

**A MANUAL FOR A COURSE ON THE
ENVIRONMENTAL ASPECTS OF
INDUSTRIAL DEVELOPMENT**

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Prepared by:

**The International Program on the Environmental Aspects
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Prepared for:

**The Office of Science and Technology
Agency for International Development
United States Department of State
Washington, D.C. 20520**

**Dr. Daniel A. Okun, Program Director
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Prepared Under AID Contract No. Ta-C-1340

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THE ENVIRONMENTAL ASPECTS OF INDUSTRIAL DEVELOPMENT**

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U.S.A.**

ESE Publication #556

for

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1979

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Reference Volumes

- VOLUME 2. Environmental Issues, Impact and Assessment
of Industrial Development
- VOLUME 3. Environmental Policy, Management and Regula-
tion
- VOLUME 4. The Nature of Environmental Pollution
- VOLUME 5. Environmental Case Studies

INTRODUCTION

The International Program on the Environmental Aspects of Industrial Development was initiated in 1973 by Professor Arthur C. Stern of the Department of Environmental Sciences and Engineering of the University of North Carolina and the United Nations Industrial Development Organization (UNIDO) and mounted with the strong support of Bill Long, then of the Office of Science Technology of the Agency for International Development (AID) of the U. S. Department of State. The program as originally conceived involved an 11-week course in the United States, including 8 weeks on the campus of the University of North Carolina and 3 weeks of field experience. The second and third courses in 1975 and 1977 were shortened to 8 weeks and 4 weeks respectively with short field trips incorporated into the program. The shortening of the program was to permit attendance of those not able to leave their responsibilities for lengthy periods.

In all, 78 participants from 39 countries in Latin America, Asia, Africa, the Middle and Near East, and Europe attended. They included virtually every profession with any interest in development and/or the environment: engineers, scientists, lawyers, economists, administrators, etc. A list of the participants is appended at the end of the manual.

The instructors in the courses were drawn primarily from the faculty of the Department of Environmental Sciences and Engineering, but other faculty from the University of North Carolina and neighboring educational institutions as well as experts from industry and government were also involved in the presentations. A list of those who lectured in the IPEAID courses is also appended.

It was recognized that the number of policy makers and others who are involved in the environmental aspects of development who could be reached through such courses in the United States is extremely limited. Accordingly, a series of short 1 to 3-day seminars was designed for conduct in the countries themselves. IPEAID participants helped initiate these courses, and help was also received from engineers in the AID missions in these countries who had participated in one of a series of 2-week courses in the AID Engineers Environmental Program held at UNC. In all eight such seminars were conducted in Honduras, Guatemala, Costa Rica, El Salvador, Egypt, Ghana, Kenya, and Guyana.

This manual was conceived to be an aid to those who might wish to organize courses of study or seminars on the environmental aspects of development to enable them to profit from experience gained by the University of North Carolina in conducting these courses. The lectures utilized in our programs and the participants who attended the on-campus courses are listed as potential resources for those who might be interested in organizing such courses.

This manual illustrates how such courses can be organized, and four reference volumes have been compiled from source materials used by the lecturers in the program as well as from case studies prepared by participants in the program. Also, other resource material is drawn from lectures in the country seminars. In no way is this manual and its four reference volumes intended to be all that would be necessary for organizing a course or seminar, but it can be a useful beginning upon which program planners can enlarge, drawing upon resources appropriate to their own local situation.

In addition to those already mentioned, the important contributions of others should be recognized. In particular, Ms. Molly Kux of the AID Office of Science and Technology, program manager for IPEAID, maintained close contact with the courses, attended many of the seminars, reviewed the manual and the reference volumes, and altogether provided invaluable guidance throughout the program. In addition, Mr. F. Eugene McJunkin and Professor Arthur Stern served as program consultants, Ms. Charlotte Hermann as program coordinator, and Mr. Ron Sims as program assistant for early IPEAID courses. The responsibility for the last course, all the country seminars and for preparation of the manual and the reference volumes rested with Dr. Daniel A. Okun, Program Director; Ms. Phyllis Carlton, Program Coordinator; and Mr. Paul V. Hebert, Program Assistant. Mr. Joseph Gadek also served as a Program Assistant during the final on-campus course.

Credit also goes to the many agencies, in addition to AID, who sponsored participants for both on-campus and overseas seminars. These agencies and organizations include: United Nations Industrial Development Organization (UNIDO); World Health Organization (WHO); Pan American Health Organization (PAHO); United Nations Environment Program (UNEP); Central American Research Institute for Industry (ICAITI); Regional Office for Central American Programs (ROCAP); National Council of Scientific and Technical Research (CONICIT); Central American Institute of Public Administration (ICAP); National Commission on Ecology in San Salvador; Government of Kenya-National Environment Secretariat (NES); Government of Ghana-Environmental Protection Council (EPC); Government of Egypt-University of Alexandria-High Institute of Public Health (HIPH); Government of Guyana-National Science Research Council (NSRC); and the various AID Missions stationed in countries which sent representatives to participate in the short courses and seminars.

Of course, there are many friends and university and agency support personnel who were responsible for the successful accomplishments of the IPEAID series. It is impossible to list all the names. However, we would like to express our sincere gratitude to all persons who worked to the advantage of IPEAID in these many different capacities.

A Manual for a Course
on the Environmental Aspects of Industrial Development

I. Purpose and Scope of the Manual

This manual and its supporting reference volumes are intended to aid those interested in establishing programs on the environmental aspects of development. It is based on experience gained by the staff of the Department of Environmental Sciences and Engineering in the conduct of several such courses held on the University of North Carolina campus for participants from developing countries, and from a number of short seminars conducted in several developing countries, all sponsored by the Agency for International Development as part of UNC's International Program on the Environmental Aspects of Industrial Development (IPEAID).

The manual provides program guides, primarily in the form of suggested curricula, general readings, references by topic areas, and other supporting materials. Four reference volumes are printed separately. Those organizing similar programs would tailor their own programs to the particular needs of the intended participants, the country or countries from which they come, and the time available for the course.

II. Purpose of the Program

The purpose of developing and presenting a course of this nature is to provide a background for policy makers, industrialists, planners, economists, and educators from developing countries on the environmental aspects of industrial development. Industrial development in this context is considered to include all types of physical development including agriculture, transportation, all types of power production, etc. Particular emphasis is placed on methods and techniques for anticipating and assessing the potential environmental impacts associated with various types and levels of industrialization and development and with the technologies, methods and associated economic, social, and health effects of adopting alternative approaches to the protection of environmental quality and health.

Generally, the course should provide an overview of available pollution control technologies and policy alternatives at a level of detail appropriate for individuals concerned with development in general. It should not be a detailed course of instruction for the technical specialist concerned with a specific pollution control program or industrial manufacturing process.

The course materials presented in this manual draw in part on United States problems and experience, relating them to the differing socio-cultural-economic conditions and development priorities in the developing countries. The examples of various institutional and legal approaches to pollution control in industrialized countries are presented not as normative or sole solutions but to provide an opportunity to examine the experience gained in attempting to implement alternative approaches.

Such a course is appropriate for presentation in the United States, other developed countries, or in developing countries themselves. Presentation of the course in a developed country would allow for easier access to a wide variety of relevant materials, the use of experienced instructors, and would draw participants from several different developing countries, hopefully with common environmental problems and at similar stages of economic development. Presentation of a course in a developing country itself would require some sacrifice in the number of experienced instructors that could be utilized, but the course could then focus better on the problems of that particular country or geographical region. Also, the course can then be given in the language of the country and the costs would be substantially less.

To make a course to be given in a developed country economically justifiable, the length of the course should be at least two, and preferable four, weeks. This would perhaps limit the participation of the leading administrative and policy-making officials from the developing countries, but could accommodate authorized representatives of these officials. Courses with a

developing country, on the other hand, can be more flexible in their design and scope of activity, allowing for diversity or homogeneity of participants and the areas of expertise.

III. Organization and Development of the Course

The course should be organized based on the needs to be met and particularly on the backgrounds of the prospective participants. The organizers must make the decisions regarding the focus, the participants desired, and the scope and length of the course. In addition to utilizing local resources to the fullest, the organizers should utilize the considerable assistance available from international and other organizations, such as the United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), United Nations Educational, Scientific, and Cultural Organization (UNESCO), World Health Organization (WHO), Pan American Health Organization (PAHO), the World Bank (IBRD), United States Agency for International Development (USAID), and other regional and national assistance agencies. A listing of organizations concerned with the environment is presented at the back of this manual. In addition, help may be available from the University of North Carolina.

