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**FIRST PAN AMERICAN MEETING
OF SANITARY AND ENVIRONMENTAL
ENGINEERING PROFESSORS**

FINAL REPORT

Washington, D. C.

August 14 - 17

1989

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*FIRST PAN AMERICAN MEETING OF SANITARY AND
ENVIRONMENTAL ENGINEERING PROFESSORS
FINAL REPORT*

*WORKSHOP ON INCORPORATION OF DISASTER
PREPAREDNESS INTO COURSES ON SANITARY
AND ENVIRONMENTAL ENGINEERING*

*WASHINGTON, D.C.
AUGUST 1989*

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INTRODUCTION

Given that the "First Pan American Meeting of Sanitary and Environmental Engineering Professors" and the Workshop on "Incorporation of Disaster Preparedness into Sanitary and Environmental Engineering Courses," are closely linked in being directed toward professors of these courses and that they were held sequentially, with practically the same participants, the Pan American Health Organization felt that it would be appropriate to present the information on the activities of both events in this document.

The professors' meeting took place from 14 to 17 August and aimed at updating and improvement of the training of sanitary, environmental, and public health engineers. On 18 August the workshop on the teaching of disaster preparedness was held, with the idea that the participants would, upon returning to their schools, initiate various activities aimed at the incorporation of this topic into courses for sanitary, environmental, and public health engineers.

These two meetings are the result of a collaborative effort in which, in addition to the participants themselves, the following organizations took part:

- Association of Environmental Engineering Professors, AEEP.
- Agency for International Development, AID.
- Canadian International Development Agency, CIDA.
- Water and Sanitation for Health Project, WASH/AID.
- Pan American Health Organization/World Health Organization (PAHO/WHO) through the following programs:
 - Environmental Health Program.
 - Human Resources Development Program.
 - Emergency Preparedness and Disaster Relief Coordination Program.

ACRONYMS INCLUDED IN THE REPORT

AEEP	Association of Environmental Engineering Professors.
AID	Agency for International Development.
CIDA	Canadian International Development Agency.
WASH/AID	Water and Sanitation for Health Project.
PAHO/WHO	Pan American Health Organization/World Health Organization.
AIDIS	Inter-American Association of Sanitary and Environmental Engineering.
CEPIS	Pan American Center for Sanitary Engineering and Environmental Sciences.
UNDP	United Nations Development Program
ECO	Pan American Center for Human Ecology and Health.
REPIDISCA	Pan American Network for Information and Documentation on Sanitary Engineering and Environmental Sciences.
EPA	Environmental Protection Agency.
PALTEX	Expanded Textbook and Instructional Materials Program.
UNAM	National Autonomous University of Mexico.
DIECA	Division of Education and Training of AIDIS.
EESC	Engineering School of Sao Carlo, Brazil.

PART 1

FIRST PAN AMERICAN MEETING OF SANITARY AND
ENVIRONMENTAL ENGINEERING PROFESSORS

WASHINGTON, D.C., 14-17 AUGUST 1989

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PART 1

FIRST PAN AMERICAN MEETING OF SANITARY AND
ENVIRONMENTAL ENGINEERING PROFESSORS

1.1 Background

Over the last 10 years, particularly in Latin America, there has been a considerable increase in the number of courses and schools of sanitary, environmental, and public health engineering.

This increase reflects a healthy concern over the problems resulting from the population growth and industrial development occurring in the countries of Latin America.

Notwithstanding the increase in the number of schools, there are still not the ties and formal relations that would make it possible to exchange experiences, study programs, and human and technical resources, as well as to adopt a joint approach to local and regional problems.

It was for this reason that in 1986 the Pan American Health Organization (PAHO) initiated a process of general mobilization that had the effective participation of almost all the schools and educators in Latin America. That mobilization process has already passed through several phases:

- First Phase. Creation of a data base on the undergraduate and graduate programs in sanitary engineering, environmental engineering, and public health engineering in Latin America.
- Second Phase. Preparation of the "Directory of Training Programs in Sanitary and Environmental Engineering in Latin America and the Caribbean."
- Third Phase. Holding of the "I Latin American Meeting of Schools of Sanitary and Environmental Engineering," at the School of Public Health of the Universidad de Sao Paulo in July 1987, Sao Paulo, Brazil.
- Fourth Phase. Conduct of a continuous program of technical updating for professors of sanitary and environmental engineering at the Pan American Center for Sanitary Engineering and Environmental Sciences -CEPIS/PAHO, in Lima, Peru.
- Fifth Phase. Holding of the "II Latin American Meeting of Schools of Sanitary and Environmental Engineering," on the occasion of the XXI Congress of AIDIS, held in Rio de Janeiro, Brazil in September 1988.

The results of these efforts included the establishment of several technical cooperation agreements and pacts between schools both within and outside the country, the objective of this cooperation being mutual strengthening of the teaching programs through the exchange of professors and materials as well as joint research.

At the "II Meeting," the participants made a decision as to the importance of holding a meeting between Latin American professors of sanitary and environmental engineering and their American and Canadian colleagues. This decision was based on evidence that Latin America can both receive and give cooperation with regard to the North American schools.

Based on the above factors and in recognition of the recommendations of the II Meeting, the Pan American Health Organization decided to hold the "I Pan American Meeting of Sanitary and Environmental Engineering Professors," with the objectives that are listed in the following section.

1.2 Objectives

- a) To discuss the training of sanitary, environmental, and public health engineers, including curricular elements aimed at meeting the current and future demands of environmental health.
- b) To identify areas of bidirectional collaboration between North American and Latin American schools and professors of sanitary and environmental engineering.
- c) To identify sources of financial resources to support the collaboration programs, as well as mechanisms for mobilizing these resources.
- d) To develop principles of collaboration agreements and their respective plans of action.

1.3 Panel on Sanitary and Environmental Engineering Education

This panel made it possible to learn representative views concerning the environmental health problems facing Latin America and the implied challenge for sanitary and environmental engineering, both today and in the future.

Emphasis was placed on the importance of the Universities' giving consideration to this problem when defining the profile of the professional that they must train and, as a result, the curriculum modifications that need to be considered periodically so that the environmental health professionals that they train have current knowledge and are trained to satisfactorily resolve the diversity of environmental problems that they must face in the performance of their professional duties.

This panel included presentations by representatives of the World Bank, the Pan American Health Organization, the Association of Sanitary and Environmental Engineering Professors of the United States and Canada, and the Escuela de Ingeniería (School of Engineering) of San Carlos (Brazil). A summary of their presentations follows.

Guillermo Yepes (World Bank)

The problems of the water supply and sanitation sector in Latin America are complex for a diversity of reasons, most notably, the accelerated population growth, predominantly in the urban areas, and the existing socioeconomic conditions.

In the water supply and sanitation sector, the World Bank has identified five problem areas that are important to take into account in the education of sanitary and environmental engineers:

- The scarcity of economic resources to meet the demand for services.
- Institutional ineffectiveness in the execution of projects.
- The need to improve the planning of the sector.
- The need for improvement of the capacity to execute projects, especially with regard to their operation and maintenance.
- The need for strengthening and improvement of the system for training and administration of the personnel in the enterprises.

The World Bank's policies with respect to its participation in this sector are:

- Priority attention to urban areas.
- Support for research on and development of low cost technology.
- Rehabilitation and/or improvement of the operation and maintenance of the existing systems.
- Attention to water pollution and related problems.
- Strengthening of the financial self-reliance of the agencies in the sector, supporting the establishment of rates that are sufficient to cover their costs and finance the projects that they are carrying out.
- Promotion of participation by the private sector and the community in order to help accelerate improvement in the coverage of water supply and sanitation services.

Guillermo Dávila (Pan American Health Organization)

A broad overview was given of the environmental problems present in Latin America with emphasis on the role of those professors who are responsible for educating the professionals who handle environmental problems that are related to health, and for making sure that the new professionals

receive, in addition to the traditional scientific concepts, an education with more appropriate human characteristics and a more solid conception of how to best utilize the limited resources we have to work with.

The environmental problems presented constitute the framework for the activities of the sanitary and environmental engineer, who, because of the specific characteristics of Latin American development, must usually take on leadership, decision-making, and executive duties very shortly after graduation from University, with responsibilities which in developed countries he would assume only after many years of professional experience.

For all of these reasons, it is considered important to try to define answers to the following questions:

- ¿What will be the profile of the engineer whom we must educate so that he is able to perform satisfactorily in dealing with the problems present in our Region?
- ¿What are the specialized curriculum supplements that are required in order to better serve the wide range of environmental health activities?
- ¿What are the specialties that should be developed in the area, both in engineering and in the environmental sciences?
- ¿How is it possible to more efficiently foster learning and motivation in the student, so that he can have a realistic appreciation of the social, managerial, and financial implications of the professional work he must perform upon leaving the University?
- ¿How is it possible to strengthen and analyze research, in order to improve knowledge of appropriate approaches to deal with the fundamental problems of developing countries?

Another important topic which requires adequate attention is the role of the universities in keeping environmental health professionals up-to-date.

A point for reflection is that there is a trinomial on our horizon--poverty/environment/health--which is adding a new dimension to environmental health, and in turn imposing severe restrictions on the development and human well-being of the countries of our Region.

George Tchobanoglous (Association of Sanitary and Environmental Engineering Professors of the United States and Canada)

There are four basic considerations to be taken into account when addressing the subject of environmental engineering education:

- The general factors that affect that education.

- The current approach of environmental engineering education.
- Changes in curricula and course content.
- The need for continuing education.

In the United States, the current situation of environmental engineering education can be characterized as follows:

- The number of courses in environmental engineering at the undergraduate level has remained constant in recent years, with a declining trend. The Master's level programs face a similar situation.
- The number of students in environmental engineering has not increased sufficiently in recent years, which is causing serious problems in that the field is faced with a lack of trained personnel in this area.

The AEEP is concerned that in the United States there is not a sufficient number of professionals being produced in this area.

- There are few programs that having to do with public health, and very few schools teach this subject as part of their engineering courses. Usually the schools of public health operate separately from the the engineering schools, which limits the spectrum of broad-based engineers' training. With respect to the education itself, it is considered that an engineer should have a fundamental and basic scientific education in sanitary and environmental engineering which will allow him to adapt to the development of technology; in other words, the student should know what it is, how it is classified, and what it is used for. With this base he can adapt to technology.

With respect to continuing education the university has a very important role and, in order to define the courses that need to be offered, should establish a dialogue with the employing agency and the professional.

Jurandy Povinelli (School of Engineering of San Carlos, University of Sao Paulo, Brazil)

The universities should have curricular awareness and flexibility in order to train better professionals; they should also have options for meeting the demands of the labor market. There is a need to train researchers and professors to administer that research.

We should not forget that we have not resolved our basic sanitation problems, or that resources are limited and, when available, expensive. Hence the need to carry out research on low cost technology without compromising teaching, which calls for efforts to be made to intensify research and promote broad exchange between universities.

Conclusions

- The schools of sanitary and environmental engineering need to readjust the profile of the engineers they educate to take into account the current problems of the environmental health sector.
- The study curricula need to be flexible, and should be restructured according to the new professional profile in such a way that the engineers being taught are trained to solve the problems they must face in the exercise of their professional duties.
- There is a need for periodic updating, both technically and in the area of teaching, of the professors at these schools.
- The universities need to develop programs for continuing education in sanitary and environmental engineering to make it possible for the professionals in this area to keep up-to-date.
- Given the socioeconomic situation in the countries of Latin America, there needs to be promotion of research and the development of low cost technology in the field of sanitary and environmental engineering.
- Researchers need to be trained in this field, together with professors to administer that research.

