe Rich led the team that produced the book and was assisted early in the process by Charlie Hagan. Shirley Wright, Felicia Reeves, Lisa Haff, and Lana McDonald spent long hours word processing the book. Their dedication is sincerely appreciated.

Stephen G. Hildebrand

Johnnie B. Cannon

June 1992

CHAPTER 1

INTRODUCTION

S. G. Hildebrand and J. B. Cannon, Oak Ridge National Laboratory, Oak Ridge, Tenn.

A logical outgrowth of the environmental awareness of the 1960s was the passage of the National Environmental Policy Act of 1969 (NEPA), Public Law 91-190, by the 91st Congress on January 1, 1970. The purposes of NEPA were to establish a policy that would encourage harmony between man and the environment, prevent or eliminate damage to the environment, stimulate the health and welfare of man, enrich the understanding of ecological systems and resources important to the nation, and establish the Council on Environmental Quality. One particular segment of NEPA [Section 102(2)(c)] has had a profound impact on the evolution of applied science in the United States and abroad. This section of NEPA established the basis for requiring federal agencies to prepare environmental assessments and environmental impact statements. The challenge to physical scientists, biological scientists, and social scientists presented by NEPA was to predict adverse (and beneficial) impacts on the environment arising from the execution of a wide range of projects, policies, and programs across the federal establishment. The evolution of the NEPA process has been a rocky one, and the development of technical skills, approaches, and

methods to provide the necessary predictive capability has been a major focus of many scientists over the last 20 years.

During the 1970s, the early experience with NEPA evoked criticism from the technical community as well as the policy makers. Fairfax suggested that NEPA implementation was a disaster (Fairfax 1978). For many scientists involved in NEPA in the early days, the critical editorial by D. W. Schindler was particularly disturbing (Schindler 1976). He maintained that the idea of NEPA protecting the environment had backfired. He criticized the process for developing a *gray literature* that was nothing more than massive amounts of uninterpreted and incomplete descriptive data. Scientists participating in the process were characterized as a *traveling circus* who produced products that seldom received hard scrutiny similar to peer review in scientific journals. He characterized the methods employed in the NEPA process as *ancient, descriptive textbook techniques*, that did not take advantage of new developments in science. Schindler even suggested the scientific method was in jeopardy. Schindler's viewpoint was refuted (Auerbach et al. 1976), but he certainly got the attention of the research scientists as well as the applied scientific community. Additional criticism of the NEPA process, as practiced in the 1970s, proliferated. Efford (1975) characterized a mid-1970s approach to impact assessment of hydroelectric dams in Canada as *haphazard*. He suggested that old techniques of limnology and ecology were used and that questions to be addressed were not systematically defined. The result was that biologists and ecologists were not capable of providing precise evidence in court on *serious* or *irreparable* injury. Eberhardt

(1976) reviewed ecological approaches to making impact assessment quantitative. He concluded that experimental approaches utilizing preproject and postproject studies at affected and control sites suffered from lack of replication in the NEPA process. He questioned the use of basic ecological data on productivity and diversity and recommended, among other things, that improved ecological census methods should be developed.

Two studies in the 1980s further evaluated technical performance in the environmental assessment process. The National Science Foundation commissioned a study of ways to improve the scientific content and methodology of an environmental impact analysis (Indiana University 1982). A major point of this study recognized that impact assessments in the NEPA context are not *scientific* documents, but that *science* is certainly used in the NEPA process. It was emphasized that advancements in science alone will not necessarily strengthen the scientific quality of impact assessments. This policy-oriented analysis began to focus on the social science needs and the way in which science can contribute to policy issues. An excellent study of the role of basic ecology in environmental assessment was completed in Canada (Beanlands and Duinker 1983). This thorough study defined requirements for conducting ecological impact studies and made recommendations pertaining to institutional aspects of impact assessment. The 1980s also witnessed the signing of the "Peace Treaty for the Hudson," a classic case study in the role of science in impact analysis (Christensen et al. 1981). This out-of-court settlement ended 17 years of controversy over the impact of electric power generation

on Hudson River fish populations. This case provided one profound lesson for all involved in environmental impact assessment: once technical issues are formally delineated, it is possible to carry out scientific assessments. It is inevitable, however, that these assessments will also always be made challenging by the complexity of biological systems, by limited ability to describe such systems, and by the interests of various parties and institutions whose conflicts provide the basic forces for the assessment process. The case also documented the effectiveness of adjudicatory hearings as a powerful stimulus for defining and resolving issues that are both important to society and amenable to scientific analysis.