The Participants. Participants who should benefit most from the course are senior-level officials from ministries of economic planning and industrial development, newly established or enlarged national environmental protection agencies, established government agencies responsible for planning, monitoring, and regulation of industrial operations, executives from industry and industrial research institutes, and university faculty members concerned with industrialization or with environmental protection. A special group of participants might well include personnel from industrialized countries who are involved in training personnel in developing countries or who themselves are involved in development projects in developing countries, as representatives of international or bilateral assistance agencies. For example, a series of six two-week courses was run at UNC for engineers from AID to apprise them of the possible environmental consequences of development projects for which they are responsible. The number of participants in a course should be based on the length of the course and professional level of the participants. Courses for senior level officials should be limited in number, ranging between 10 and 15 participants. Courses for technicians might serve 20 to 30 participants. The short seminars could accommodate up to 50 participants. A general guide to determining the appropriate size of the participant group is the intended length of the program. The longer courses, those to span more than 2 weeks, should be limited to a smaller group, 10-15 participants; whereas the shorter courses, those to be run for only 2 to 3 days, could accommodate up to 50 participants.

Prerequisites. As illustrative, the prerequisites for participation in the 4-week IPEAID program on the University of North Carolina campus included possession of a university degree, significant professional or administrative experience, and the endorsement and support of the agency sponsoring the applicant. A working command of written and spoken English is essential, if the course is held in the United States or if outside speakers

are used who come from English-speaking countries, and applicants may be required to take a language proficiency test. Participants should be nominated by the sponsoring agency and approved by the program organizer.

IV. Course Curriculum and Schedule

Introduction. The following course curriculum and general schedule are presented to illustrate a comprehensive course on the environmental aspects of development. The curriculum is set up for a course which would last for approximately one month. The number of sessions suggested for each sub-topic is based on a one-month course.

Topics are grouped under four major headings:

- 1) Environmental issues and procedures for environmental impact analysis
- 2) Environmental policy, management and regulation
- 3) The nature of environmental pollution; and
- 4) Environmental case studies.

For field trips, the participants might be grouped into smaller sections with common interests. This procedure also provides an opportunity for fostering closer, more informal, relationships between staff and participants. Examples of appropriate field trips includes:

- 1) Visits to environmental management and regulatory agencies at local, regional, state, or national levels.
- 2) Visits to one or more industrial sites such as pulp and paper mills, power plants, textile mills, mines and/or ore processing sites, food processing plants, agro-business.
- 3) Visits to combined industrial-municipal wastewater treatment facilities.
- 4) Visits to environmental research or educational facilities.

The curriculum is presented as a guide, as the time available, the type of group participating, the locale of the course, and resources available would determine the extent to which modifications in the curriculum schedule would be necessary or desirable. Generally, presentations are organized along the lines of development interests, rather than by dividing the subject matter into various types of pollution. However, depending on the background of the participants, some focus on the various media, such as water, air, and soil, is helpful in providing to the technically uninitiated a minimum base of understanding of the media and the transformations that can take place within them. Where the participants have a high level of technical competence and background, this section of the curriculum may be

minimized. The curriculum has topics divided along both lines, so that content should be dependent on the interests of the participants.

Participant Presentations. A most valuable part of this program should be the discussions of particular problems in the participants' countries and regions. A substantial portion of time in the schedule throughout the course is allowed for round-table discussions of such problems.

When arrangements are made for the participants to attend the course, they should be advised to bring materials (maps, reports, slides, etc.) concerning development projects with which they are involved. Each participant should then be obliged to make a formal presentation on this project. This may take the form of an environmental impact assessment, a proposal for an environmental management program, or some other topic that is germane to the program. Sufficient time should be allotted for discussion following each presentation. These presentations should be of value both to the individual participant making the presentation and to the other participants who will recognize problems similar to their own.

ONE-MONTH ILLUSTRATIVE COURSE

CURRICULUM: MAJOR TOPICS

Total Number of Sessions: 47
Duration of Each Session: 75 minutes
Number of Participants: 10-15

A. Environmental Issues and Procedures for Environmental Impact Analysis

<u>No. of Sessions</u>	<u>Topic and Description</u>
1	<u>Environmental Issues of Major Concern</u> : the growth of population, pollution, and industrialization on a world wide scale.
1	<u>Environmental Implications of Development</u> : overview of environmental degradation and health effects, which often accompany large scale development.
1	<u>Effects of Pollution on Environmental Quality</u> : sources of major pollution problems and overall effects on the environment, economy, and on the quality of life.
1	<u>Impact of Development Projects on Ecological Systems</u> : the major impact of development projects and industrial activities on fauna, flora, and on entire ecosystems.
1	<u>Impact of Development on Human Health</u> : the disease implications of development projects and industrialization including water-borne diseases, bacterial and other intestinal diseases, schistosomiasis, onchocerciasis, and others; and toxic and chronic effects of chemical pollution of the water, air, and soil.
1	<u>Socio-Economic Impact of Development</u> : the implications of adverse changes on human settlements and on existing local economic structures.
1	<u>Environmental Assessment Requirements</u> : the types of projects requiring detailed environmental assessments and the types of impacts to be considered.

1 Preparation of Environmental Impact State-
ments: details of preparation of EISs; based
on US experience and experience in developing
countries.

2
10 Roundtable Discussion: environmental assess-
ments of development activities in partici-
pant countries.

B. Environment Policy, Management and Regulation

1 Policies for Environmental Control and Man-
agement: overview of policy alternatives
available including administrative, legal,
economic mechanisms for controlling environ-
mental degradation.

1 Administrative and Institutional Approaches:
institutions and administrative framework
necessary to manage and regulate activities
which degrade environmental quality; with
specific examples of such institutions.

1 Legal Approaches to Environmental Control:
the use of the law and the courts to regulate
activities which degrade the environment; use
of specific examples.

1 Economic and Financial Considerations: dis-
cussion of externalities, economic incentives
and alternative means of financing environ-
mental control measures.

2 Development and Use of Environmental Quality
Standards: the criteria used and objectives
of environmental quality standards; refer-
ences to air and water quality standards; the
application and enforcement of standards
(monitoring).

1 Regulatory Control of Industry: governmental
approaches to controlling industrial pollu-
tion.

1 Site Selection for Development Projects: the
criteria necessary for site selection for
industrial development projects, considering
environmental quality objectives.

1 Lane Use Planning and Environmental Quality:
planning as a tool for directing growth and
development projects considering environmen-
tal quality objectives.

2
11 Roundtable Discussions: environmental poli-
cies and management in the participants'
countries or regions.

C. The Nature of Environmental Pollution

4 Water Pollution: sources of pollution, im-
pacts, treatment and disposal of wastewaters
and monitoring.

4 Air Pollution: sources of pollutions, im-
pacts, meteorology, control technology and
monitoring.

3 Solid Wastes: impacts, soil and groundwater
pollution, generation of wastes, collection,
disposal and resource recovery.

1 Radiation and Noise: the potential hazards
of various types of ionizing and non-ionizing
radiation; and the sources, impacts and con-
trol of excessive noise.

2 Environment of the Industrial Worker and
Occupational Health and Safety: the hazards
of the industrial environment and the methods
available for their control.

2
16 Roundtable Discussion: the nature and extent
of pollution in the environments of the par-
ticipants' countries or regions.

D. Environmental Case Studies

1 Water Resource Development

1 Transportation Development

1 Power Development

1 Urbanization

2 Industrial Development: pulp and paper manu-
facturing, textile manufacturing, food pro-
cessing, mining and other industries.

2 Agricultural Development: pesticides, or-
ganic wastes, fertilizers.

2
10 Roundtable Discussion: specific development
projects of particular environmental concern
to participants.

ILLUSTRATIVE SCHEDULE FOR A THREE-DAY SEMINAR
ON ENVIRONMENTAL ASPECTS OF DEVELOPMENT

As an alternative to presenting a comprehensive course such as just outlined, it may be desirable to initiate one or more short seminars on the same topic. Such a program would entail much less preparation and could be organized and run by only a few individuals. An illustrative schedule for a 3-day seminar program is presented below.

THREE-DAY SEMINAR ILLUSTRATIVE SCHEDULE

Total Number of Sessions: 10
Duration of Each Session: 60-75 min.
Number of Participants: 30-50

Day One:

<u>Session Number</u>	<u>Topic and Description</u>
1	<u>Environmental Issues</u> : summary of major environmental issues with specific reference to developing countries.
2	<u>Industrial Pollution</u> : description of industrial pollution sources, types, and impacts.
3	<u>Health Impacts of Pollution</u> : major health problems resulting from pollution from various sources.
4	<u>Government's Role in Pollution Control</u> : description of administrative, legal, and financial alternatives available to government in controlling pollution.