1.4 Presentation by the schools represented at the Meeting

This part of the program was conducted by the professors participating in the meeting, each of whom gave a brief presentation on the courses and characteristics of the sanitary and environmental engineering programs offered by their schools.

Annex IV gives detailed information on each school.

The purpose of these presentations was to describe the characteristics of each school represented. In this way, it was possible to identify those having the potential to collaborate in the development of other schools. It was also possible to identify the fields in which some schools sought to collaborate with others.

Collaboration for mutual development of the programs and teaching mechanisms relies on the availability of external resources that can be mobilized for these activities. With a view to learning the availability of resources in the different international and bilateral agencies, a panel was organized to analyze the bases of resource availability.

1.5 Bases of resources for collaboration

The following are the presentations by the World Bank, PAHO, US/AID, and the Canadian International Development Agency (CIDA) which indicate their possibilities for collaboration with the programs for sanitary and environmental engineering education in Latin America.

World Bank: Alfonso Zavala and Wilfrido Barreiro

The World Bank finances and supports the formation of human capital by means of direct investments in education and indirect investments through projects in other sectors:

- a) Education (VET) and vocational training in education projects at the university, secondary, and post-secondary levels.
- b) Training (PRT) in relation to regional projects that sustain and support systematic development of the individual or collective ability and specific technical skill required by those projects.

The annual loans for PRT have been US\$300 million, and recently have exceeded those for VET. In addition, the PRT are being used to direct efforts toward the need for training over the long term and on a broader scale than simple project needs.

The most serious problem facing PRT is the lack of context, since in most cases the training related to specific projects does not consider either the needs of the specialized education subsector or the evaluation of national requirements, but rather answers project needs.

The Bank's sectoral studies give little coverage to the topic of training in the drinking water and sanitation sector.

In contrast to the education and vocational training projects (VET), the training components in non-educational projects have generated great controversy for such varied reasons as:

- Doubts produced by their tendency to be imposed on the loans, whether they are needed or not.
- The fact that the small components of PRT have a narrow orientation and ought to be replaced by more substantial or permanent investments in sectoral training. For these reasons many governments and not a few Bank staff members are averse to these PRT. Nonetheless, the Bank's investment in non-educational projects continues to grow; in 1988 nearly US\$300 million represented 1.7% of the Bank's total loans for PRT.

In addition, over the last two or three years, the quality of the preparation and design of the training components in the sectoral water projects has improved notably.

Finally, the sectoral studies of water and sanitation analyzed in an evaluation of 116 sectoral reports in different areas have been showing favorable and impressive results, and have been considered to be in second place in terms of the attention given to the problems of human resources and training.

The Bank has not done studies on the training needs of the drinking water and sewerage sector in specific countries, but trusts that these countries can, in the near future and with the assistance of specialized agencies such as PAHO, formulate feasible training programs for the sector.

But we are not forgetting a real and fundamental fact: although the universities educate professionals, it is the demand for appropriately enthusiastic professionals which motivates young people to get training for the sector that requires them, whether public or private.

The World Bank also has a world-level training network on aspects of drinking water and sanitation which has the support of the UNDP. The principal objectives of this program revolve around the consideration that through low cost technological development, drinking water and sanitation coverage can be expanded in low income groups, with emphasis on the marginal areas. For this purpose, there is support material such as slides and films that were translated by CEPIS.

In the last three years this material has been disseminated through permanent centers in the network, thus serving as an effort to expand the capacity of the training institutions to focus on and disseminate the technology developed by the program.

The World Bank is interested in expanding its network, and thus the institutions that aspire to such cooperation should offer the program on a permanent basis.

AID/WASH: John Austin

AID awards fellowships annually; it also supports development projects which by preference use the following guidelines as a framework:

- Environmentally healthy projects (they are non-polluting).
- Sustainable projects (they continue after cooperation has ceased).
- Participation by women.
- Development of human resources.

It is important that the projects be initiated through the local offices of AID and that they have the support of the country. The initial contact at the offices of AID should be the official responsible for health, population, food, education, training, or environmental affairs.

AID through WASH can collaborate with the schools in their curriculum revision by financing courses and seminars, as well as by translating texts.

CIDA: Dr. Eric Schiller

The government of Canada offers 2,000 two- or four-year fellowships annually. It also supports research proposals for the development of low-cost technology and the strengthening of the community and its institutions.

CIDA has a regional agency for Latin America with headquarters in Bogota, Colombia. CIDA supports the development of research proposals in Latin America and Africa.

Another Canadian agency that can give support to Latin American Universities is the IDRC, which provides fellowships and grants for research and publications.

PAHO: Mr. Horst Otterstetter

PAHO is fundamentally an agency of technical cooperation and belongs to the Member Countries of the Organization.

In each country it is the Ministry of Health that decides in what aspects PAHO will cooperate with the country.

The technical advisory services in environmental health are provided through:

- The PAHO Representative Offices in each country.
- The Environmental Health Program at Headquarters and its specialized Centers, CEPIS and ECO.

The technical advisory activities are quite varied and range from participation in courses through collaboration in the identification and formulation of projects, including projects to be presented to other agencies in order to obtain funds for support.

Access to PAHO's programs must be gained through the Ministries of Health and the PAHO Country Offices.

Included under the program of assistance that PAHO provides to the Member Countries, the following are of note:

- Execution of development projects. PAHO frequently acts as the agency responsible for the execution of development projects, when it is so agreed with the agency providing the financial support for the project and the agency or government that is receiving the benefits of the project.

PAHO's own resources for the execution of development projects are extremely limited.

- Fellowship Program. PAHO annually offers 1,000 fellowships for the education and training of health sector human resources; the trend is to reduce the duration of the fellowships.
- Research Grants Program. The funds are basically seed grants, for the purpose of motivating the institutions that receive cooperation to establish permanent research programs.
- Program for Young Professionals. For several years PAHO has been offering a 10-month training program for professionals who have recently graduated from university in some aspect of environmental sanitation; this training is carried out at CEPIS and recently at ECO and within the countries.
- Program for Bringing Professors Up to Date. Conducted by ECO and CEPIS. Initially it was oriented only to the countries in which these Centers are located, but beginning in 1990 a Program will be launched that will make it possible to finance professors from other countries so that they can spend some time at these Centers, updating their knowledge and improving their texts.
- Program for Publications and Instructional Resources. This includes the Textbook Program which PAHO subsidizes with the objective of providing students with good quality textbooks at low prices.
- Technical and Scientific Information. PAHO through CEPIS has developed the REPIDISCA program and has promoted the creation of a network of cooperating centers.

Environmental Protection Agency (EPA): Faith Halter

Although the EPA is a national agency of the United States Government, it has an office specializing in international technology transfer.

The principal areas of EPA activity in technology transfer have to do with water supply, wastewater disposal, the management of toxic and hazardous substances, and control of water and air pollution.

This technology transfer is effected through publications and technical visits. The publications can be requested directly from EPA (the Library or Office of International Affairs) and can be obtained through the Latin American libraries that participate in the INFOTERRA network.

In addition, the EPA can collaborate in the organization of programs for technical visits to the United States; however, it does not have financial resources to sponsor those visiting programs.

1.6 Principal conclusions of the meeting

The meeting demonstrated the need for revision of the educational processes for training and bringing up to date the engineering professionals active in the different fields of environmental health. The current environmental concerns and the rapid changes in the interrelationship between the environment and human beings call for the universities and their professors to have a great deal of flexibility in order to adjust programs and study topics and give more attention to research activities. The adjustments needed would cover both the technical and technological aspects, and the institutional aspects, which include human resources, mainly professors.

In addition, it was concluded that the technical and institutional development of the schools of sanitary, environmental, and public health engineering can be achieved more efficiently through horizontal mechanisms of cooperation between and among countries.

In this context, it was considered to be extremely important to have the possibility of AEEP support, in order to transfer its experiences to the professors and schools of environmental engineering in Latin America. Towards this end it was considered urgent to set up a permanent mechanism for organizing the Latin American professors and schools into an association able to serve as a counterpart to the AEEP, in addition to acting as the group's spokesman before national and international agencies and authorities. A working group on this matter was formed.

In order to keep the information on schools, programs, and professors up-to-date, it was decided to update the Directory of Training Programs in Sanitary and Environmental Engineering in Latin America and the Caribbean, published by PAHO in 1987, with data through 1989.

Another urgent need that was identified was the critical review and possible updating of the teaching programs and their respective "tasks," so that they are better adapted to the actual environmental situations of the countries and the Region. It was agreed to form another working group that will analyze the current programs and make proposals for minimum programs at the different levels of training. This definition of minimum programs will facilitate the identification of specific bibliographical needs as well as needs for textbooks that are adapted to the specific realities of Latin America. Moreover, it will make it possible to organize programs for bringing professors and researchers up to date in technical and teaching matters.

It was determined that it is necessary to organize a new Latin American meeting of professors and schools to discuss and approve the proposals of the two working groups that were set up. It was decided to hold this meeting in Puerto Rico in coordination with the XXII Congress of AIDIS.

It was also agreed that each school of sanitary, environmental, and public health engineering in Latin America would initiate activities with the objective of strengthening its teaching programs. For this purpose, each participant prepared a plan of action that included cooperation activities with other schools within the framework of "technical cooperation between and among countries." They also included the search for resources for support at the national and international level.

1.7 Plans of action for collaboration efforts

Each of the schools of sanitary and environmental engineering in Latin America present prepared a plan of action. Annex III gives the details of the plans.

The particular Plan of Action should be thoroughly reviewed by the governing body and professors of each university; from these will come the projects for academic strengthening and research. In any case, it is important to take into account the actual situation in the countries; the installed capacity; and the identification of agencies, financial institutions, and universities that can collaborate with the programs, without overlooking the fact that cooperation should be bidirectional so that it constitutes development and not dependency.

1.8 Commitments made by the participants

1.8.1 At the local level, the countries will do follow-up on the plans of action formulated during the meeting; in order to do this it is important to take into account the need to be organized at the country and regional level so as to supplement the activity and avoid competition.

PAHO will support the arrangements made by the countries and can serve as a bridge to the cooperating agencies.

1.8.2 At the regional level the following commitments were made:

- a) Updating of the Directory of Programs, 1990 edition. In order to fulfill this commitment, the following activities were identified:

At the country level:

- Collection of information and distribution of detailed program, including a basic bibliography.
- Comments on the draft questionnaire.

Those responsible for this activity are: Pedro Martínez Pereda (Mexico), Pedro Saravia (Guatemala), Guillermo Rodríguez (Colombia), Jurandyr Povinelli (Brazil), Griselda de Giner (Venezuela), Luis Leal (PAHO/Bolivia), Paul Sáez (Chile), and Augusto Pescuma (Argentina). This activity should be completed by October 1989.

At the level of PAHO

- Distribution of the forms through the local country representative offices.
- Publication of the 1990 Directory, which should be finished in January 1990.

b) Meeting of the Textbooks Committee.