Impact assessment today should benefit from more than 20 years experience with the NEPA process. This book presents examples of the state of science in impact assessment based on the learning of two decades. Individual chapters address the process itself, examples of recent experience with ecological impact assessment, evaluation of social impact assessment and the important role the public must play, the difficult challenge of assessing cumulative effects of multiple impacts, the regional and global implications of NEPA, the important role of follow-up studies in the process, and federal, state, and international experience. Contributors of individual papers represent the major sectors that have been key participants in the process from the beginning (academia, national laboratories, federal agencies, state agencies, the private sector, and foreign nations). Both the topical diversity evidenced in this book and the representation of the major players provide a comprehensive snapshot of the NEPA process as we face the NEPA challenges of the 1990s.

The technical challenge of NEPA for the future has several dimensions. There is a continuing need for scientifically defensible analyses in NEPA documents. The NEPA approach to decision making is being utilized for issues of ever-increasing complexity and scope. The difficult technical issues surrounding acidic deposition, global climate change, and management of hazardous wastes are a few examples of the types of problems where scientific uncertainty is great. NEPA assessments must always frame conclusions acknowledging this uncertainty. The NEPA process will serve as an important public forum for evaluating these and other issues, and scientific input to the process continues to be essential for rational decision making. Integrating the complex regulatory requirements for hazardous waste management under the Resource Conservation and Recovery Act, the clean up of past waste operations under Superfund, and the consideration of environmental consequences of these activities under NEPA are current challenges facing managers of many federal facilities. The technical experience with NEPA documented in this book should be a useful reference for addressing these types of issues.

NEPA is an important statute for both the public and scientific community. Experience dictates that NEPA analyses receive widespread public review and comment and assist federal agencies in giving careful consideration to the environmental effects of their actions. The NEPA process gives other agencies, public interest groups, and the general public opportunity to express alternative views and debate significant issues. Thus, the NEPA process provides an important public forum for discussing the environmental effects of federal government activities and

major environmental issues. The role of scientists in this process should be to continually improve the predictive capability of their respective technical disciplines to address environmental issues and to explicitly state the uncertainty of their predictions. We hope this book stimulates scientific progress in fulfilling the intent of NEPA in the next 20 years equal to the progress realized in the first 20 years.

REFERENCES

Auerbach, S. I., R. W. Brocksen, R. B. Craig, F. O. Hoffman, S. V. Kaye, D. E. Reichle, and E. G. Struxness. 1976. Environmental Impact Statements (Letter to the Editor). Science 193:188.

Beanlands, G. E., and P. M. Duinker. 1983. An Ecological Framework for Environmental Impact Assessment in Canada. ISBX O-7703-0460-S. Dalhousie University, Institute for Environmental Studies, Dalhousie University, Halifax, Nova Scotia, Canada.

Christensen, S. W., W. Van Winkle, L. W. Barnthouse, and D. S. Vaughn. 1981. Science and the Law: Confluence and conflict on the Hudson River. EIA Rev. 2(1):63–88.

Eberhardt, L. L. 1976. Quantitative ecology and impact assessment. J. Environ. Manage. 4:27–40.

Fairfax, S. K. 1978. A disaster in the environmental movement. Science 199:743–47.

Indiana University School of Public and Environmental Affairs. 1982. A study of ways to improve the scientific content and methodology of Environmental Impact Analysis. Final report to the National Science Foundation on Grant PRA-79-10017, Bloomington, Ind.

Schindler, D. W. 1976. The impact statement boondoggle. Science 192:50.