Day Two:

5	<u>The Environmental Impact Statement</u> : description of the use and details of preparation of environmental impact statements in LDCs.
6	<u>Use and Development of Standards</u> : types and levels of environmental standards and details of their implementation and enforcement.
7	<u>Economic and Financial Approaches</u> : description of economic incentives, externalities, and financial considerations in pollution control.

8

Roundtable Discussions on the Above Topics.

Day Three:

9

Case Studies of Environmental Problems: presentation of case studies on pollution, or environmental degradation in the participants' regions.

10

Roundtable Discussion: discussion of case studies and potential approaches to resolution of specific environmental problems.

Field trips could be considered at the end of the seminar if feasible.

V. IPEAID Speakers and Participants

Two fundamental aspects of any successful program are the speakers who conduct the sessions, and the participants who are active in the exchange of information. The IPEAID program has been particularly fortunate in attracting high-caliber individuals to fill both these roles.

The speakers and course leaders have included university professors, businessmen, consulting engineers, leaders of various state and federal agencies, and professionals from all realms of environmental concern. Many of the speakers have participated in both the campus courses (1973, 1975, and 1977) and the overseas seminars. The participants have, in some instances, become lecturers for later courses.

Following are listings of the lecturers and the participants for the 1973, 1975, and 1977 on-campus courses.

Department of Environmental Sciences and Engineering

Faculty Lecturers in IPEAID Courses and Seminars

Professor Emeritus George E. Barnes
Professor of Sanitary Engineering

Professor Emil T. Chanlett
Professor of Sanitary Engineering
Environmental Management and Protection

Professor Russell F. Christman
Department Chairman
Professor of Environmental Sciences and Engineering
Environmental Chemistry and Biology

Professor Donald L. Fox
Assistant Professor of Environmental Sciences and Engineering
Air and Industrial Hygiene

Professor Donald E. Francisco
Lecturer
Environmental Chemistry and Biology

Professor David A. Fraser
Professor of Industrial Health
Air and Industrial Hygiene

Professor Robert L. Harris, Jr.
Professor of Environmental Sciences and Engineering
Air and Industrial Hygiene

Professor Harvey E. Jeffries
Assistant Professor of Environmental Sciences and Engineering
Air and Industrial Hygiene

Professor Edward J. Kuenzler
Professor of Environmental Biology
Environmental Chemistry and Biology

Professor James C. Lamb, III
Professor of Sanitary Engineering
Water Resources Engineering

Professor Donald T. Lauria
Associate Professor of Environmental Sciences and Engineering
Water Resources Engineering

Professor Daniel A. Okun
Kenan Professor of Environmental Sciences and Engineering
Water Resources Engineering

Professor Parker C. Reist
Professor of Environmental Sciences and Engineering
Air and Industrial Hygiene

Professor Jabbar K. Sherwani
Associate Professor of Hydrology, Systems Analysis and Water Resources
Water Resources Engineering

Professor Morris A. Shiffman
Professor of Environmental Health
Environmental Management and Protection

Professor Philip C. Singer
Associate Professor of Environmental Sciences and Engineering
Water Resources Engineering

Professor Emeritus Arthur C. Stern
Professor of Air Hygiene
Air and Industrial Hygiene

Professor Alvis G. Turner
Associate Professor of Environmental Sciences and Engineering
Environmental Management and Protection

Invited Lecturers in IPEAID Courses on UNC Campus

Dr. Robert Baker (1973)
Director
Environmental Sciences Division
Teledyne Brown Engineering
Huntsville, Alabama 35804

Remi Barre (1975)
Consulting Economist
Systems Analyst
13, Rue de la Cerisaie
75004 Paris, France

Mr. Page Benton
Head, Water Quality Section
Division of Environmental Management
Raleigh, N. C. 27611

Dr. Leonard Berry (1977)
Professor of Geography
Co-Director, International Development Program
Clark University
Worcester, Massachusetts 01610

Mr. Thomas Broughton (1977)
Director
Economic Development Division
N. C. Department of Commerce
Raleigh, N. C. 27611

Dr. James C. Brown (1975)
Consulting Engineer
Olsen Associates
Post Office Box 10666
Raleigh, N. C. 27605

Professor William A. Burgess (1973)
Associate Professor of Environmental Health and Safety Engineering
Department of Environmental Health Science
Harvard School of Public Health
Cambridge, Massachusetts 02115

Dr. Paul Busch (1973)
Vice President
Malcolm Pirnie Engineers, Inc.
White Plains, New York 10602

Dr. William A. Campbell (1975, 77)
Assistant Director
Institute of Government
University of North Carolina
Chapel Hill, N. C. 27514

Dr. Thomas D. English (1975)
National Environmental Research Center
Environmental Protection Agency
Research Triangle Park, N. C. 27709

Mr. Curtis Farrar (1975)
Acting Assistant Administrator for Technical Assistance
Agency for International Development
Department of State
Washington, D. C. 20523

Dr. Charles E. Feigley (1977)
Department Environmental Health Sciences
School of Public Health
University of South Carolina
Columbia, S. C. 29208

Professor Benjamin Ferris (1973)
Professor Environmental Health and Safety
School of Public Health
Harvard University
Cambridge, Massachusetts 02115

Mr. James V. Fitzpatrick (1973)
President
Environmental Analysts Incorporated
Garden City, New York 11530

Dr. Jean French (1973)
Research Epidemiologist
Division of Human Studies
National Environmental Research Center
Environmental Protection Agency
Research Triangle Park, N. C. 27711

Prof. Leonard Goldwater (1973)
ELB Associates
400 Eastowne Drive
Chapel Hill, N. C. 27514

Dr. Robert Goodland (1977)
Office of Environmental & Health Affairs
World Bank
1818 H Street NW
Washington, D. C. 20433

Ms. Delores Gregory
Director, Division of Visitors and Information Exchange
Office of International Activities
US Environmental Protection Agency
Washington, DC 20460

Professor Milton S. Heath, Jr. (1973)
Prof. of Public Law & Government
Institute of Government
University of North Carolina
Chapel Hill, N. C. 27514

Dr. David Hemenway (1973)
Assistant Professor
Department of Civil Engineering
University of Vermont
Burlington, Vermont 05401

Mr. Neal A. Hill (1975)
President
Hill Environmental Group
NCNB Plaza/610 Concordia Court
Chapel Hill, N. C. 27514

Dr. Edward Kaiser (1975, 77)
Associate Professor
Department City & Regional Planning
University of North Carolina
Chapel Hill, N. C. 27514

Dr. Donald R. King (1975)
Science Advisor
Office of Environmental Affairs
Department of State
Washington, DC 20520

Dr. Lawrence D. Kornreich (1975, 77)
Environmental Health Associate
ITT Corporation
320 Park Avenue
New York, New York 10022

Dr. George J. Kriz (1975, 77)
Associate Director
Agricultural Experiment Station
N. C. State University
Raleigh, N. C. 27607

Mr. Robert E. Leak (1973)
Director, Office of Industrial Tourist and Community Resources
N. C. Department of Natural Resources and Community Development
Raleigh, N. C. 27611

Dr. Linda W. Little (1973)
Biologist
Research Triangle Institute
Post Office Box 12194
Research Triangle Park, N. C. 27709

Mr. William L. Long (1975)
Environmental Affairs Specialist
Office of Science and Technology
Agency for International Development
Washington, D. C. 20523

Mr. F. Eugene McJunkin
Environmental Services Corporation
Post Office Box 2427
Chapel Hill, N. C. 27514

Professor Cutris McLaughlin (1973)
Professor of Business Administration
University of North Carolina
Chapel Hill, N. C. 27514

Dr. K. Hosny Mancy
Professor of Environmental Chemistry
Department Environmental & Industrial Health
School of Public Health
University of Michigan
Ann Arbor, Michigan 48104

Mr. Michael A. Maxwell (1975)
Gas Cleaning & Metallurgical Process Branch
Control Systems Laboratory
Environmental Protection Agency
Research Triangle Park, N. C. 27711

Dr. William H. Miernyk (1973)
Professor of Economics, and Director,
Regional Research Institute
West Virginia University
Morgantown, West Virginia 26505

Dr. David Moreau (1977)
Associate Professor of Systems Analysis & Planning
University of North Carolina
Chapel Hill, N. C. 27514

Dr. Barry Moriarity (1977)
Associate Professor of Geography
University of North Carolina
Chapel Hill, N. C. 27514