For this the following activities were identified:

- The countries will send PAHO the list of basic and desired texts recommended by the professors.
- PAHO will offer to convene the Textbooks Committee, based on this information, to decide on the incorporation of new titles into PALTEX.

c) Development of a proposal on mechanisms for the organization of schools and professors at the level of Latin America.

Two alternatives were felt to be valid:

- Setting up a Latin American Association of Schools and Professors of Environmental, Sanitary, and Public Health Engineering.
- Becoming associated with AIDIS as part of the CIECA.

For this purpose a working group was formed, made up of the following people: Augusto Pescuma (Argentina), Aristides Almeida Rocha (Brazil), and Guillermo Rodríguez (Colombia). It is expected that the proposal will be ready for the next meeting in Puerto Rico.

Prof. Pedro Martínez Pereda of UNAM was given the responsibility of coordinating this working group.

d) Curriculum analysis.

A working group was set up for this activity and will present its report at the meeting in Puerto Rico.

The group includes Paul Schifini (Argentina), Guillermo Rodríguez (Colombia), Pedro Martínez (Mexico), and Paul Sáez (Chile). Prof. Jurandyr Povinelli of the EESC was assigned the responsibility of coordinating this group.

- e) Organization of the II Pan American Meeting of Sanitary and Environmental Engineering Professors.

PAHO and AIDIS/DIECA were given the responsibility of organizing this meeting in Puerto Rico (September 1990) jointly with the XXII Congress of AIDIS.

1.8.3 The AEEP made the following commitments:

- To distribute the registry of Programs and Schools of Sanitary and Environmental Engineering in the United States and Canada.
- To distribute the list of members of the Association.

In addition, the AEEP requested that the Latin American schools express their interest in receiving copies of its publications, or of the AEEP Newsletter. If they are interested, support can be sought for financing the translation of some publications into Spanish.

The AEEP is also considering whether the professors at the schools are interested in belonging to the Association, either as individual members or as a group.

In order to continue with the process of exchanging experiences, it was considered important that the AEEP continue to participate in joint meetings with the Latin American professors.

ANNEXES

- I. Agenda.
- II. List of participants.
- III. Plans of action formulated by the participants with respect to collaboration efforts.
- IV. Information provided by the participants on the courses given by their institutions.

AGENDA
FIRST PAN AMERICAN MEETING OF SANITARY AND
ENVIRONMENTAL ENGINEERING PROFESSORS

Monday 14 August

9:00 - 10:00 a.m. Inaugural ceremony.
10:00 - 10:30 a.m. Objectives, agenda, results, and standards.
10:30 - 11:00 a.m. Break.
11:00 - 12:30 a.m. "Getting acquainted" - Expectations of the working
Groups.
12:30 - 1:30 p.m. Lunch.
1:30 - 3:00 p.m. Panel on "Sanitary and Environmental Engineering
Education."
3:00 - 3:30 p.m. Break.
3:00 - 4:30 p.m. Analysis of the panel. Conclusions on need for
adjustments. Program - Working groups.
4:30 - 5:30 p.m. Presentation by the schools of engineering.
Preparation for the poster session.

Tuesday 15 August

9:00 - 10:00 a.m. Presentation by the schools of engineering.
Presentation of posters.
10:30 - 11:00 a.m. Break.
11:00 - 12:30 p.m. Continuation. Presentation by schools.
12:30 - 1:30 p.m. Break.
1:30 - 3:00 p.m. Ties of collaboration. Presentation of experiences
with collaboration efforts.
3:00 - 3:30 p.m. Break.
3:30 - 4:45 p.m. Bases of resources for collaboration. Needs for
support for collaboration.
4:45 - 6:00 p.m. Bases of resources for collaboration. Presentation by
agencies of support.

Wednesday 16 August

9:00 - 12:00 p.m. Preparation of plans of action for collaboration
efforts. Working groups for the development of plans.

AFTERNOON Free to contact agencies in Washington.

Thursday 17 August

9:00 - 12:30 p.m. Sharing and commenting on the plans of action.
12:30 - 1:30 p.m. Break.
1:30 - 3:00 p.m. Finalization of the plans of action and agreements.
3:00 - 5:00 p.m. Summary, evaluation, and closing.

LIST OF PARTICIPANTS
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PLAN OF ACTION FOR COLLABORATION EFFORTS

ARGENTINA

INSTITUTION: Instituto de Ing.
Sanitaria, Univ. Buenos Aires

PERSON IN CHARGE: Augusto Pescuma

OBJECTIVE: To train professionals with experience to find answers to different aspects of the sanitation problems that can occur in the country.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Identify where similar problems are being confronted.	Information.	PAHO.	One Year	Professionals trained in one aspect of sanitation problems.
2. Establish relations with the country's school of sanitary engineering and the entity in charge of the problem.		Organization of the Schools of Sanitary Engineering of the Continent.		
3. Agree as to way in which our students can participate in the work of that entity.	Money for the travel and expenses called for by that participation.	World Bank. CIDA.		

PLAN OF ACTION FOR COLLABORATION EFFORTS

ARGENTINA

INSTITUTION: Instituto de Ing.
Sanitaria, Univ. Buenos Aires

PERSON IN CHARGE: Augusto Pescuma

OBJECTIVE: To obtain equipment for applied research.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Prepare list of equipment for each program.			2 months	Parameters for plans and designs. Trained researchers.
2. Determine which institutions have equipment available after use in their own programs and ask that it be donated.	Information.	PAHO. Organization of the Schools of Sanitary Engineering of the Continent.	6 months	
3. Do budget for equipment that cannot be obtained through donation.	Money for equipment purchase.	World Bank. CIDA.	4 months	

PLAN OF ACTION FOR COLLABORATION EFFORTS

BOLIVIA

INSTITUTION: Universidad Mayor de San Andrés (UMSA)

ENTITY IN CHARGE: Instituto de Ingeniería Sanitaria (IIS) with PAHO collaboration

OBJECTIVE: To create a graduate course for the Master's degree in Sanitary Engineering so that Bolivia can have professionals who respond to the urgent needs of the environmental sanitation sector.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Institutional support.		IBRD, IDB, AID JICA, GTZ, PAHO/WHO.	August - October 1989	Have the international agencies make the official entities see the importance that creation of the graduate course has for the sector.
2. Exchange of information with graduate schools in sanitary engineering.	Informative material.	Universities in the Region.	August - October 1989	Learn about teaching programs, texts, bibliographies, and teaching approaches used by graduate schools in sanitary engineering.
3. Dovetailing with the infrastructure of the Instituto de Ing. Sanitaria.	Materials and laboratory equipment.	JICA, UNDP, IBRD, Kellogg Foundation, PAHO/WHO.	August - October 1989	Update and dovetail classrooms and laboratory equipment.

PLAN OF ACTION FOR COLLABORATION EFFORTS

BOLIVIA

INSTITUTION: Universidad Mayor de San Andrés (UMSA)

ENTITY IN CHARGE: Instituto de Ingeniería Sanitaria (IIS) with PAHO collaboration

OBJECTIVE: To create a graduate course for the Master's degree in Sanitary Engineering so that Bolivia can have professionals who respond to the urgent needs of the environmental sanitation sector.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
4. Update the IIS operations of UMSA.	Money. Technical support of 2 directors of the schools of sanitary engineering.	PAHO, directors of schools of sanitary engineering.	October - November 1989	Institutionally strengthen the IIS of UMSA.
5. Revise the professional profile of sanitary engineering that the country needs.	PAHO/WHO staff. Professors for one week.	PAHO/WHO, universities in the Region.	October 1989	Define the areas that need to be emphasized so that the country can obtain immediate benefits from the professionals who complete the graduate degree.
6. Definition of curriculum.	Professors for one week.	Universities in the Region.	October 1989	Establish curriculum for the course.
7. Contact international institutions and universities in the Region.		AID, CIDA, IBRD, JICA, UNESCO, Andean Pact, GTZ, and Universities in the Region.	September - October 1989	Learn the possibilities for economic and technical support for creation of the course.

PLAN OF ACTION FOR COLLABORATION EFFORTS

BOLIVIA

INSTITUTION: Universidad Mayor de San Andrés

ENTITY IN CHARGE: Instituto de Ingeniería Sanitaria (IIS) with PAHO collaboration

OBJECTIVE: To create a graduate course for the Master's degree in Sanitary Engineering so that Bolivia can have professionals who respond to the urgent needs of the environmental sanitation sector.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
8. Explore possibilities for agreements with countries, international entities, and universities.	Economic resources, professors, teaching material.	International agencies. Governments of allied countries.	September 1989 - January 1990	Establish agreements with governments, international entities and especially with universities.
9. Bring teachers up to date.	Economic resources national agencies, professors.	PAHO, other international schools of sanitary engineering.	January 1990 and economic support	Obtain technical support for bringing teachers up to date.
10. Propose research programs.	Economic resources.	PAHO, international agencies, universities.	January 1990	Have centers with support for research and organize scientific meetings.

PLAN OF ACTION FOR COLLABORATION EFFORTS

BRAZIL

INSTITUTION: EESC-USP

PERSON IN CHARGE: Jurandyr
Povinelli

OBJECTIVE: To have advisors for research on stabilization ponds.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Identification of institutions and persons in the area.	Collaboration, Mr. Otterstetter.	PAHO.	March 1990	List of specialists in the area.
2. Selection of entities and researchers.		EESC-USP.	April 1990	List with the names selected.
3. Contacts and agreements to achieve the objectives.	Collaboration.	PAHO/USAID.	June 1990	Contract for execution of the project.
4. Execution of the task.	US\$10,000.	PAHO, CNPq, FAPESP	September 1990	Broadening of the research on wastewater treatment.

PLAN OF ACTION FOR COLLABORATION EFFORTS

BRAZIL

INSTITUTION: EESC-USP

PERSON IN CHARGE: Jurandy
Povinelli

OBJECTIVE: To receive advisory services for research on solid waste.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Identification of institutions and professors in the area.	Collaboration, Mr. H. Otterstetter.	PAHO.	March 1990	List with names of specialists.
2. Selection of entities and researchers.		EESC-USP.	April 1990	List of the names selected.
3. Contacts and agreements to achieve the objectives.	Collaboration, Mr. H. Otterstetter.	PAHO/USAID.	June 1990	Contract for project execution.
4. Execution of the tasks.	US\$10,000.	PAHO/CNPq/FAPESP.	September 1990	Broadening of knowledge of the area and improvement of the level of the group.

PLAN OF ACTION FOR COLLABORATION EFFORTS

BRAZIL

INSTITUTION: EESC-USP

PERSON IN CHARGE: Jurandyr
Povinelli

OBJECTIVE: To update bibliographical material.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Preparation of a list.		EESC-USP.	November 1990	Identify needs.
2. Donation of the publications.	US\$20,000.	EPA, PAHO/WPCF/AID.	March 1990	Better serve the students.

PLAN OF ACTION FOR COLLABORATION EFFORTS

BRAZIL

INSTITUTION: Fac. de Salud Pública
(FSP), Universidad de Sao Paulo
(USP)

PERSON IN CHARGE: Aristides
Almeida Rocha

OBJECTIVE: To reformulate the program and teaching content of specialized and graduate courses.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Identification of institutions and persons in the area.	Collaboration.	PAHO/EESC-USP.	February 1990	List of experts and programs at similar institutions.
2. Selection of the institutions and persons in the area.	None.	FSP-USP.	April 1990	List of the names and similar programs selected.
3. Contact and agreement to achieve the objectives.	Collaboration.	PAHO.	May 1990	Terms of reference and agreement for carrying out the work.
4. Exchange with the persons and institutions identified.	Collaboration.	PAHO (Mr. Horst Otterstetter).	September 1990	Procurement of publications, training, costs for training personnel.

