PRIMER TALLER INTERNACIONAL SOBRE ENFOQUES REGIONALES PARA EL DESARROLLO Y GESTIÓN DE EMBALSES EN LA CUENCA DEL PLATA:

Aspectos Ambientales

ACTAS

Sao Carlos (USP) e Itaipú (IB), Brasil, y Yacyretá (EBY – Ituzaingó), Argentina

Agosto de 1991

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UNCRD Proceedings Series No.2

Regional Approaches to Reservoir Development and Management in the La Plata River Basin

A Summary Report of
the International Workshop on
Regional Approaches to
Reservoir Development and Management
in the La Plata River Basin:
Focus on Environmental and Social Aspects,
5-16 August 1991, Sao Carlos/Itaipu,
Brazil and Yacyreta(Ituzaingo), Argentina

United Nations Centre for Regional Development
International Lake Environment Committee Foundation
United Nations Environment Programme

REGIONAL APPROACHES TO RESERVOIR DEVELOPMENT AND MANAGEMENT IN THE LA PLATA RIVER BASIN FOCUS ON ENVIRONMENTAL AND SOCIAL ASPECTS

A SUMMARY REPORT OF THE

INTERNATIONAL WORKSHOP ON REGIONAL APPROACHES TO RESERVOIR DEVELOPMENT AND MANAGEMENT IN THE LA PLATA RIVER BASIN: FOCUS ON ENVIRONMENTAL AND SOCIAL ASPECTS

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UNCRD Proceedings Series No. 2

United Nations Centre for Regional Development
July 1994

ORGANIZED BY
United Nations Centre for Regional Development (UNCRD), Nagoya, Japan
International Lake Environment Committee Foundation (ILEC), Otsu, Japan
United Nations Environment Programme (UNEP), Nairobi, Kenya
Rregional Office for Latin America and Caribbean (ORPALC), Mexico

CO-SPONSORED BY
United Nations University (UNU), Tokyo, Japan
BRAZIL
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Ecological Society of Brazil
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ACKNOWLEDGEMENT - AGRADECIMENTOS - AGRADECIMIENTOS

To all the Institutions and persons that supported and collaborated in the organization of the Workshop.

A todas as Instituicoes e pesoas que auspiciaram e colaboraram na organizacao deste Seminario.

A todas las Instituciones y personas que auspiciaron y colaboraron en la organización de este Taller.

INTRODUCTION

To solve problems, the first step is to identify them. A *reliable description* about the situation and its actors is required in order to propose goals and to design efficient policies and strategies. The "International Workshop on Regional Approaches to Reservoir Development and Management in the La Plata River Basin: Focus on Environmental and Social Aspects" was organized to contribute to this "reliable description" with the aim of improving the motivation, knowledge and training of decisionmakers, managers, planners and research workers by promoting cooperation and facilitating interaction among them.

This kind of activity, together with heightening of awareness of the population at large about issues, is needed to promote sustainable development in a region like the La Plata River Basin where a remarkable increase in the concentration of population and economic activities is taking place.

The sponsorship and the active participation of UNCRD, ILEC and UNEP were very much appreciated by the local organizers of this Workshop. This Workshop was a follow-up and practical application of the three-year project entitled "River/Lake Basin Approaches to Water Resources Management". This Workshop on the La Plata River Basin also received enthusiastic and able support from universities and scientific, technical and administrative organizations of the region.

The Workshop was successful, thanks to the speakers and participants. Their interest and hard work were evident during the twelve busy days of activities. Nearly 100 professionals, specialized in research, planning and administration of reservoirs participated in the different stages of the Workshop. Six working groups were organized to prepare the Conclusions and Recommendations; their draft version was then discussed in an Open Forum with decisionmakers and representatives of local organizations. The final version was analyzed and agreed upon during the last plenary session.