Mr. Brock Nickelson (1977)
Chief Engineer, Air Quality Section
Division of Environmental Management
N. C. Department Natural Resources & Community Development
Raleigh, N. C. 27611

Mr. James T. Peterson (1975)
Meteorologist
Meteorology Lab
Environmental Protection Agency
Research Triangle Park, N. C. 27711

Mr. Alan Rimer (1977)
Consulting Engineer & Vice President
Wiggins-Rimer Associates
Durham, N. C. 27707

Dr. Peter Robinson (1977)
Assistant Professor of Geography
University of North Carolina
Chapel Hill, N. C. 27514

Dr. James A. Roseboro (1975)
Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, California 91103

Dr. Jean J. Schueneman (1973)
Director
Control Programs Development Division
Office of Air Quality & Planning Standards
Environmental Protection Agency
Research Triangle Park, N. C. 27711

Dr. Carl M. Shy (1975, 77)
Director
Institute for Environmental Studies
University of North Carolina
Chapel Hill, N. C. 27514

Mr. Herbert Smallwood (1975)
Ralph Stone and Company, Inc.
10954 Santa Monica Boulevard
Los Angeles, California 90025

Mr. Ralph Stone, President
Ralph Stone and Company, Inc.
10954 Santa Monica Boulevard
Los Angeles, California 90025

Dr. Jean Tixhon
Office of Environmental Health Affairs
World Bank
1818 H Street, NW
Washington, D. C. 20433

Col. James L. Trayers (1973)
Senior Staff Member
Council on Environmental Quality
Washington, D. C. 20006

Dr. Aarne Vesilind (1973, 75)
Assistant Professor
Department of Civil Engineering
Duke University
Durham, N. C. 27706

Mr. James Wallace (1973, 75, 77)
N. C. Environmental Management Commission
Raleigh, N. C. 27611

Mr. Roy F. Weston, President (1977)
Weston Consulting Engineers
Weston Way
West Chester, Pennsylvania 19380

Ms. Beatrice E. Willard (1975)
Council on Environmental Quality
Executive Office of the President
722 Jackson Place, NW
Washington, D. C. 20006

Dr. Vicente Witt (1977)
Chief, Environmental Support Program
Division of Environmental Health
Pan American Health Organization
Washington, D. C. 20037

Mr. Karl F. Zeller (1973)
Meteorologist
Air Pollution Training Institute
Environmental Protection Agency
Research Triangle Park, N. C. 27711

IPEAID ON-CAMPUS COURSE PARTICIPANTS

Moncef Ben ABDALLAH (1973)
Principal Engineer
Company of Electricity & Gas (STEG)
Tunisia

Clement Dorm ADZOBU (1975)
Senior Research Officer
Environmental Protection Council
Parliament House
Accra, Ghana

Luis Alvaro ALANDIA (1977)
Honorable Alcaldia Municipal
Direccion de Desarrollo Urbano
Mercado S1N
La Paz, Bolivia

Waris ALI (1977)
49-Rasul Park Ichra
Lahore, Pakistan

Julio ARAUZ (1977)
Director
Environmental Protection Program
National Industrial Development Center (CENDES)
P. F. Cevallos 728
Quito, Ecuador

Joyce R. ARYEE (1975)
Public Relations Officer and Assistant Secretary
Environmental Protection Council
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VI. IPEAID Overseas Seminars

A series of short seminars was developed to be conducted in various foreign countries. These seminars, from two to three days duration, were designed to broaden the scope of participants and to augment efforts that were being made in the developing country. Many of these short seminars were initiated by participants in the on-campus course, and carried out through the cooperation of local agencies and bureaus.

The program was oriented to address the problems specifically relating to the country visited. Topics were chosen and resolutions made which were relevant to the critical developmental projects, research opportunities, and professional interests of the sponsoring agencies as they related to the environmental sector of the country.

Following is a listing of the sites for each such seminar and the UNC faculty and cooperating local personnel who helped to conduct the seminars.

SEMINAR ON
"Industrial Development and the Environment"
October 2-10, 1975

Guatemala City, Guatemala
San Jose, Costa Rica
San Salvador, El Salvador

Sponsoring Agencies:

Central American Research Institute for Industry (ICAITI)
Regional Office for Central American Programs (ROCAP)
National Council of Scientific and Technical Research (CONICIT)
Central American Institute of Public Administration (ICAP)
National Commission of Ecology (in San Salvador)

Combined Attendance: 144 participants

Speakers and Agency Representatives:

Gladys de Sanchez Aguillone - National Commission on Ecology

Ing. Francisco Aguirre - Deputy to the Director, ICAITI

Dr. Jorge Arias - Deputy to the Director, ICAITI

Joaquin Bayer - ICAITI

Dr. Salvador Bonilla - National Commission on Ecology

Edgar Brenes - CONICIT

Professor Emil Chanlett - UNC

Ing. Carlos Crowe - ROCAP

Robert Davis - ROCAP

Dr. Gabriel Dengo - Director, ICAITI

Ramondo Hederra - PAHO

Dr. Donald Lauria - UNC

Professor F. Eugene McJunkin - UNC

Ing. Francisco Mejia - ICAITI

James Riley - ROCAP

Mario Santos - ICAITI

Luis F. Vettorazzi - ICAITI

Henryk Weitzenfeld - PAHO

SEMINAR ON

"Environmental Aspects of Industrial Development"

September 27-28, 1976

Tegucigalpa, Honduras

Sponsoring Agencies:

U. S. Agency for International Development
Mission to Honduras
Tegucigalpa, Honduras

Central American Bank for Economic Integration
Tegucigalpa, Honduras

Attendance: 40 registered participants, plus several observers

Speakers and Agency Representatives:

Professor Emil T. Chanlett - UNC

Dr. Russell F. Christman - UNC

Mr. Robert K. Clark - Capital Resources Development Officer, AID
Mission

Ms. Betty Facey - Engineer, AID Mission

Mr. Frank Kimball - Director, AID Mission to Honduras

Dr. Donald T. Lauria - UNC

Mr. F. Eugene McJunkin - UNC

Dr. Morris A. Shiffman - UNC

SEMINAR ON

"Environmental Aspects of Industrial Development"

October 11-13, 1977

Alexandria, Arab Republic of Egypt

Sponsoring Agencies:

High Institute of Public Health
University of Alexandria
Alexandria, Arab Republic of Egypt

U. S. Agency for International Development
Mission to Arab Republic of Egypt
Cairo, Egypt

Attendance: 35 participants

Speakers and Agency Representatives:

Professor Emil T. Chanlett - UNC

Dr. Ahmed El Ahkad - Under Secretary of State, Ministry of Health, Cairo, Egypt

Dr. Fahmu El Sharkawi - Professor of Sanitary Engineering, UA

Dr. Kamal E. Hakim - Professor of Environmental Chemistry, HIPH

Dr. Mohammed Hussein - Dean HIPH

Dr. Donald T. Lauria - UNC

Dr. K. Hosny Mancy - Professor of Environmental Chemistry, School of Public Health, University of Michigan at Ann Arbor

Dr. Ali Massoud - Professor of Industrial Medicine, Air Shams University, Cairo, Egypt

Mr. F. Eugene McJunkin - UNC

Dr. Carl Shy - UNC

Mr. Jack Snead - AID Mission to Cairo

Mr. James R. Woglam - President, Camp Dresser & McKee Consulting Engineers, Boston, Massachusetts

SEMINAR ON

"Industrial Development and the Environment"

October 17-19, 1977

Accra, Ghana

Sponsoring Agencies:

Environmental Protection Council of Ghana
Accra, Ghana

U. S. Agency for International Development
Mission to Ghana
Accra, Ghana

Attendance: 52 participants

Speakers and Agency Representatives:

Mr. J. L. Abbey - Session Chairman
Mr. N. B. Ayibotele - Session Chairman
Dr. E. A. Boateng - Chairman, EPC
Professor Emil T. Chanlett - UNC
Mr. Irving D. Coker - Director, AID Mission to Ghana
Mr. John A. Cooper - AID Mission to Ghana
Dr. B. W. Garbrah - Session Chairman
Dr. Robert K. A. Gardiner - Commissioner for Economic Planning,
Accra
Mrs. S. Al Hassar - Session Chairman
Mr. F. K. A. Jiagge - Secretary, EPC
Dr. E. Lartey - Session Chairman
Dr. Donald T. Lauria - UNC
Mr. F. Eugene McJunkin - UNC
Mr. H. Noye-Nortey - Session Chairman
Dr. A. B. Quainoo - Session Chairman
Mr. H. K. Quartey-Papafio - Session Chairman
Mr. L. C. Quist - Session Chairman
D. C. E. P. Samarasinghe - Session Chairman
Dr. Morris Shiffman - UNC
Professor A. N. Tackie - Opening Session Chairman