PLAN OF ACTION FOR COLLABORATION EFFORTS

BRAZIL

INSTITUTION: Fac. de Salud Pública
(FSP), Universidad de Sao Paulo
(USP)

PERSON IN CHARGE: Aristides
Almeida Rocha

OBJECTIVE: To reformulate the program and teaching content of the specialized and graduate courses.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
5. Identification of institutions and persons in the area.	Collaboration.	PAHO/EPA.	March 1990	List of experts and institutions in the area.
6. Selection of the institutions and persons in the area.	None.	FSP-USP.	May 1990	List of the names and institutions selected.
7. Contact and agreement to achieve the objectives.	Collaboration.	PAHO/EPA.	July 1990	Terms of reference and agreement to carry out the work.
8. Execution of the work.	US\$15,0000.	CNPq/FAPESP/PAHO.	October 1990	Training of personnel and establishment of line of research.

PLAN OF ACTION FOR COLLABORATION EFFORTS

COLOMBIA

INSTITUTION: Universidad del Valle

PERSON IN CHARGE: Guillermo
Rodríguez

OBJECTIVE: To identify training needs within Colombia for professors in the area.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Identification of water, air, and sanitation needs.	Money for correspondence.	PAHO, COLCIENCIAS.	7 weeks	Priorities for teachers' training.
2. Definition of places and topics to be taught.	Money for correspondence and travel.	PAHO, COLCIENCIAS.	6 weeks	Consensus within the country for this work.
3. Identification of institutions for the course in the United States.	Money for correspondence.	COLCIENCIAS.	9 weeks	
4. Preparation of courses.	Money for trips inside and outside Colombia.	PAHO, AID, COLCIENCIAS.	15 weeks	List of courses for 1990, beginning in spring.

PLAN OF ACTION FOR COLLABORATION EFFORTS

COLOMBIA

INSTITUTION: Universidad del Valle
(UNIVALLE)

PERSON IN CHARGE: Guillermo
Rodríguez

OBJECTIVE: To make a list of professors of sanitary/environmental engineering.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Identification of undergraduate and graduate schools.	Secretary. Money for correspondence.	COLCIENCIAS, UNIVALLE.	5 weeks	List of schools.
2. List of professors.	Secretary. Money for correspondence.	UNIVALLE.	4 weeks	List of schools.
3. Dissemination of information.	Money for correspondence and xerox copies.	PAHO, COLCIENCIAS, UNIVALLE.	4 weeks	Updated list for 1989.

PLAN OF ACTION FOR COLLABORATION EFFORTS

COLOMBIA

INSTITUTION: Univ. de Antioquia

PERSON IN CHARGE: Horacio Muñoz

OBJECTIVE: To disseminate and develop appropriate, low-cost technologies in environmental sanitation.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Obtaining of information.	Bibliography and experiences of other countries, \$10,000.	PAHO, WASH, CIDA, ABES (Brazil).	6 months	Have a bibliography at a Documentation Center.
2. Dissemination of information.	Economic resources to produce manuals, and prepare small-scale training courses.	U de A (Internal resources), Min. of Health, PAHO.	Continuous activity.	Improve environmental health. Train and provide updating for health promoters. Promote contact of sanitary engineering students with the national reality.
3. Research.	Training for researchers.	CIDA.	Continuous activity.	

PLAN OF ACTION FOR COLLABORATION EFFORTS

COLOMBIA

INSTITUTION: Univ. de Antioquia

PERSON IN CHARGE: Horacio Muñoz

OBJECTIVE: To develop appropriate technology for wastewater treatment.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Search for information.	Bibliography. Results of research in other countries (Brazil). US\$15,000.	PAHO, REPIDISCA, Brazil, CETESB, Univ. San Carlos, Univ. Católica de Parana.	6 months	Bank of data and experiences to avoid duplication of efforts and orient future research work.
2. Research.	Training for researchers, US\$12,000. Contact with cities or agencies having specific problems with domestic wastewater.	Latin American universities with broad experience in this field, or an official institution like CETESB.	2 years	Adaptation and development of wastewater treatment technology appropriate to the specific conditions in Colombia.

PLAN OF ACTION FOR COLLABORATION EFFORTS

COLOMBIA

INSTITUTION: Univ. de La Salle.

PERSON IN CHARGE: Carlos Fonseca

OBJECTIVE: To update/revitalize the profession of environmental and sanitary engineering.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Revision of the academic program.	Information on other universities.	PAHO/national/international universities.	9 months	Attractive modern career appropriate for the country. Effective.
2. Acquisition of more equipment. Laboratory/Computer.	Information on possible acquisitions at low prices. Complementary funds. Facilitation of import procedures.	EPA, AID, PAHO, IDB, American universities.	1 year (1st phase)	Research support. Increased possibility of providing services in all the areas.
3. Offering of competitive scholarships.	"Seed" fund to use the interest from the accumulated capital. US\$2,500/student would make it possible to ensure an entire education (5 years).	AID.		
4. Exchange of students and teachers.	Fund for travel/lodging. Agreements with other universities.			

PLAN OF ACTION FOR COLLABORATION EFFORTS

COLOMBIA

INSTITUTION: Univer. de La Salle.

PERSON IN CHARGE: Carlos Fonseca

OBJECTIVE: To generate and transfer research and technology/share research.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Prepare research proposals.	Information on experiences in other countries with: water saving and recycling; environmental evaluation project; environmental technologies; liquid waste treatment; solid waste treatment. Seed capital to pay for preparation of proposals.	WASH/AID, World Bank, IDB, ECO, universities.	Urgent, 3-6 months	
2. Improve and prepare human resources and physical equipment.	Research financing (partial). Financing (partial) for equipment procurement. Facilitation of grants, short and long courses for professors.	AID, CIDA/IDRC, EPA, OAS, PAHO/WHO.	1-2 years	
3. Implement pilot projects.	Funds for procurement of materials. Funds (partial) to pay researchers.		1-3 years	

PLAN OF ACTION FOR COLLABORATION EFFORTS

COLOMBIA

INSTITUTION: Univer. de La Salle.

PERSON IN CHARGE: Carlos Fonseca

OBJECTIVE: To bring national and Latin American professionals up to date.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
<u>Course on:</u>				
1. Modelling of quality of surface water.	Travel, lodging for international/national conference participants.	IDRC/CIDA, Univ. of Ottawa.	6 months, with a one week course	40 trained professionals.
2. Management of urban runoff.		Univ. de La Salle.		40 trained professionals.
3. Water reuse.	U. de La Salle would provide: - Computers for the modelling practice. - Organization of the courses.	U. of Delaware (Prof. Gaudy). AID		40 trained professionals.
<u>4. Latin American Seminar on:</u>				
- Environmental and Sanitary Engineering: Advances and the Laying of New Groundwork	Travel money/per diems for conference participants. Costs of documents.	U. of California, Florida State U., Clemson U., Chapel Hill, Lafayette, CEPIS ECO, U. de San Carlos, various Colombian universities.	February 1990	250 participants.

PLAN OF ACTION FOR COLLABORATION EFFORTS

CHILE

INSTITUTION: Escuela de Ing.,
Pontificia Univ. Católica

PERSON IN CHARGE: Pablo Sáez

OBJECTIVE: To establish contacts and seek out possible areas of cooperation with PAHO.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Establish contact with PAHO/Washington.		Pablo Sáez, H. Otterstetter.	Completed.	Become acquainted with each other.
2. Establish contact with PAHO/Chile.		PAHO Representative/ Chile, R. Abaliuk.	August - September 1989.	Become acquainted with each other.
3. Exchange information on activities carried out by the two institutions.		H. Otterstetter, PAHO Representative/ Chile, Roberto Abaliuk, Pablo Saéz.	October - December 1989.	Defined in the description of the activity.
4. Identify possible areas of cooperation.		Same as 3	January - March 1990.	Defined in the description of the activity.
5. Formulate plan of action for cooperation.		Same as 3	April - June 1990.	Defined in the description of the activity.
6. Initiate cooperation.		Same as 3	2nd half of 1990.	Advisory services, training, etc.

PLAN OF ACTION FOR COLLABORATION EFFORTS

CHILE

INSTITUTION: Escuela de Ing.(EI),
Pontificia Univ. Católica (UC)

PERSON IN CHARGE: Pablo Sáez

OBJECTIVE: To find possible areas of collaboration with IDRC.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Contact IDRC.		EI-UC, IDRC.	September 1989	Defined in the description of the activity.
2. Get information on IDRC'S priority areas.		EI-UC, IDRC.	September - November 1989	Defined in the description of the activity.
3. Prepare research/training project.	Set aside by EI-UC.	EI-UC.	December 1989 - March 1990.	
4. Initiate cooperation.		EI-UC, IDRC.		Bring to completion a research project of mutual interest with a strong training component (e.g. visits by professors to various centers, preparation of seminars, advisory services by foreign experts, etc.).

PLAN OF ACTION FOR COLLABORATION EFFORTS

ECUADOR

INSTITUTION: Escuela Politécnica
Nacional

PERSON IN CHARGE: Mr. Milton
Silva

OBJECTIVE: To train professors and students at Clemson University in the United States. (There is an already existing cooperation agreement).

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Preparation of short-term plan of action.	Commitment of services of professors and students for the duration of the grants.	PAHO/WHO, EPN. Clemson Univ.	5 years (duration of the agreement)	Academic preparation and collaboration between graduate levels at the institutions.
2. Selection of professors and students.	Amount of the grants.			
3. Determination of research projects.				

PLAN OF ACTION FOR COLLABORATION EFFORTS

ECUADOR

INSTITUTION: Escuela Politécnica Nacional (EPN)

PERSON IN CHARGE: Mr. Milton Silva

OBJECTIVE: To train research personnel and gain knowledge of new teaching programs and techniques for professors who wish to make use of the sabbatical year.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Request a one-year sabbatical for 3 professors.	Commitment of services 1 year/person.	EPN directives.	1 person/year will be reqused. until by 1993 these objectives have been achieved.	Professors with more experience and new ideas.
2. Request support from different universities and organizations.	Salaries for one year that need to be covered by each university and international organizations.	UNAM, Univ. Sao Paulo, CETESB, Clemson Univ, or Univ. of North Carolina. PAHO.		

PLAN OF ACTION FOR COLLABORATION EFFORTS

GUATEMALA

INSTITUTION: ERIIS - Universidad de San Carlos

PERSON IN CHARGE: Mr. Arturo Pazos

OBJECTIVE: To have bilateral collaboration between neighboring countries. To strengthen the program of teaching and research at the graduate schools of environmental engineering of the Universidad Autónoma in Mexico (UNAM) and the Universidad de San Carlos in Guatemala.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. ERIIS/USC-UNAM coordination meeting (program preparation).	Per diems for 3 professors for 3 days and airline tickets Guatemala-Mexico-Guatemala. US\$1,000 for organizational costs.	PAHO country office, January 1990 UNAM, and ERIIS. Local PAHO Representatives. Deans and directors.		Bilateral program of collaboration to: - Identify and execute research in common areas. - Exchange professors and students. - Aid in the development of areas of interest. - Hold courses and seminars.
2. Organization and execution of bilateral collaboration program.	Financing of: - Equipment. - Research. - Lodging for professors, 4/year. - 4 travelling courses. - Researchers.	Local university officials, Ministers of Planning, Foreign Affairs. Take advantage of the meeting of the presidents of Guatemala and Mexico. Universities in the United States.	January 1990 - December 1994	- Strengthening of areas of research at both schools. - Academic strengthening of both schools.