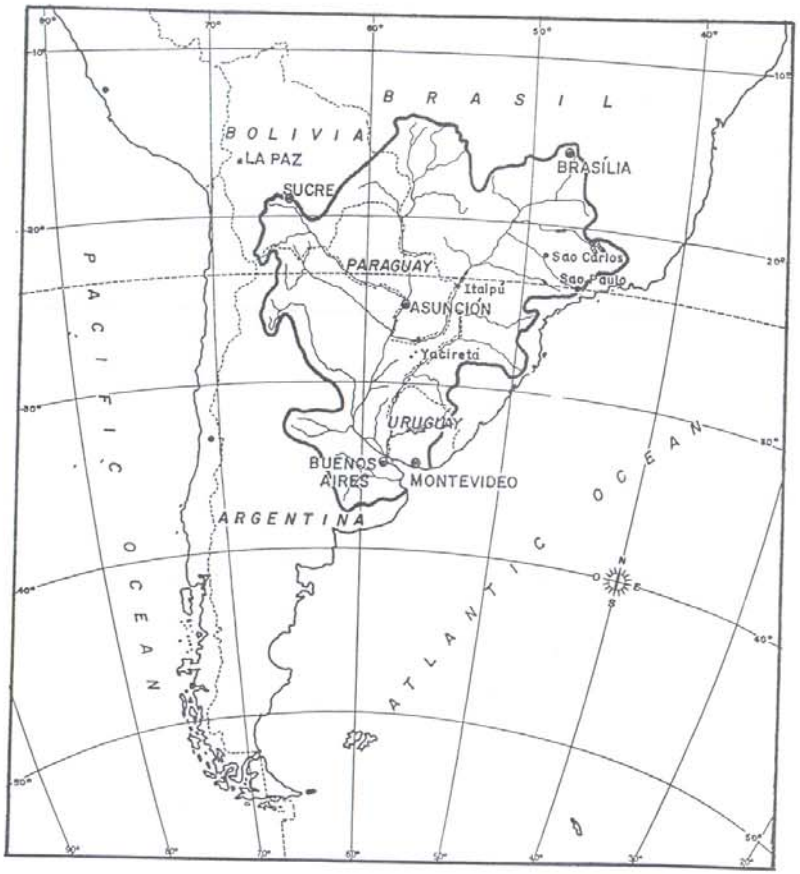
The UNCRD made this edition of the Summary Report of the Workshop possible. The Recommendations were completed with the collaboration of Dr. Jose Tundisi, coordinator of the organization for the Workshop in Brazil.

We hope this Report will reach many people who are interested in the management of reservoirs and river/lake basins, particularly in South America and in many other regions of the world with similar problems. We also expect that the intellectual contribution of this Workshop will improve future activities aimed at a sound and sustainable development and management of reservoirs and river/lake basins.

Buenos Aires, July 1992

Conrado E. Bauer
Coordinator of the Workshop

MAP OF THE LA PLATA RIVER BASIN



REGIONAL APPROACHES TO RESERVOIR DEVELOPMENT AND MANAGEMENT IN THE LA PLATA RIVER BASIN: FOCUS ON ENVIRONMENTAL AND SOCIAL ASPECTS

TABLE OF CONTENTS

Photo 1: Opening Session at Sao Carlos, Brazil

Photo 2: Workshop Participants at Yacyreta on the Parana River

Photo 3: Open Forum with Decision Makers at Yacyreta (Ituzaingo), Argentina

BACKGROUND AND OBJECTIVES

The watersheds and downstream areas of reservoirs constitute very important ecosystems in South America, particularly in the La Plata River Basin. Dams and their associated reservoirs have produced changes in the natural environment as well as in local communities. A better understanding of the dynamic linkages between a reservoir and its watershed -- biophysical, economic and social impacts as well as upstream, on-site and downstream influences -- is essential to promote economically viable, socially acceptable, and yet environmentally sustainable local and regional development.

In recent years, water resources managers and regional development planners of the La Plata River Basin countries have become increasingly concerned with the environmental and social effects of reservoir development and management. In response to this concern, the International Workshop on Regional Approaches to Reservoir Development and Management in the La Plata River Basin: Focus on Environmental and Social Aspects was organized on 5-16 August 1991 in São Carlos and Itaipu, Brazil and Yacyreta (Ituzaingo), Argentina. The main objectives of the International Workshop were:

(1) To provide a forum for senior planners and managers in charge of water resources (hydroelectric) projects from the five La Plata River Basin countries (Argentina, Bolivia, Brazil, Paraguay and Uruguay) to exchange country experiences and emerging policy issues in reservoir development and management; and

(2) To explore alternative strategies and approaches, in a broader regional development context, that will facilitate an economically viable, socially acceptable, and yet environmentally sound sustainable development and management of reservoirs and their surroundings.

FOCUS

The main focus of the International Workshop was on the environmental and social aspects of reservoir development and management and dealt with the following specific subject areas: (a) Changes in hydrological regime and their associated effects on human health, river bioproductivity, water use, navigation, and flood and drought control; (b) impacts produced by the inundation of human settlements, agricultural land, wildlife habitat, and cultural and historical sites; (c) water quality changes in the reservoirs and its effects on aquatic fauna and flora; (d) induced land-use changes in the watershed; (e) patterns of sedimentation; and (f) run-off system, processes and forecasting.