SEMINAR ON

"Environmental Aspects of Industrial Development"

March 6-9, 1978

Nairobi, Kenya

Sponsoring Agency:

National Environment Secretariat
Kenyatta Conference Center
Office of the President
P. O. Box 30510
Nairobi, Kenya

Attendance: 40 participants

Speakers and Agency Representatives:

Professor Emil T. Chanlett - UNC

Mr. P. Gacie - Secretary, National Council of Science and Technology, Nairobi

Mr. Kanthi Kamalgoda - Senior Lecturer, University of Nairobi

Mr. I. Karuga - Director of Industries, Nairobi

Mr. Mutua Kihu - Economist, NES

Mr. Y. Z. Kyesimira - Programme Officer, UNEP

Dr. Donald T. Lauria - UNC

Dr. B. S. Meadows - Pollution Control Officer, Ministry of Water Development, Nairobi

Dr. Liberty Mhlanga - Director, ENDA, Dakar, Senegal

Mr. G. K. Muhoho - Director, NES

Mr. E. N. D. Ndegwa - Physical Planner, NES

Dr. Daniel A. Okun - UNC

SEMINAR ON

"Environmental Aspects of Development"

October 18-20, 1978

Georgetown, Guyana

Sponsoring Agencies:

Man and the Biosphere Committee
National Science Research Council
Georgetown, Guyana

USAID Mission to Guyana
Georgetown, Guyana

Attendance: 73 participants, 25 observers

Speakers and Agency Representatives:

Dr. Phillip Boyd - Caribbean Common Market
Professor E. T. Chanlett - UNC
Dr. A. V. Downer - Chairman, Agricultural Research Committee,
NSRC
Dr. H. George - Sr. Geologist, GUYMINE (Linden Operations)
Dr. B. A. Gibbs - Senior Scientific Officer, NSRC
Dr. Robert Goodland - Environmental and Health Affairs Officer,
World Bank, Washington, D. C.
Dr. S. Hubbard - Central Agricultural Station
Mr. Karl John - Physical Planning Unit, Ministry of Finance, St.
Vincent
Dr. E. J. Kuenzler - UNC
Mr. Christopher Maximea - Head, Forestry Division, Roseau, Dominica
Dr. Frank Mongul - Public Health Veterinarian, Ministry of Health
Dr. P. A. Munroe - Secretary-General, NSRC
Dr. S. Narine - Minister of Works and Transport
Dr. J. J. Niles - Chairman, MAB National Committee
Dr. Sybil Patterson - Lecturer in Sociology, University of Guyana
Dr. Oscar Pollard - Management Systems Adviser, Hinterland Roads
Division
Dr. B. K. Rai - Central Agricultural Station
Dr. Donald Rawana - Epidemiologist, Ministry of Health
Dr. A. M. B. Sankies - Mechanical Engineer and Senior Lecturer,
University of Guyana
Miss Jill Sheppard - Executive Director, Caribbean Conservation
Association
Dr. A. G. Turner - UNC
Dr. Maurice Veacock - Deputy Chief Hydropower Engineer, Ministry
of Energy and Natural Resources
Dr. W. Wolford - Lands and Mines Division, Ministry of Energy and
Natural Resources

VII. References

Reference materials contained in the four companion volumes are grouped under the topic headings presented in the one-month illustrative course curriculum. A Master Table of Contents for these companion volumes is included at the rear of this manual. Additional references are cited in the general reference list which follows.

Some of the materials were prepared specifically for previous IPEAID courses. They and the other references relate directly to the topics listed under the major headings. All of the references are considered useful as background material which would help instructors in the preparation of presentations for the various topic areas.

The references which are starred are included in the accompanying reference volume set and should provide an initial resource base for developing the content of the curriculum. However, the materials which are not included in the reference volume set are as valuable. They are available from the publishers and/or organizations cited with each reference.

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B. References by Topic Areas

-- ENVIRONMENTAL ISSUES, IMPACT AND ASSESSMENT OF DEVELOPMENT--

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-- THE NATURE OF ENVIRONMENTAL POLLUTION AND CONTROL --

"Water and Water Pollution"

- Castagnino, Walter A. Pollucion de Agua Modelos y Control, Division de Salud Ambiental, Serie Tecnica 20, CEPIS, PAHO, Lima, Peru.
- Fair, Gordon M., John C. Geyer, and Daniel A. Okun. Water and Wastewater Engineering, Vols. 1 and 2, John Wiley and Sons, Inc., NY (1968).
- * Federal Water Pollution Control Administration. A Primer on Wastewater Treatment, US Department of the Interior (1969).
- * Hines, Lawrence G. "Water Pollution, the Options of Control" in Environmental Issues: Population, Pollution and Economics, Chapter 10, pp. 47-60 (1966).
- * Okun, Daniel A. "Appropriate Technology in Planning for Water Management Projects", A paper prepared for the International Program on the Environmental Aspects of Industrial Development (1975).
- * Okun, Daniel A. "Water and Industrial Development", A paper prepared for the International Program on the Environmental Aspects of Industrial Development (1975).
- Science Council of Singapore. Water Resources, Environment, and National Development, Selected Paper from the Workshop, Singapore, March 13-17, 1972.

"Air Pollution"

- * Kornreich, Lawrence D. "Air Pollution and Its Control", A paper prepared for the International Program on the Environmental Aspects of Industrial Development (May 1975).
- Lynn, David A. Air Pollution, Threat and Response. Addison Wesley Publishing Co., Reading, MA (1976).
- Pan American Health Organization. Planificacion, Proyecto y Operacion de Sistemas Monitorios Comprehensivos de Calidad de Aguas, CEPIS, Lima, Peru (1975).
- * Robinson, Peter. "Meteorology and Air Pollution", A paper prepared for the International Program on the Environmental Aspects of Industrial Development (1977).
- Seinfeld, John. "Air Pollution", McGraw Hill Book Co., NY (1975).
- Stern, Arthur C. Fundamentals of Air Pollution, Academic Press, NY (1973).

"Solid Wastes and Soil Contamination"

- Brunner, D. R. and Daniel J. Keller. "Sanitary Landfill Design and Operation", USEPA-SW-65ts: Washington, DC (1972).
- * Carroll, John B. and F. Eugene McJunkin. A Collection of Source Materials on Solid Waste Management, Prepared for the International Program on the Environmental Aspects of Industrial Development (1975).
- 4th Report to Congress: "Resource Recovery and Waste Reduction", USEPA-SW-600, Washington, DC (1977).
- Taak, Ronald. Focus on Environmental Geology, Oxford University Press, NY (1973).
- Tchobagnoglous, George, Hilary Thrisen and Rolf Eliassen. "Solid Wastes", McGraw Hill Book Co., NY (1977).

"Noise and Ionizing Radiation"

- Barnes, Edgar C. "Ionizing Radiation" in The Industrial Environment -- Its Evaluation and Control, Chapter 29, US Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health (1973).

- * Chanlett, Emil T. "Ionizing Radiation and Its Control", "Sound, The Unwanted Form - Noise" in Environmental Protection, Chapter 9 and Chapter 11, resp., McGraw Hill, Inc., NY (1973).

"The Industrial Environment"

- * Fraser, David A. "Principles of Industrial Toxicology", A paper prepared for the International Program on the Environmental Aspects of Industrial Development (1975).
- * Fraser, David A. "The Environment of the Industrial Worker", A paper prepared for the International Program on the Environmental Aspects of Industrial Development (1975).
- * Peterson, Jack E. "Principles for Controlling the Industrial Environment" in Industrial Environment - Its Evaluation and Control, US Department of Health, Education and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health (1973).

US Department of Health, Education and Welfare. Registry of Toxic Effects of Chemical Substances, NIOSH, US Government Printing Office, Washington, DC (1976).

US Department of Health, Education and Welfare. The Industrial Environment - Its Evaluation and Control, NIOSH, US Government Printing Office, Washington, DC (1973).