PLAN OF ACTION FOR COLLABORATION EFFORTS

GUATEMALA

INSTITUTION: ERIS - Univ. de
San Carlos

PERSON IN CHARGE: Mr. Arturo
Pazos

OBJECTIVE: To train within AIDIS the section for professors of sanitary and environmental engineering in the area of Central America.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Local meeting with AIDIS.	Telephone.	Secretarial.	3 weeks	Interest the local section of AIDIS in doing the proposal and supporting the Central American Congress of AIDIS.
2. Meeting at the Central American Congress of AIDIS.	Travel and per diems. One professor per country.	PAHO/WHO. Organizations that support research programs.	2 months	Fund the Association of Professors of Sanitary Engineering of Central America.

PLAN OF ACTION FOR COLLABORATION EFFORTS

GUATEMALA

INSTITUTION: ERIS - Univ. de San Carlos

PERSON IN CHARGE: Mr. Arturo Pazos

OBJECTIVE: To have cooperation for research and teaching development between international organizations and universities outside the Region and ERIS.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Identification of cooperating parties.	ERIS locations.	Director of ERIS, Professors from ERIS, local PAHO.	4 weeks	Prepare profiles of cooperation projects according to agency or university.
2. Making of a request for cooperation	ERIS locations. Local PAHO.	PAHO/WHO (local and central); local represent. offices of BID, World Bank, UNDP, AID, etc.; ERIS, Univ. de San Carlos.	6 months	Implement projects.
3. Project preparation.	Financing of the seminar on preparation of the program, US\$1.000. Travel for 1 representative of the agency to Guatemala.	PAHO, U. San Carlos, Agency or University involved.	4 months	Finance the program.
4. Development of the program.	Financing of: Grants. Publications. Travel for Professors and students. Equipment. Research. Researchers.	PAHO, U. San Carlos, agency or university that supports the project.	4 years	Update curriculum. Academic, teaching, and research strengthening.

PLAN OF ACTION FOR COLLABORATION EFFORTS

MEXICO

INSTITUTION: Universidad Nacional Autónoma

PERSON IN CHARGE: Mr. P. Martínez P.

OBJECTIVE: To establish close ties for permanent collaboration between the areas of sanitary and environmental engineering of the Universidad de San Carlos of Guatemala and the Universidad Autónoma of Mexico. To establish teaching and research programs.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Workshop seminar to prepare the specific 2-year program (duration 2 days).	Round trip air transportation Guatemala-Mexico (4 profs).	PAHO, UNAM, and Univ. de San Carlos.	3 months (September - December 1989)	Identify specific areas of collaboration and prepare specific teaching program. Research for the next 2 years and then on a permanent basis.
2. Departure of professors.	Air transportation and per diems.	Coordinators of sanitary and environmental eng., Univ. San Carlos, UNAM.	2 professors (one per semester, for a period of 10 days each)	
3. Research.	For specific research projects.			
4. Travelling courses.		Local institutions and universities in the United States.		

MEXICO

PLAN OF ACTION FOR COLLABORATION EFFORTS

INSTITUTION: UANL, Monterrey,
Nuevo León

PERSON IN CHARGE: David Fernández

OBJECTIVE: To eliminate the risk of pollution of the aquiferous stratum or subsoil, providing industry with a place for its controlled disposal.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Short course on toxic waste disposal (40 hrs.).	Payment for profs., per diems and travel.	PAHO/WHO	Within 10 months, to last one week.	Exchange of experiences. Sensitization of private industry and local governments.

PLAN OF ACTION FOR COLLABORATION EFFORTS

MEXICO

INSTITUTION: UANL, Monterrey,
Nuevo León

PERSON IN CHARGE: David Fernández

OBJECTIVE: To update the study plans for the Master's degree in environmental engineering and the Master's degree in public health engineering.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Revision of the curriculum for the Master's in environmental engineering.	Pay for 2 advisors, travel and per diems.	PAHO and a university.	Within 1 year to last 1 week.	Updating of the study plan.

PLAN OF ACTION FOR COLLABORATION EFFORTS

VENEZUELA

INSTITUTION: Universidad Central

PERSON IN CHARGE: Griselda F. de Giner

OBJECTIVE: To improve and update the library of the Department of Sanitary Engineering.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Acquire new books.	US\$2,000.	CIDA.	6 months	Update and improve
2. Subscribe to four journals.	US\$1,500.	CIDA.	6 months	information transfer in the area
3. Acquire microcomputer with laser disc equipment.	US\$2,500.	PAHO.	6 months	of sanitary and environmental engineering.

PLAN OF ACTION FOR COLLABORATION EFFORTS

VENEZUELA

INSTITUTION: Universidad Central

PERSON IN CHARGE: Griselda F. de Giner

OBJECTIVE: To request help in order to strengthen weak areas at the graduate level, such as: 1) Use of applied models for environmental systems. 2) Environmental impact evaluation. 3) Toxic waste treatment.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Workshop given by experts in such areas:	Financing for travel, lodging, and salary of each professor.			
1.1 Clemson Univ. faculty.		AID, PAHO.	6 months	Bringing of professors up to date; strengthening of the graduate level.
1.2 ECO staff.		AID, PAHO.	9 months	
1.3 Drexel Univ. faculty.		AID, PAHO.	12 months	

PLAN OF ACTION FOR COLLABORATION EFFORTS

VENEZUELA

INSTITUTION: Universidad Central

PERSON IN CHARGE: Griselda F. de Giner

OBJECTIVE: To obtain 10 grants for full-time graduate students (for 2 years).

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Obtain external financing.	US\$7,500/student. Total: US\$75,000.	CIDA, PAHO, OAS.	9 months	Strengthen the graduate studies offered by the department.

PLAN OF ACTION FOR COLLABORATION EFFORTS

VENEZUELA

INSTITUTION: Universidad Central

PERSON IN CHARGE: Griselda F. de
Giner

OBJECTIVE: To design a graduate course at the level of specialization.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Curriculum design of the course.	Experts in curriculum design in the area.	PAHO.	8 months	Plan for studies leading to the degree of specialist.

PLAN OF ACTION FOR COLLABORATION EFFORTS

VENEZUELA

INSTITUTION: Universidad Central

PERSON IN CHARGE: Griselda F. de Giner

OBJECTIVE: To design a graduate course at the level of specialization.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Obtain financial aid.	US\$15,000.	World Bank.	6 months	Design parameters for stabilization ponds adapted to the environmental conditions and type of wastewater in the country.

PLAN OF ACTION FOR COLLABORATION EFFORTS

UNITED STATES

INSTITUTION: Lafayette College

PERSON IN CHARGE: Terence McGhee

OBJECTIVE: To promote visits by professors and students from Latin America to Lafayette College to share their experiences with our faculty and students.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGAN- IZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Identify institutions/ persons as potential candidates.	None.	PAHO, AIDIS.	This week	Agreement for the establishment of such a program.
2. Seek financial support at Lafayette for the first visit(s).	Travel expenses and per diems.	Office of the Pro- vost, Lafayette College.	This month	Agreement to provide funds for the first visit(s).
3. Seek additional funds for this and related activities.	Travel, per diems, and honoraria.	World Bank, AID PAHO, and private foundations.	This year	Continuous support.

PLAN OF ACTION FOR COLLABORATION EFFORTS

UNITED STATES

INSTITUTION: Lafayette College

PERSON IN CHARGE: Terence McGhee

OBJECTIVE: To send professors and students from Lafayette College to Latin America to learn about environmental problems and their solutions.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGANIZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Identify persons and institutions as potential candidates.	None.	PAHO, AIDIS.	This week	Agreement to establish such a program.
2. Seek financial support at Lafayette.	Resources for travel from Lafayette.	Office of the Provost, Lafayette College.	This month	Agreement to provide funds.
3. Seek continuous financial support for this activity.	Resources for travel.	Lafayette College, private foundations.	This year	Continuous support.

PLAN OF ACTION FOR COLLABORATION EFFORTS

UNITED STATES

INSTITUTION: Lafayette College

PERSON IN CHARGE: Terence McGhee

OBJECTIVE: To establish joint research activities in the United States and/or Latin America, using our students and students from Latin America in projects of mutual interest.

ACTIVITY	REQUIRED RESOURCES	SUPPORTING ORGAN- IZATIONS OR PERSONS	TIMETABLE	RESULTS
1. Identify areas of mutual interest.	Contacts achieved with the 2 previous objectives.	Lafayette College, PAHO, AID, AIDIS. Private foundations.	This year	Identification and definition of potential projects.
2. Formulate joint proposals.	Travel, telephone, facsimile.	Lafayette College, PAHO, AID.	Next year	Formal proposal.
3. Submit proposals to AID, PAHO, etc.	Travel, telephone, facsimile.	Lafayette College, PAHO, AID.	Next year	Funds for research.
4. Conduct projects.	Support for students. Support for professors. Travel, publications.	AID, PAHO. Private foundations.	1990-1991 and subsequent years	Applications to the solution of environmental problems.

ANNEX IV

INFORMATION PROVIDED BY THE PARTICIPANTS ON
THE COURSES GIVEN BY THEIR INSTITUTIONS

ARGENTINA

NAME OF THE COURSE

Specialization in Sanitary Engineering.

TITLE OF DEGREE AND LEVEL

Graduate.

INSTITUTION

Instituto de Ingeniería Sanitaria de la Universidad de Buenos Aires.

LOCATION

Buenos Aires, Argentina.

OBJECTIVE OF THE PROGRAM

To educate engineers specializing in sanitary and environmental engineering.

DURATION

15 months.

NUMBER AND LEVEL OF STAFF

10 full-time professors and 17 part-time professors.

NUMBER OF STUDENTS - THEIR ORIGINS

25 Argentine students and one Colombian.

AREAS OF RESEARCH

- Industrial wastewater.
- Air pollution.
- Solid waste treatment.

STRONG POINTS OF THE PROGRAM

- Water treatment and drains.
- Planning.
- Urban waste.

WEAK POINTS

- Treatment, research, and solid waste.

BOLIVIA

NAME OF THE COURSE

Graduate Study in Sanitary Engineering.

TITLE OF DEGREE AND LEVEL

Master's Degree in Sanitary Engineering.

INSTITUTION

University Mayor de San Andrés.

LOCATION

La Paz, Bolivia.

OBJECTIVE OF THE PROGRAM

To give civil engineers specialized training in sanitary engineering.

DURATION

2 years.

NUMBER AND LEVEL OF STAFF

In planning phase.

NUMBER OF STUDENTS - THEIR ORIGINS

30 students per year.

AREAS OF RESEARCH

STRONG POINTS OF THE PROGRAM

- Community participation.
- Appropriate technologies for the rural sector.
- Well-drilling and exploitation of groundwater.