-- ENVIRONMENTAL CASE STUDIES --

"Environmental Impact of Development Projects -- Case Studies"

- * Barre, Remi. "Energy and the Environment", Prepared for the IPEAID program, Dept. Environmental Sciences and Engineering, School of Public Health, UNC, Chapel Hill, NC (1975).
- Beale, S. E. et al. An Assessment of the Environmental Impact of Alternative Energy Sources, Oak Ridge National Laboratory, Oak Ridge, TN (1974).
- Carmichael, Jack B. Environmental Considerations in the Planning and Evaluation of Development Projects, Excerpts: "Case Study: Ecological Survey of the Menta River in the Country of Farmington"; "Case Study: Iron Ore Project in the Country of Edel"; "Case Study: Nickel Ore Mining and Refinery Project in the Country of Teleroy".
- Cary Arboretum of the New York Botanical Garden, Environmental Assessment Department. Various publications on many different development sites, dated between the years 1972-1977. For a complete list of these, contact the Cary Arboretum in Millbrook, NY.
- Freeman, Peter H. Environmental Aspects of a Large Tropical Reservoir: A Case Study of Lake Volta, Ghana. Prepared by the Smithsonian Institution for USAID, Office of Science and Technology, Washington, DC (1974).
- Freeman, Peter H. The Environmental Impact of a Large Tropical Reservoir: Guidelines for Policy and Planning: Based Upon a Case Study of Lake Volta, Ghana in 1973 and 1974. Prepared by the Smithsonian Institution for USAID, Office of Science and Technology, Washington, DC (1974).
- Freeman, Peter H. The Environmental Impact of Rapid Urbanization: Guidelines for Policy and Planning. Based upon a case study of Seoul, Korea in 1972 and 1973, Office of International and Environmental Programs, Smithsonian Institution, Washington, DC (1974).
- Goodland, Robert. Cerron Grande Hydroelectric Project Environmental Impact Reconnaissance, El Salvador, for the World Bank. The Cary Arboretum of the New York Botanical Garden, Environmental Protection Program, Millbrook, NY (April 1973).
- Goodland, Robert, H. S. Irwin, and G. Tillman. Ecological Development for Amazonia, The Cary Arboretum of the New York Botanical Garden, Millbrook, NY (January 1977).

- * Mancy, Khalil A. "Water Quality Studies on the River Nile and Lake Nasser", A summary statement of goals and objectives prepared for presentation to the Environmental Protection Agency, (October 10, 1976).

"The Industrial Sector -- Case Studies"

- * Lamb, James C., III. "Bibliography on Industrial Wastes"; "Guidelines for the Control of Industrial Wastes: #3--Cane Sugar Industry Wastes" #5--Pulp and Paper Manufacturing Wastes; #6--Metal Finishing Wastes", World Health Organization Unpublished Documents #WHO/WD/71.8; #WHO/WD/72.11; #WHO/WD/73.12.

Lund, Herbert F. Industrial Pollution Control Handbook, McGraw Hill Book Co., NY (1971).

Ralph Stone & Company, Inc. Industrial Pollution Control: Volume 2 Technological Strategies, Prepared for the US Agency for International Development, Washington, DC (1977).

- * World Bank. Manual on General Environmental Protection for the Industrial Sector, The World Bank, Washington, DC (1977).

"The Agricultural Sector -- Case Studies"

Jewel, William J., ed. Energy, Agriculture and Waste Management, Ann Arbor Science (1975).

- * Kriz, George J. et al. "Beef Cattle Waste Management Alternatives", North Carolina Agricultural Extension Division Service, North Carolina State University, Raleigh (1974).

- * Kriz, George J. et al. "Dairy Waste Management Alternatives"; "Poultry Waste Management Alternatives"; "Bee Waste Management Alternatives", North Carolina Agricultural Extension Division Service, North Carolina State University, Raleigh (1973).

- * Lamb, James C., III. "Guidelines for the Control of Industrial Wastes: Livestock wastes", World Health Organization Unpublished Document #WHO/WD/72.10.

Loehr, Raymond C. "Pollution Control in Agriculture", Academic Press, Inc., NY (1977).

VIII. Public Agency Environmental Information Sources

This list was adapted from a compilation by Ralph Stone and Company, Los Angeles, California, for the US Agency for International Development. Additions and modifications have been made to better suit the needs of those persons and organizations using this manual. This listing in no way claims to be complete, but does provide an introduction to some of the larger international environmental information sources.

PUBLIC AGENCY ENVIRONMENTAL INFORMATION SOURCES

SELECTED UNITED NATIONS ORGANIZATIONS

Director General
Office of the Secretariat
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO)
Via delle Terme di Caracalla
0100 Rome, Italy

Phone: 5797
Telex: 61181 FOODAGRI
Cable: FOODAGRI ROME

FAO helps promote education, research, training, facilities, and institutions related to food and agriculture--including forestry and fisheries. Its area of concern includes water pollution affecting marine and inland fisheries, use of soil and water resources, and animal production and health.

Director
Office of Environmental and Health Affairs
INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (IBRD)
1818 H Street NW
Washington, D. C. 20433, USA

Phone: 202/477-6151
Cable: INTBAFRAD WASHINGTON

IBRD (World Bank) provides loans for productive enterprises and related technical assistance, including information on meeting pollution control requirements for its loans.

Secretary-General
Trade and Development Board
UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT (UNCTAD)
Palais des Nations
CH-1211 Geneve, 10 Switzerland

Phone: 34-60-11, 31-02-11
Telex: 22212 or 22349
Cable: UNCTAD, GENEVE

International Referral System for Sources of Environmental Information (IRS) UNITED NATIONS ENVIRONMENT PROGRAM (UNEP/IRS)
P. O. Box 30552
Nairobi, Kenya

Phone: 33930
Telex: 22068 UNITERRA
Cable: UNITERRA, NAIROBI

UNEP/IRS is a referral system for sources of environmental information in participating countries. It provides international cooperation through a worldwide network consisting of National Focal Points, Subfocal points, and sources.

The National Focal Point inventories participating organizations within the given country, prepares a National Directory of Information sources for the IRS International Director, and provides referral service for domestic and foreign IRS users.

Subfocal points are selected government and non-government agencies which identify and register information sources within their own organizations. A source provides information on a single aspect of the environment; it responds to questions submitted to it through the International Referral System.

Referrals are cost-free; costs of substantive information are the responsibility of the questioner and responding source.

For further information (including a list of National Focal Points), contact UNEP/IRS directly.

Executive Director
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)
Lerchenfelderstrasse 1
P. O. Box 707
A 1070 Vienna, Austria

Phone: 43500
Telex: 75612
Cable: UNIDO, VIENNA

UNIDO coordinates all United Nations activities in the field of industrial development including industry-related pollution and control. It provides technical and training assistance for research and investigation.

Executive Director

UNITED NATIONS INSTITUTE FOR TRAINING AND RESEARCH (UNITAR)
801 United Nations Plaza
New York, N. Y. 10017
U.S.A.

Phone: 212/745-1234

The purpose of UNITAR is continuous examination of world problems including long-term trends (e.g., energy, raw materials, environment and technology). It provides training for United Nations diplomats, U. N. agency staffs, and national officials of developing countries. Research areas include the environmental effects of development projects.

The Man and the Biosphere Program (MAB)
U. S. MAB Secretariat
Department of State (IO/UCS)
Washington, D. C. 20520

Phone: 202/632-2786

The United States Committee for Man and the Biosphere is a Committee of the United States National Commission for UNESCO. MAB got its start at the 1970 General Conference of the United Nations Educational, Scientific and Cultural Organization (UNESCO) when initial plans were approved and the governing body (the International Coordinating Council) was established. The objective of the MAB Program is to develop the basis within the natural and social sciences for the rational use and conservation of the biosphere, and for the improvement of the relationship between man and the environment.

The Man and the Biosphere Program (MAB)
International MAB Secretariat
Division of Ecological Sciences
UNESCO
7 Place de Fontenoy
75700 Paris, France

Objectives of the international MAB program are similar to those of the U. S. MAB program. It got its start and is governed in the same way as the US program.

Director
Division of Environmental Health
WORLD HEALTH ORGANIZATION (WHO)
Avenue Appia
1211 Geneva 27
Switzerland

Phone: 022-346061
Telex: 27821
Cable: UNISANTE GENEVE

As the central authority directing international health work, WHO provides administrative, research, technical information and services, and fellowships. Its areas of concern include national environmental health programs, training sanitation personnel, improving water supplies and waste disposal, and the control of air and water pollution. There are separate Regional Directors for Africa, Americas, Eastern Mediterranean, Europe, South-East Asia, and Western Pacific.

SELECTED REGIONAL MULTI-GOVERNMENT ORGANIZATIONS

Director
Environmental and Consumer Protection Service
COMMISSION OF THE EUROPEAN COMMUNITIES (CEC)
Rue de la Loi, 1049 Bruxelles

Phone: 735-0040
Telex: 21877 COMEU B

ECPS (CEC) pollution-related interests include: environmental quality; the prevention of air, waste, and noise pollution; water management; environmental planning and improvement; and international aspects of the Community's environmental quality problems.

Director
INSTITUTO CENTRO-AMERICANO DE INVESTIGACION Y TECHNOLOGIA INDUSTRIAL
Avenida Reforma 4-47, Zona 10
Apdo. postal 1237
Guatemala City, Guatemala

ICAITI (Central American Institute of Research and Industrial Technology) was organized by the five Central American Republics under the aegis of Central American Common Market (CACM), the Organization of Central American States (ODECA). It promotes the sharing of industrial technology and research including that related to pollution problems.

President
INTER-AMERICAN DEVELOPMENT BANK (IADB)
808 - 17th Street NW
Washington, D. C. 20577

Phone: 202/634-8000

The Bank's purpose is to promote the individual and collective economic development of its member countries. It finances industrial and other facilities in Latin America. Like the World Bank, it sets environmental standards as conditions for its loans and can provide information assistance related to meeting those requirements.

Committee on the Challenges of Modern Society
NORTH ATLANTIC TREATY ORGANIZATION (NATO)
NATO Information Service
1110 Brussels

Phone: (02) 241-0040
Telex: 23867 OTAN/NATO

CCMS (NATO) is concerned with international environmental problems. Areas of interest include: air pollution; inland and coastal water pollution; regional environmental planning; advanced wastewater treatment; hazardous waste disposal; and solar, geothermal, and other energy uses. Member countries sponsor research on voluntary basis; study results are available to non-NATO countries.

Secretary General
ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT (OECD)
2 rue Andre-Pascal
Paris 16, France

Phone: 542-82-00

OECD purposes include contributing to the economic expansion of non-member countries in the process of economic expansion. They conduct seminars and studies on the economics of pollution and environmental problems, and collect information on related activities in member countries.

Secretary General
ORGANIZATION OF AMERICAN STATES (OAS)
17th Street and Constitution Avenue NW
Washington, D. C. 20006

Phone: 202/393-8450
Telex: 89503
Cable: PAUOAS Washington

OAS Performs broad regional, technical studies relating to trade, energy, pollution, development, and treaties; and promotes cooperation and the exchange of information among its member countries.

Director, Division of Environmental Health
PAN AMERICAN HEALTH ORGANIZATION (PAHO)
Pan American Sanitary Bureau
525 Twenty-third Street, NW
Washington, D. C. 20037

Phone: 202/223-4700

PAHO was formed under the aegis of the Organization of American States (OAS), with assistance from the United Nations. It now serves as the Regional Office for the Americas of the World Health Organization. Its purpose is to coordinate health-promoting efforts of countries in the Western Hemisphere.

Note: There are regional organizations associated with the United Nations in Africa, Asia, Europe, and other areas. The above are listed to illustrate some of the types of services available. For information on other regional agencies, contact your own government or the United Nations directly.

SELECTED UNITED STATES GOVERNMENT SOURCES OF INFORMATION

Note: Because Government telephone numbers are subject to change, they have been omitted from the table. Please consult the Washington, D. C. telephone directory or information operator (202/555-1212).

Office of Communications
UNITED STATES DEPARTMENT OF AGRICULTURE
14th Street and Independence Avenue SW
Washington, D. C. 20250

The Department of Agriculture has many programs of research, education, and public information relating to environmental quality impacts on farm crops and animals.

Administrator
AGRICULTURAL RESEARCH SERVICE
United States Department of Agriculture
14th Street and Independence Avenue SW
Washington, D. C. 20250

ARS performs studies and tests on protecting crops and farm animals against pollution, the use of nonpesticidal methods, and utilizing farm waste products to minimize air, land, and water pollution.

For general information, contact the Information Division, Agricultural Research Services, Department of Agriculture, Washington, D. C. 20250.

Chief
UNITED STATES FOREST SERVICE
Department of Agriculture
Washington, D. C. 20250

The Forest Service manages national Forests and grasslands. Its objectives include environmental protection and conservation, and it performs basic research in related areas.

For general information, contact the Information Office, U. S. Forest Service, Department of Agriculture, Washington, D. C. 20250.

Office of Marine Environment and Systems
UNITED STATES COAST GUARD
400 Seventh Street, SW
Washington, D. C. 20590

The Coast Guard enforces environmental laws relating to coastal waters. It has a marine environmental protection program aimed at prevention, detection, and control of pollution on and adjacent to United States navigable waters. It monitors hazardous spills from industrial or other sources.

Director of Communications
UNITED STATES DEPARTMENT OF COMMERCE
14th Street Between Constitution and E Street, NW
Washington, D. C. 20230

The Department is a major source of information on available process and pollution control equipment, related materials, basic costs, and shipping details. It does extensive data gathering and analysis in all areas relating to production and trade, including pollution control technology.

Information Center
NATIONAL TECHNICAL INFORMATION SERVICE
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

NTIS is a clearing house for Department of Commerce publications and for data files and scientific and technical reports of many agencies of other federal departments. Information is available in one or more of the following forms: paper copy, microfiche, magnetic tape, and punched cards.

Major services include: Weekly Government Abstracts, Environmental Pollution and Control (summaries of most unclassified federally funded research as completed and made available to the public); Published Searches (Bibliographies on selected subjects developed in anticipation of users' needs--primarily from over 600,000 federally funded citations and the Engineering Index worldwide engineering research data base); On-Line Searches (custom searches to satisfy a very specific information need); Selected Research in Microfiche or SRIM (automatic biweekly service which provides complete government research reports--not abstracts--on users' preselected topics).

All NTIS publications and services must be sold at a price which recovers cost. In some countries, orders can be placed locally through NTIS-trained representatives. Where available, this service reduces mail cost and foreign exchange problems. For further information on all available services, contact NTIS directly.

Office of the Chief of Engineers
UNITED STATES ARMY CORPS OF ENGINEERS
Washington, D. C. 20314

The Corps of Engineers is responsible for structural engineering relating to federal water-waterways, ocean dumping, dredging, draining, and designation of safe disposal sites. Its Civil Works Program involves engineering works such as major dams, levees, harbors, and locks; water supply for industrial and municipal use; generation of hydroelectric power; river regulation for improved water quality; enhancement of fish and wildlife; and protection of ocean and lake shores.

UNITED STATES COUNCIL ON ENVIRONMENTAL QUALITY
Executive Office of the President
722 Jackson Place, NW
Washington, D. C. 20006

The Council is the national environmental advisor to the President, and assists in preparing the President's annual environmental quality report to the Congress.

Director
Office of Public Affairs
U. S. Department of Energy
20 Massachusetts Avenue
Washington, D. C. 20013

The U. S. Department of Energy is a relatively new federal agency charged with developing new sources of energy for the U. S. It does have an environmental affairs information division.

Director
Office of International Activities
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
401 M Street, SW
Washington, D. C. 20460

USEPA is the government's primary regulatory, investigative, and administrative agency in all matters relating to environmental protection. It develops national programs, technical policies, and regulations for air, land, and water pollution control. Its activities include research, monitoring, standards setting, enforcement, environmental impact statement review, training programs, and technical assistance. It publishes extensively on the generation, effects, and control of industrial discharges; and the management of hazardous and toxic wastes including radioactivity, pesticides, and heavy metals.

Office of International Health
UNITED STATES DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
330 Independence Avenue, SW
Washington, D. C. 20201

HEW has administrative responsibility for all federal health services and activities, including health-related research, training, and investigations.

Director
NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (NIEHS)
United States Department of Health, Education, and Welfare
Post Office Box 12233
Research Triangle Park, North Carolina 27709

The Institute performs research on the biological effects of chemical, physical, and biological substances in the environment.

Director
Office of Communications
UNITED STATES DEPARTMENT OF THE INTERIOR
C Street between 18th and 19th Streets, NW
Washington, D. C. 20240

Department of the Interior activities include the conservation and development of mineral and water resources; promotion of mine safety; conservation, development, and use of fish and wildlife resources; preservation of scenic and historic areas; reclamation of arid lands; and management of hydroelectric power systems.

For general information, contact the Director, Office of Communications, Department of the Interior, Washington, D. C. 20240

Assistant Director for Public Affairs
UNITED STATES FISH AND WILDLIFE SERVICE
Department of the Interior
Washington, D. C. 20240

The Service provides leadership in protecting land and water environments (habitats) through scientific research; surveillance of pesticides, heavy metals and thermal pollution; fish, wildlife, and ecological studies; river basin environmental impact statement review; and many education and information services.

Information Office
UNITED STATES GEOLOGICAL SURVEY
Department of the Interior
National Center
12201 Sunrise Valley Drive
Reston, Virginia 22092

The Survey supervises industrial operations under geothermal, oil, shale, mining, and gas leases on public domain including the outer Continental Shelf to prevent waste of the mineral resources, limit environmental damage and pollution, and protect public health and safety. It monitors and tests ground and surface water quality.