WEAK POINTS OF THE PROGRAM

Analysis of the proposal for setting up the course, bringing educators up to date, organizing research programs, and carrying out institutional strengthening of sanitary engineers.

BRAZIL

NAME OF THE COURSE

Graduate Study in Hydraulics and Sanitation.

TITLE OF DEGREE AND LEVEL

Master's Degree or Doctorate.

INSTITUTION

Escuela de Ingeniería de San Carlos, Universidad de Sao Paulo.

LOCATION

Sao Paulo, Brazil.

OBJECTIVE OF THE PROGRAM

To train specialists for the environmental area with emphasis on: Water treatment, wastewater treatment, solid waste disposal, the ecology of dams, and mathematical modelling.

DURATION

30 to 48 months.

NUMBER AND LEVEL OF STAFF

30 full-time professors and 4 part-time professors.

NUMBER OF STUDENTS - THEIR ORIGINS

AREAS OF RESEARCH

- Water treatment (filtration, coagulation, flocculation, UV disinfection).
- Wastewater treatment (anaerobes and ponds).
- Solid waste disposal: Applied limnology and mathematical models.

STRONG POINTS OF THE PROGRAM

The same fields as the areas of research.

WEAK POINTS

- Stabilization ponds.

BRAZIL

NAME OF THE COURSE

Specialization in Environmental Engineering and Specialization in Public Health.

Graduate Study in Public Health Engineering (Master's Degree and Doctorate).

TITLE OF DEGREE AND LEVEL

Environmental Engineer or Public Health Engineer. Master's Degree or Doctorate in Public Health.

INSTITUTION

Facultad de Salud Pública, Universidad de Sao Paulo.

LOCATION

Sao Paulo, Brazil.

OBJECTIVE OF THE PROGRAM

To supplement the training of engineers in disciplines directed toward aspects of the environment and public health.

DURATION

11 months; Master's degree from 2.5 to 3 years; and Doctorate from 4 to 5 years.

NUMBER AND LEVEL OF STAFF

9 full-time professors, 4 full-time professors with commitments to other programs, 6 part-time professors, and 3 collaborators.

NUMBER OF STUDENTS - THEIR ORIGINS

40 Brazilians and students from other countries of America and Africa.

AREAS OF RESEARCH

- Wastewater treatment.
- Drinking water treatment.
- Solid waste disposal.
- Sanitary limnology.
- Occupational health.

STRONG POINTS OF THE PROGRAM

- Occupational health and sanitary limnology.

WEAK POINTS

- Wastewater treatment.
- Solid waste treatment.
- Research plant.

CANADA

NAME OF THE COURSE

Graduate Course in Hydraulic and Environmental Engineering.

TITLE OF DEGREE AND LEVEL

Master's Degree in Engineering (ME)
Master's Degree in Applied Sciences (MAsc)
Doctorate (PhD)

INSTITUTION

Department of Civil Engineering, University of Ottawa, Canada.

LOCATION

Ottawa, Canada.

OBJECTIVE OF THE PROGRAM

DURATION

2-4 years.

NUMBER AND LEVEL OF STAFF

6 full-time professors (3 in hydraulics and 3 in environmental engineering) and 4 associate professors.

NUMBER OF STUDENTS - THEIR ORIGINS

30 to 40 students, more than half coming from developing countries.

AREAS OF RESEARCH

Simplified methods for water treatment (hydraulic flocculators, disinfection with UV rays). Wastewater treatment (small diameter drains, removal of dissolved organic matter); pumping with renewable energy (hydraulic ram, solar pump); rainwater catchment. Urban runoff, rock dams, rural and roadway drainage, statistical hydrology.

STRONG POINTS OF THE PROGRAM

Special programs for developing countries

Orientation, short courses, water supply and sanitation, irrigation and drainage. Our ability to give courses in other countries. Research laboratories on water quality and hydraulics. Our access to the NRC laboratories in Ottawa.

WEAK POINTS

Our need for a better definition of Latin America's research priorities in the study and research programs for the graduate students.

CHILE

NAME OF THE COURSE

Licenciante in Engineering Sciences and Master's Degree in Engineering Sciences (Environmental Engineering).

TITLE OF DEGREE AND LEVEL

Licenciante and Master's Degree.

INSTITUTION

Pontificia Universidad Católica de Chile.

LOCATION

Santiago, Chile.

OBJECTIVE OF THE PROGRAM

- To educate engineers from almost all the specialties with a specific common base.
- Specialization through graduate study.

DURATION

5 to 6 years for the Licenciante and from 1 to 1.5 years for the Master's degree.

NUMBER AND LEVEL OF STAFF

70 full-time professors for the Licenciante, and 2 full-time and 2 part-time professors for the Master's degree.

NUMBER OF STUDENTS - THEIR ORIGINS

1500 studying for the Licenciante and 40 for the Master's degree.

AREAS OF RESEARCH

- Transport of reagent solutes in groundwater.
- Biological treatment of wastewater.

STRONG POINTS OF THE PROGRAM

- Modern and established educational program.
- Defined lines of research.
- Infrastructure.

COLOMBIA

NAME OF THE COURSE

Program in Sanitary Engineering.

TITLE OF DEGREE AND LEVEL

Sanitary Engineer.

INSTITUTION

Facultad de Ingeniería, Universidad de Antioquia.

LOCATION

Medellín, Colombia.

OBJECTIVE OF THE PROGRAM

To train sanitary engineers for the study, design, construction, maintenance and the operation of works aimed at the protection of public health and the control of environmental pollution.

Preparation to solve problems in sanitation and environmental pollution.

DURATION

5 years.

NUMBER AND LEVEL OF STAFF

11 full-time professors and 7 part-time professors.

NUMBER OF STUDENTS - THEIR ORIGINS

350 Colombians.

AREAS OF RESEARCH

- Appropriate technology for wastewater treatment.
- Low cost technologies in basic sanitation.

STRONG POINTS OF THE PROGRAM

Water treatment.

WEAK POINTS

- Research.
- Computer models applied to sanitary engineering.
- Air pollution.

COLOMBIA

NAME OF THE COURSE

Bachelor's Degree in Sciences.

TITLE OF DEGREE AND LEVEL

Bachelor's Degree in Sciences (Sanitary Eng.).

INSTITUTION

Universidad del Valle.

LOCATION

Cali, Colombia.

OBJECTIVE OF THE PROGRAM

To prepare professionals to work in the public and private sectors. These professionals will be trained for:

- a) The design and operation of water works.
- b) The design and operation of simple and inexpensive water distribution systems.
- c) The design of water distribution and sewerage systems.
- d) Work with air pollution.
- e) Work with solid wastes.
- f) Knowledge and development of rural sanitation programs.
- g) Work in industrial hygiene.

DURATION

5 years.

NUMBER AND LEVEL OF STAFF

20 full-time professors.
3 technicians.
2 part-time professors.

NUMBER OF STUDENTS - THEIR ORIGINS

135. All Colombians and many of them from the same state.

AREAS OF RESEARCH

- a) Anaerobic treatment: VASB (Baffled reactors)
- b) Biological quality of water.
- c) Manual on solid wastes.
- d) Slow sand filters.

ECUADOR

NAME OF THE COURSE

Graduate Study in Environmental Engineering.

TITLE OF DEGREE AND LEVEL

Master's degree in Engineering.

INSTITUTION

Escuela Politécnica Nacional.

LOCATION

Quito, Ecuador.

OBJECTIVE OF THE PROGRAM

To give our technicians knowledge of environmental engineering and, at the same time, to teach them the most appropriate technology for our environment.

DURATION

3 semesters, with additional time devoted to a thesis (1 week).

NUMBER AND LEVEL OF STAFF

2 full-time professors and 2 part-time professors.

NUMBER OF STUDENTS - THEIR ORIGINS

30 Ecuadorians.

AREAS OF RESEARCH

- Water clarification.
- Treatment of wastewater and highly contaminated water.

STRONG POINTS OF THE PROGRAM

- Water treatment for drinking water.
- Wastewater treatment in anaerobic beds.

WEAK POINTS

- Laboratories
- Air pollution.
- Protection of ecosystems.

GUATEMALA

NAME OF THE COURSE

Central American Master's degree in Sanitary Engineering.

TITLE OF DEGREE AND LEVEL

Master's Degree in Sanitary Engineering, MS.

INSTITUTION

Escuela Regional de Ingeniería Sanitaria y Recursos Hidráulicos,
Universidad de San Carlos, Guatemala.

LOCATION

Guatemala City.

OBJECTIVE OF THE PROGRAM

To provide advanced education in the field of sanitary engineering and water resources.

DURATION

1 year.

NUMBER AND LEVEL OF STAFF

4 full-time professors and 16 part-time professors.

NUMBER OF STUDENTS - THEIR ORIGINS

20 Central Americans.

AREAS OF RESEARCH

- Low cost technology for wastewater treatment.
- Utilization of groundwater in volcanic land.

STRONG POINTS OF THE PROGRAM

- Low cost technology for wastewater treatment.
- Project preparation and evaluation.
- Public health.
- Development, management, and administration of hydrometeorological information systems.

WEAK POINTS

- Environmental management.
- Pollution control technology (water, air, and soil).
- Environmental impact evaluation.

MEXICO

NAME OF THE COURSE

Graduate Study in Environmental Engineering. Options: Control of Air Pollution, Water Quality, Soil Pollution, Solid Waste Management, and Sanitary Engineering.

TITLE OF DEGREE AND LEVEL

Master's Degree or Doctorate in Environmental Engineering.

INSTITUTION

División de Estudios de Posgrado, Facultad de Ingeniería, Universidad Autónoma de México.

LOCATION

Mexico, D.F.

OBJECTIVE OF THE PROGRAM

To prepare specialists to plan, design, and supervise works for the prevention and control of environmental pollution, and for drinking water supply and wastewater disposal systems.

DURATION

3 academic semesters.

NUMBER AND LEVEL OF STAFF

6 full-time professors, 3 part-time professors.

NUMBER OF STUDENTS - THEIR ORIGINS

From 20 to 30 students (10 to 20% foreign).

AREAS OF RESEARCH

- Anaerobic treatment of wastewater.
- Evaluation and control of air quality (Dispersion Model).
- Classification and treatment of wastewater.
- Treatment of water supply for drinking water.

STRONG POINTS OF THE PROGRAM

- Biological treatment of wastewater.
- Modelling of air quality.
- Design of wastewater treatment systems.
- Water treatment for drinking water (Design of plants).

WEAK POINTS OF THE PROGRAM

- Water reuse--utilization of wastewater in irrigation.
- Hazardous waste management.
- Application of models of water quality in rivers and small freshwater lakes.

MEXICO

NAME OF THE COURSE

Master's degree in Environmental Engineering.

TITLE OF DEGREE AND LEVEL

Master's degree at graduate level.

INSTITUTION

Facultad de Ingeniería Civil, UANL (Universidad Autónoma de Nuevo León).

LOCATION

Monterrey, Mexico.

OBJECTIVE OF THE PROGRAM

To prepare highly trained professionals in the area.

DURATION

3 academic semesters.

NUMBER AND LEVEL OF STAFF

7 full-time professors, 5 part-time professors, and 6 collaborators.

NUMBER OF STUDENTS - THEIR ORIGINS

10 Mexicans.

AREAS OF RESEARCH

Water and air.