Director
Office of Mineral Information
UNITED STATES BUREAU OF MINES
Department of the Interior
2401 E Street, NW
Washington, D. C. 20241

The Bureau is primarily a research and fact-finding agency. Environmental concerns include solid waste recycling, abatement of pollution and land damage caused by mineral extraction and processing, and mine health and safety.

Director for Public Affairs
UNITED STATES NATIONAL PARK SERVICE
Department of the Interior
Washington, D. C. 20240

The functions of the National Park Service are to protect the natural environment of National park areas, preserve historic properties, and present environmental education programs.

Director, Office of Public Affairs
UNITED STATES BUREAU OF RECLAMATION
Department of the Interior
Washington, D. C. 20240

To reclaim arid or semi-arid lands, reclamation projects include regulation, conservation, and use of water and related resources; basin-wide water studies; and other multi-purpose regional studies. In cooperation with other agencies, the Bureau also gives technical assistance to foreign countries in water resource development and use.

Director
OFFICE OF WATER RESEARCH AND TECHNOLOGY
Department of the Interior
Washington, D. C. 20240

OWRT conducts research and development activities, training programs for scientists and engineers, and information programs related to water resource problems. Its purpose is to develop new or improved technology and methods for the protection and use of water resources, including the conversion of saline water to water suitable for agricultural, industrial, and municipal use.

Chairman
UNITED STATES NUCLEAR REGULATORY COMMISSION
Washington, D. C. 20555

The Commission's purpose is to ensure that civilian uses of nuclear energy are consistent with public health, safety, and environmental quality.

Office of Science and Technology
AGENCY FOR INTERNATIONAL DEVELOPMENT
Department of State
320 - 21st Street NW
Washington, D. C. 20523

AID provides technical and financial assistance to increase economic independence and improve the quality of life in certain less developed countries. Its programs include environmental protection.

For general information, contact the Director, Office of Public Affairs, Agency for International Development, Department of State, Washington, D. C. 20523

Assistant Secretary for
BUREAU OF OCEANS AND INTERNATIONAL ENVIRONMENTAL
AND SCIENTIFIC AFFAIRS
Department of State
2201 C Street, NW
Washington, D. C. 20520

The Bureau formulates and implements policies for United States participation in international science and technology programs relating to oceans, weather, atmosphere, fisheries, wildlife, conservation, environment, population, food, health, and nuclear energy.

Director
Smithsonian Science Information Exchange, Inc.
SMITHSONIAN INSTITUTION
1730 M Street, NW
Washington, D. C. 20036

The Exchange (SSIE) Maintains a central data base of information on research in progress within the past two government fiscal years. It annually collects, indexes, stores, and retrieves information on about 100,000 government, non-government, and foreign research projects in all fields of life and physical sciences (including agriculture, biology, chemistry, earth

science, electronics, engineering, materials, mathematics, and medical science).

SSIE can provide a brochure describing the available custom search services and their prices.

OTHER ENVIRONMENTAL ORGANIZATIONS AND PROGRAM OFFICES

United Nations Environment Programme
Industry and Environment Office
17 Rue Margueritte
75017 Paris, France

The main activities of IEO include ongoing assessment of the environmental aspects of the major sectors of industry. Sectors already covered: pulp and paper; aluminum; motor vehicles; petroleum industry; and utilization of agricultural and agro-industrial residues. Sectors presently studies: chemical, iron and steel, non-ferrous metals (other than aluminum) industries. Reports have been completed on the first group of industrial activities and are available from IEO.

Environmental Management Education Programme
Centre d'Etudes Industrielle
14 Chemin des Conches
Geneva, Switzerland

The Centre has been involved in development and presentation of environmental management seminars in developing countries in various parts of the world. Twenty-eight (28) such seminars have been conducted in 12 different developing countries, and have included topics on environmental impact assessment, environmental management education, and waste producing aspects of various technologies. The Centre has produced teaching materials on environmental education.

International Institute for Environment and Development (IIED)
27 Mortimer Street; London WIN 8DE, ENGLAND OR
1525 New Hampshire Avenue, NW
Washington, D. C. 20036

This organization is concerned with environmental protection and development promotion. IIED has established two communication function; Earth-Science, a media information unit and the Environmental Organization Liaison Programme. The organization is publishing materials dealing with development and environment. Specific subject areas include human settlements, water and desertification, appropriate technology, indigenous peoples and their role in the conservation and wise exploitation of wildlife resources. The organization attempts to establish and maintain close ties with international organizations concerned with development and environment.

Environment Training Programme (ENDA)
PO Box 3370
Dakar, Senegal

ENDA is a joint project of the african institute for Economic Development and Planning (IDEP-Dakar), UNEP, and the Swedish International Development Authority (SIDA). The organization is involved in environmental education and development in Africa. It conducts training programs integrating environmental and development concepts and practical application to specific conditions those involved in development programs encounter. The organization publishes the bulletin Environment in Africa, and a papers series.

Monitoring and Assessment Resource Center (MARC)
Chelsea College, Octagon Building
459A Fulham Road
London SW10 ENGLAND

Organization funded by United Nations Environment Program with capabilities for environmental monitoring and environmental assessment.

IX. MASTER TABLE OF CONTENTS FOR REFERENCE VOLUMES

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Carmichael, Jack B. "Environmental Management in Industry"

Christman, R. F. "Human Population Growth"

Coale, Ashley J. "Man and His Environment"

Odum, Eugene P. "The Strategy of Ecosystem Development"

World Bank. The World Bank, Industrial Development and the Environment

II. Environmental Health Issues

Hughes, Charles C. and John M. Hunter. "The Role of Technological Development in Promoting Disease in Africa"

World Health Organization. Health Aspects of Environmental Pollution Control: Planning and Implementation of National Programs

III. Environmental Impact Statements and Assessments

Barre, Remi. "The Environmental Impact Statement as Practiced in the United States"

North Atlantic Treaty Organization. "Background Paper for the CCMS Roundtable Discussion on the Environmental Impact Statement Process of the United States"

Hebert, Paul V. "Incorporating Environmental Parameters in the Appraisal of Development Projects"

Volume Three

-- ENVIRONMENTAL POLICY, MANAGMENT AND REGULATION --

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Anderson, A. E. Environmental Considerations in the Location of Industry

Barre, Remi. "Environmental Management, Economic Development, and Social Welfare"

Okun, Daniel A. "Principles of Water Quality Management"

II. Legal Approaches

Levi, D. R. and Dale Colyer. "Legal Remedies for Attacking Environmental Problems"

III. Economic Considerations and Approaches

Council on Environmental Quality. "The Economic Impact of Environmental Programs"

Solow, Robert M. "The Economist Approach to Pollution and Its Control"

Teller, Azriel. "Air Pollution Abatement: Economic Rationality and Reality"

Turvey, Ralph. "The Side Effects of Resource Use"

IV. Environmental Standards and Regulation

Harris, Robert L. "Regulatory Approaches - Air Quality Standards and Best Available Control Technology"

Lamb, James C. III. "Effluent and Stream Standards - A Rational Approach"

Lauria, Donald T. "Environmental Quality Standards"

Organization for Economic Cooperation and Development. Environmental Standards: Definitions and Needs for International Harmonization

V. Land Use and Environmental Planning

Kaiser, Edward J. "Urban Land Use Planning for Industrial Development"

Mudari, David H. "Land Use Planning and Environmental Impact Assessment"

Volume Four

-- THE NATURE OF ENVIRONMENTAL POLLUTION AND CONTROL --

I. Water and Water Pollution

Federal Water Pollution Control Administration. A Primer on Wastewater Treatment

Hines, Lawrence G. "Water Pollution, The Options of Control"

Okun, Daniel A. "Appropriate Technology in Planning for Water Management Projects"

Okun, Daniel A. "Water and Industrial Development"

II. Air Pollution

Kornreich, Lawrence D. "Air Pollution and Its Control"

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III. Solid Wastes and Soil Contamination

Carroll, John B. and F. Eugene McJunkin. A Collection of Source Materials on Solid Waste Management

IV. Noise

Chanlett, Emil T. "Sound, The Unwanted Form - Noise"

V. The Industrial Environment

Fraser, David A. "Principles of Industrial Toxicology"

Fraser, David A. "The Environment of the Industrial Worker"

Peterson, Jack E. "Principles for Controlling the Industrial Environment"

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-- ENVIRONMENTAL CASE STUDIES --

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