STRONG POINTS OF THE PROGRAM

Equipment in the drinking water and air sector, and physical infrastructure.

WEAK POINTS OF THE PROGRAM

Research on solid waste.

UNITED STATES

NAME OF THE COURSE

Environmental and Water Resource Engineering.

TITLE OF DEGREE AND LEVEL

Master's degree (12 to 18 months). Doctorate (2 to 3 years).

INSTITUTION

University of Texas, Austin

LOCATION

Austin, Texas.

OBJECTIVE OF THE PROGRAM

- Education of Engineers in Environmental Engineering. Water Resources Engineering.

DURATION

12 to 18 months (Master's degree). 2 to 3 years (Doctorate).

NUMBER AND LEVEL OF STAFF

16 on the faculty (Engineers). 4 on the staff.

NUMBER OF STUDENTS - THEIR ORIGINS

70 (50 from the United States, 20 international).

AREAS OF RESEARCH

- Wastewater treatment.
- Water treatment.
- Treatment of hazardous wastes and on-site repair.
- Surface water and groundwater.
- Modelling of quality - allocation and transport of this water.
- Forecasting of water use.

STRONG POINTS OF THE PROGRAM

Broad system of teaching with many areas of specialization. A flexible curriculum for the students who are involved with a large number of experts (faculty), each in his own area.

WEAK POINTS

Financing for international students who are not research oriented.

UNITED STATES

NAME OF THE COURSE

Program for Master's degree and Doctorate in Environmental Engineering.

TITLE OF DEGREE AND LEVEL

Master's degree.
Doctorate.

INSTITUTION

University of California, Davis.

LOCATION

Davis, California, United States of America

OBJECTIVE OF THE PROGRAM

Training in sanitary engineering.

DURATION

Master's degree 30 months (thesis required).
Doctorate from 3 to 4 years after the Master's degree.

NUMBER AND LEVEL OF STAFF

5 Ph.D.s in sanitary engineering.

NUMBER OF STUDENTS - THEIR ORIGINS

No support for foreign students.

AREAS OF RESEARCH

- Air pollution, biological treatment, aquatic systems, solid waste.
- Flexibility in available courses and support in courses and other fields.

UNITED STATES

NAME OF THE COURSE

Degree in Civil Engineering.

TITLE OF DEGREE AND LEVEL

Civil Engineer.

INSTITUTION

Lafayette College, Easton, Pennsylvania.

OBJECTIVE OF THE PROGRAM

To train civil engineers with specialization in selected areas.

DURATION

4 years.

NUMBER AND LEVEL OF STAFF

- 8 full-time.
- 2 part-time.

NUMBER OF STUDENTS - THEIR ORIGINS

100-150 students, 90% of whom are North Americans.

AREAS OF RESEARCH

- Water quality.
- Effect of freezing on the movement of soil pollutants.

STRONG POINTS OF PROGRAM

Computer applications:

- Models.
- Data collection.
- Computer-based drawings.

Experience with engineering problems and solutions in other societies. Visitors to Lafayette; visits by our professors/students. Joint research on problems of common interest.

UNITED STATES

NAME OF THE COURSE

Multidisciplinary graduate program.

TITLE OF DEGREE AND LEVEL

Master's degree in Environmental Engineering.
Environmental Sciences.
Doctorate (Ph.D.)

INSTITUTION

Drexel University

LOCATION

Philadelphia, PA. U.S.A.

OBJECTIVE OF THE PROGRAM

To train engineers.
Design and operation - water and sewerage.
Control of hazardous wastes.
Control of air pollution.
Environmental administration.

To train environmental scientists.
Environmental chemists.
Environmental microbiologists.

Research

DURATION

Master's degree in Environmental Engineering - 2 to 5 years.
Master's degree in Environmental Sciences - 2 to 5 years.
Ph.D. - 3 to 5 years.

NUMBER AND LEVEL OF STAFF

5 full-time professors.
10 full-time associate professors.
10 part-time professors.

NUMBER OF STUDENTS - THEIR ORIGINS

20 to 30 full-time students (50% of whom are from the United States).
80 to 90 part-time students (all from the United States).

AREAS OF RESEARCH

Water supply/water quality.
Water treatment.
Solid waste management.
Air pollution.

VENEZUELA

NAME OF THE COURSE

Civil Engineering with Sanitary Option and Master's degree in Sanitary Engineering (Environmental and Water Quality).

TITLE OF DEGREE AND LEVEL

Civil Engineer and Master's Degree.

INSTITUTION

Universidad Central de Venezuela.

LOCATION

Caracas, Venezuela.

OBJECTIVE OF THE PROGRAM

To train professionals in civil engineering and for specialization in the field of sanitary engineering, giving a comprehensive view of the impact of the human activity on the environment and how this impact might be controlled.

DURATION

Licentiate 5 years, Master's degree 2 years.

NUMBER AND LEVEL OF STAFF

10 full-time professors and 10 part-time professors.

NUMBER OF STUDENTS - THEIR ORIGINS

25 for the Licentiate and 45 part-time for the Master's degree, all Venezuelans.

AREAS OF RESEARCH

- Water clarification, biological process in wastewater treatment.
- Quality of bodies of water, and evaluation and control of air quality.

STRONG POINTS OF THE PROGRAM

- Short courses and workshops.
- Teaching support material.
- Research on the areas indicated.

WEAK POINTS OF THE PROGRAM

Financing of fellowships, short courses for publicity, laboratory equipment and maintenance.

ENVIRONMENTAL SYSTEMS ENGINEERING AT
CLEMSON UNIVERSITY (UNITED STATES)

1. PROFILE OF THE DEPARTMENT

a) Became a separate department beginning in 1966.

- Facilitates the administration of internal funds.
- Facilitates the hiring of staff.
- Concentrates approaches.

b) Has only graduate courses.

2. DEGREES OFFERED

a) Doctorate (Ph.D.)

Duration from 3 to 4 years, including 1 1/2 to 2 years of applied work.

Research work requires 1 1/2 to 2 years.

There is no foreign language requirement. The graduates work in universities, consulting firms, and industries. Also in research laboratories.

b) Master of Science Degree (MS)

33 semester hours, including 6 semester hours for the thesis research. The research project is very important for the professional maturation of the student. This program accepts engineers and scientists.

From 16 to 21 months are required to complete the program. The graduates work in consulting firms, industries, and government agencies. The graduates are in very great demand. The annual starting wage is from 33 to 36 thousand dollars.

c) Master's Degree in Engineering

Requirements similar to those for the Master of Science, with the exception that a special project is required in lieu of the thesis. The graduates work with consulting firms and industries. The graduates are in very great demand. Annual starting wage of from 36 to 40 thousand dollars.

3. ADMISSION REQUIREMENTS
 - a) Minimum UG/GPA of 3.0 (frequently 3.5)
 - b) GRE, 1500 (more often, 1900)
 - c) Two favorable letters of reference.
 - d) TOEFL of 575
 - e) 75 to 100 candidates per year

4. PROFILE OF THE STUDENTS
 - a) 60 to 75 students enrolled
 - b) 25 students graduating annually
 - c) 65% engineers, 35% scientists
 - d) 35% Ph.D., 65% Master's Degree
 - e) 50% male, 50% female
 - f) 75% North American, 25% international

5. PROFILE OF THE PROFESSORS
 - a) 9 full-time professors, 10 for support
 - b) Specialties of the professors (all Ph.D.s)
 - 3 civil engineers
 - 1 chemical engineer
 - 1 mechanical engineer
 - 1 nuclear engineer
 - 1 agricultural engineer
 - 1 chemist
 - 1 biologist
 - c) 8 full professors, 1 assistant professor

6. AREAS OF THE PROGRAMS FOR SPECIALIZATION
 - a) Water treatment systems.
 - b) Hazardous waste treatment systems.
 - c) Administration of hazardous waste.
 - d) Administration of water resources.
 - e) Air quality engineering.
 - f) Solid waste engineering.
 - g) Nuclear environmental engineering.
 - h) Environmental chemistry.
 - i) Environmental biology.

7. PRINCIPAL SOURCES OF RESOURCES FOR RESEARCH

a) United States Government (45%)

- EPA
- Department of Energy
- Department of the Interior
- National Science Foundation

b) American industries (55%).

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PART 2

WORKSHOP ON "INCORPORATION OF DISASTER PREPAREDNESS INTO
COURSES IN SANITARY AND ENVIRONMENTAL ENGINEERING"

WASHINGTON, D.C., 18 AUGUST 1989

PART 2

WORKSHOP ON "INCORPORATION OF DISASTER PREPAREDNESS INTO
COURSES IN SANITARY AND ENVIRONMENTAL ENGINEERING"

2.1 Introduction

As a practical example of how to adapt teaching programs to meet the immediate needs of the countries and their populations, a workshop on "Incorporation of Disaster Preparedness into Courses in Sanitary and Environmental Engineering" was held on 18 August.

16 people participated in the meeting, of whom 12 were professors of sanitary engineering at 11 universities in 7 countries, 3 were PAHO staff members, and 1 was a consultant; all of them had taken part in the first part of the meeting. Annex I gives the list of participants.

A basic informative document (see Annex II) containing basic concepts, the purpose of the workshop, the agenda, and the working methodology was distributed to the participants.

2.2 Activities Carried Out

The program of work was based on the agenda and it included four types of activities:

- introductory session and closing session;
- orientation of the workshop;
- plenary sessions (three sessions);
- working groups (one session).

During the initial session of the workshop, Dr. Claude de Ville de Goyet, Coordinator of the Program for Emergency Preparedness and Disaster Relief Coordination, told the participants about the scope and activities of the Program, emphasizing the priority that is given to the training of personnel and the need for active and permanent participation by the universities in order to ensure the continuity of the process.

He placed emphasis on the fact that the proclamation of the "International Decade for the Reduction of Natural Disasters" would definitely mean increased attention at the global, regional, and country level to disaster prevention and disaster preparedness activities. Next, Mr. Guillermo Dávila, Coordinator of PAHO's Environmental Health Program, spoke about the importance of the environmental health component in preparation for emergencies and disasters, emphasizing the important role that the universities can play through their programs for sanitary and environmental

engineering, by carrying out training activities, conducting research, and acting as a source of knowledge and of technical and scientific information in matters related to environmental health during emergencies and disasters.

Following the introductory session Mr. Odyer A. Sperandio, Consultant, reported to the participants on the purpose of the workshop and the working methodology.

Next, Mr. Fred Reiff and Mr. Odyer A. Sperandio gave a presentation on representative examples of the educational material prepared by the Emergency Preparedness Program. Questions were asked and observations made on the potential value of the material for education and training activities at the universities.

In a plenary session the participants--sanitary and environmental engineering professors--reported on the activities that the programs for sanitary and environmental engineering at their universities carry out on aspects of emergencies and disasters. This exchange of information and experiences was accompanied by observations and suggestions for future activities.

The workshop continued with a working group session. Three working groups were set up, whose composition is shown in Annex III.

The principal topics assigned to the groups were:

- i) human resources for environmental health in emergencies;
- ii) the role of sanitary and civil engineers in environmental health;
- iii) the role of the university in emergency preparedness (with reference to environmental health).

The groups acted in accordance with the suggested working methodology, focusing on specific aspects of the topics assigned. Information on those aspects can be found in Annex III. The rapporteurs for each group prepared the material for presentation at the final plenary session.

During the final working plenary session a representative from each group reported on the conclusions of their group. Those contributions were considered and discussed by the participants and the recommendations that are included in this report are the result of the consensus reached in the discussions on the conclusions of the groups.

The workshop ended during the same session as the formal closing of the First Pan American Meeting of Sanitary and Environmental Engineering Professors. Those who took the opportunity to speak were: Mr. Horst Otterstetter, Regional Adviser on Human Resources, in order to recapitulate the activities and results of the meeting; Mr. Odyer A. Sperandio, Consultant,

in order to report on the activities and results of the workshop; Dr. Augusto Pescuma, Professor of Sanitary Engineering, Instituto de Ingeniería Sanitaria, Buenos Aires, Argentina, in order to speak on behalf of the participants; Dr. Claude de Ville de Goyet, Coordinator of the Emergency Preparedness Program, in order to reiterate to the participants both the need for them to join forces in order to expand the role of the universities in emergencies and disasters, as well as the importance of the universities' making a commitment to carry out the mission of education and training; and Dr. George Alleyne, Area Director - Health Programs Development - in order to express on behalf of PAHO the Organization's satisfaction over the results of the two events, to invite the participants to follow up on their conclusions and recommendations, and to proceed with the closing of the meeting.

2.3 Conclusions and Recommendations

A. Human resources for environmental health during emergencies

A.1) It is recognized that there is a need for personnel trained in environmental health aspects of emergencies in:

- drinking water and sewerage firms;
- health sector and environmental protection agencies;
- universities (sanitary and environmental engineering programs);
- emergency and civil defense commissions, intersectoral commissions;
- emergency camps.

The training should be carried out at the level of professionals, technicians, auxiliary personnel, and volunteers. For professionals the training should be carried out through pre-degree and continuing education activities.

The following strategy is suggested for training:

- professional personnel (short courses, incorporation of basic concepts into the curricula);
- specialized technical personnel (short courses, in-service training);
- auxiliary personnel (in-service training);
- volunteers (promotion and motivation, simulations to gain experience).

A.2) The personnel participating in the planning and execution of environmental health activities in emergency situations caused by disasters should be qualified in the subject based on specific knowledge in the following areas:

- possible emergency situations that can occur at the local and regional level;
- preparation of plans of action for each type of disaster;
- vulnerability analysis;
- implementation (for sanitary works) of regulations for antiseismic construction;
- warning systems;
- appropriate techniques for the construction of networks;
- communication and security systems;
- mechanisms for internal and external coordination.

B. Role of the sanitary engineer in emergency situations

B.1) On a multidisciplinary team having responsibility for emergency preparedness and disaster aid it is appropriate for the sanitary engineer to assume a position of leadership in the execution of plans and activities related to environmental health.

C. Role of the universities in emergency preparedness (with reference to environmental health)

C.1) It is recommended to incorporate, beginning at this time, material covering basic concepts related to environmental sanitation in emergency and disaster situations into the curriculum of undergraduate and graduate-level sanitary and environmental engineering courses and courses in civil engineering.

C.2) At the graduate level it is recommended to set up electives covering topics related to environmental health during emergencies and disasters.

C.3) It is recommended that open conferences, workshops, and seminars be organized covering topics related to environmental health during emergencies and disasters, as part of continuing education in sanitary and environmental engineering.

- C.4 It is recommended that research projects be carried out on this subject and that economic support for these activities be sought from government agencies, the private sector, and agencies of international cooperation.
- C.5 PAHO is requested to send the universities teaching and bibliographical material on emergencies.
- C.6 PAHO support is requested for training educational personnel on the subject of environmental health during emergencies.
- C.7 In order to maintain and strengthen the process of dissemination and exchange of information on environmental health during emergencies it is recommended that the University-REPIDISCA relationship (PAHO-CEPIS) be expanded. At the same time, it is felt that the programs for sanitary and environmental engineering should have basic educational material for teaching available, along with information on the subject.
- C.8 It is recommended that working relations and information exchange with other specialized centers in seismology, hydrology, and antiseismic structures be established and/or strengthened.
- C.9 It is recommended that a nucleus of persons with knowledge of emergency situations be maintained in the country and linked with the university.

ANNEXES

- I. List of participants.
- II. Information on the workshop.
- III. Working groups.

LIST OF PARTICIPANTS

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INFORMATION ON THE WORKSHOP

1. Introduction

All countries should be prepared to cope with emergency situations brought on by disasters. Disaster means not only the effects of natural events such as earthquakes, hurricanes, volcanic eruptions, floods, and droughts, but also the consequences of accidental situations such as fire, spills of oil and other chemical substances, accidents involving radiation, and some deliberate human acts such as armed uprisings, insurrections, etc.

Disasters can profoundly affect environmental conditions with changes in air and water quality, soil pollution, and damage to and even destruction of water supply systems and other public services. A sudden change in ecological equilibrium and environmental conditions can have serious consequences for the health and well-being of the affected population.

The Pan American Health Organization, through its Program for Emergency Preparedness and Disaster Relief Coordination, is engaged in collaborating with the countries of the Region to strengthen programs and activities for preparation for emergency situations, mainly those directly related to health.

The information available indicates that many government agencies are interested in developing their institutional capacity to cope with emergency situations and in order to do that they need to train personnel and adopt procedures for action in such situations. This applies to the health sector, agencies for water supply and sanitation, and institutions responsible for environmental protection and pollution control. The universities can play an important role in helping to achieve that objective through education and training activities, the dissemination of information, and the provision of advisory services on aspects of environmental health in emergency situations.

With a view to promoting activities in this area, the Organization decided to take advantage of the occasion of the "First Pan American Meeting of Sanitary and Environmental Engineering Professors" to organize a workshop on the incorporation of disaster preparedness into courses in sanitary and environmental engineering.

2. Purpose of the Workshop

The workshop has the following goals:

1. to inform the participants about the scope and achievements of PAHO's Program for Emergency Preparedness and Disaster Relief Coordination;

2. to familiarize the participants with the informative and educational material prepared by the Program;
3. to promote the exchange of experiences and information on education and training in environmental health during emergencies;
4. to identify areas for action with a view to strengthening the role of the universities in environmental health during emergencies.

This workshop is part of a process whose overall goal is to incorporate basic concepts of disaster and emergency preparedness into the curricula of courses in sanitary/environmental engineering and civil engineering at Latin American Universities, and also to establish or strengthen programs for continuing education at the undergraduate and graduate levels on the subject of environmental health during emergencies. The Organization will evaluate the workshop participants' indications of their interest in strengthening the role of their universities, with PAHO cooperation, in matters related to environmental health during emergencies.

3. Methodology for the Workshop

In accordance with the Agenda, the workshop includes plenary sessions and group work.

PAHO staff will inform the participants about the scope of the Program for Emergency Preparedness and the support that the Program offers to the countries of the Region. An attempt will be made to familiarize the participants with the informative and educational material prepared by the Program and to show how it can be a valuable tool for education and training activities at the level of the country.

It is hoped that the participants will offer suggestions and observations on the possible use of these materials in their education programs, and that they will report on the activities that their universities carry out or attempt to carry out with regard to environmental health during emergencies.

Three working groups will be set up; they are expected to discuss education and training in the context of environmental health during emergencies. Annex III offers suggestions as to points that could be examined by the groups.

Each group will be asked to name a moderator and a rapporteur who will be responsible for preparing a summary of the discussions and conclusions of their group.

During a final plenary session, a representative from each working group will report on the contributions of his group; these contributions will be considered and discussed by the participants, with the expectation that this will result in conclusions and recommendations for the workshop.

PAHO will provide the secretary for the workshop, who will be given the task of producing a final document containing the important aspects, conclusions, and recommendations of the meeting.

AGENDA

- 09:00 - 09:30 Opening of the workshop.
- The Program for Emergency Preparedness and Disaster
 Relief Coordination. Environmental Health Activities.
 Dr. C. de Ville and Mr. Guillermo H. Dávila
- 09:30 - 09:45 Information on the workshop and the working methodology.
 Mr. Odyer A. Sperandio
- 09:45 - 10:30 Presentation of educational material and general
 information.
 Mr. Odyer A. Sperandio
- 10:30 - 11:00 Break.
- 11:00 - 11:45 Presentation of educational material and general
 information.
 Mr. Fred Reiff
- 11:45 - 12:30 Observations of the participants; general discussion.
 Mr. Odyer A. Sperandio (moderator)
- 12:30 - 13:30 Break.
- 13:30 - 15:00 Group work (3 working groups).
- 15:00 - 15:30 Break.
- 15:30 - 17:00 Presentation of conclusions and recommendations of the
 groups.
- General discussion and proposal of conclusions and
 recommendations for the workshop.
- 17:00 Closing

WORKING GROUPS

GROUP A (ROOM 1013)

Arístides Almeida Rocha
Augusto Pescuma
David Fernández Camargo
Luis Alberto Leal
Luis Fernando Parra Paris

Brazil
Argentina
Mexico
Bolivia
Colombia

GROUP B (ROOM 1017)

Griselda Ferrara de Giner
Horacio A. Muñoz
Milton Efraim Silva Salazar
Pedro Martínez Pereda
Pedro Saravia

Venezuela
Colombia
Ecuador
Mexico
Guatemala

GROUP C (ROOM 1017)

Carlos H. Fonseca Zárate
Guillermo Rodríguez
Juan Pablo Schiffini
Jurandyr Povinelli
Pablo B. Sáez

Colombia
Colombia
Argentina
Brazil
Chile

WORKING GROUP A

PRINCIPAL TOPICS OF DISCUSSION

1. Human resources for environmental health during emergencies.
2. Role of sanitary and civil engineers in environmental health during emergency situations.

ASPECTS THAT THE GROUP MIGHT EXAMINE

1. Qualifications needed by the personnel (professional and technical) who participate directly in the planning and execution of environmental health activities in emergency situations brought on by disasters.
2. Opportunities for education and training on emergencies for sanitary and civil engineers.
3. The role of sanitary and civil engineers in environmental health during emergency situations brought on by disasters.

WORKING GROUP B

PRINCIPAL TOPIC OF DISCUSSION

Role of the universities in emergency preparedness (with reference to environmental health).

ASPECTS THAT THE GROUP MIGHT EXAMINE

1. Strategy for including basic concepts of emergency preparedness in the curricula of courses in sanitary and civil engineering.
2. Strategy for the organization of continuing education programs and activities at schools of sanitary and civil engineering in order to awaken interest and promote greater participation by sanitary and civil engineers in emergency preparedness and disaster aid.
3. Support needed by the universities in order to expand their activities related to preparation for emergency situations brought on by disasters.

WORKING GROUP C

PRINCIPAL TOPIC OF DISCUSSION

Role of the universities in emergency preparedness (with regard to environmental health).

ASPECTS THAT THE GROUP MIGHT EXAMINE

1. Development within the universities of the capacity to serve as a focal point for the dissemination of environmental health information during emergencies. Establishment of a "basic library" and a data bank on the subject.
2. Development within the universities of the capacity to conduct research, prepare case studies, provide public information and orientation, and present advisory services on environmental health aspects of natural and technological disasters.
3. Strengthening of the relationships among the universities, government agencies, and other institutions responsible for emergency preparedness.
4. The support needed by the universities in order to expand their activities in the area of preparation for emergency situations brought on by disasters.