The International Workshop addressed the following interrelated questions:

(1) What was the logic of the past policies for dam construction and reservoir development? What were the basic goals? What approaches were employed to achieve the goals? How successful were they?

(2) What are the prevailing cause-effect relationships between reservoir development and

its associated environmental effects? Are they positive or negative?

(3) What policy measures have been employed to enhance the positive effects and to prevent/mitigate the negative environmental effects of reservoir development? How have they been successful?

(4) What alternative approaches and strategies are available to facilitate the integration of environmental concerns into the reservoir development and management processes?

(5) What changes are required in the policies, planning and management practices, and institutional arrangements so as to make the above-identified approaches and strategies effective?

CONCLUSIONS, RECOMMENDATIONS AND REPORTS

THE LA PLATA RIVER BASIN AND THE WORKSHOP

The La Plata River Basin -- with a total surface area of 3 million km^2 and a total population of approximately 120 million -- is the most industrialized area of South America. One significant characteristic of this Basin is its cultural identity common to the countries concerned. The Basin is also characterized by the existence of a great number of large reservoirs developed or planned principally for the purpose of hydroelectric power generation. These large man-made systems have interfered with the land-water ecosystems and modified them considerably. Their impacts have become increasingly evident through studies conducted in various parts of the Basin.

The continental surface water in South America has been exploited at an increasing pace. A basic characteristic of the La Plata River Basin is the abundance of water. This is represented particularly by the Paraná River which forms the natural axis cutting across the Basin with the great water power and of the largest volume flowing from north to south. Hence, the Paraná River and its reservoirs show a fundamental feature of the La Plata River Basin.

Water pollution, eutrophication and ecosystem degradation are among the emerging environmental problems in the Basin. These environmental problems are becoming widespread due to the fact that agricultural land development, natural resource exploitation and urbanization take place in a haphazard manner. This process of economic development and its associated environmental impacts are the main source of concern among planners and resource managers because environmental protection measures have yet been adopted to ensure effective conservation and restoration of land and water ecosystems. Emerging problems affect human health and people's quality of life and threaten the sustainability of local and regional development.

The Basin presents some other hazards: for example, spillage from river transportation of fuels (alcohol, oil and its derivatives), insecticides and other products could cause severe damages. Because of the common characteristics of the Basin and the interdependence of the systems, there is a great and urgent need for regional integration and interaction, especially in relation to regional planning, administration and environmental surveillance. At the same time, the need for scientific research towards better water management, particularly of reservoirs, should be emphasized. The necessity of developing qualified human resources in the different countries comprising the Basin, exchanges among relevant disciplines, must also be emphasized.

The reservoirs could be used as focal points for regional integration and interaction. A comparison of management experiences and proposals for different future uses would be useful for all the countries in the Basin. On the other hand, these large artificial ecosystems can become permanent scientific laboratories, with broad possibilities of verifying hypothesis and theories, thus enabling the transfer of scientific findings towards effective and efficient management processes.

The International Workshop on Regional Approaches to Reservoir Development and Management in the La Plata Basin: Focus on Environmental and Social Aspects, held in

Brazil, Paraguay and Argentina for twelve days from 5–16 August 1994, was attended by researchers, planners, managers and specialists in institutional aspects from the countries of the Basin, other countries of North and South America and Japan. The Workshop had the aim of taking up problems and opportunities. The Workshop participants raised a number of ideas to foster implementation of a continuous interdisciplinary updating process, focused on reservoirs, in order to support the harmonious and sustainable development of the Basin.

During the first week of the Workshop, general papers and case studies on different approaches in the various subregions of the Basin were presented, discussed, analyzed and compared. There were also technical visits to supplement these. After this preparatory process, the participants were divided into six working groups in order to discuss the selected subjects; they contributed with the recommendations and ideas stated below. Hence, programmes and actions to be developed in the immediate future are proposed as activities of researchers, planners, lawmakers, environmental managers, and authorities from governmental and non-governmental entities and institutions.

The six working groups dealt with the following topics: (1) Population resettlement in urban and rural areas; (2) Water flow regulation and water quality; (3) Human health and reservoirs (sanitation and waterborne diseases); (4) Bioproductivity: focus on fisheries; (5) Planning and evaluation; and (6) Institutional aspects.

Finally, on the last day, general conclusions and recommendations were discussed.

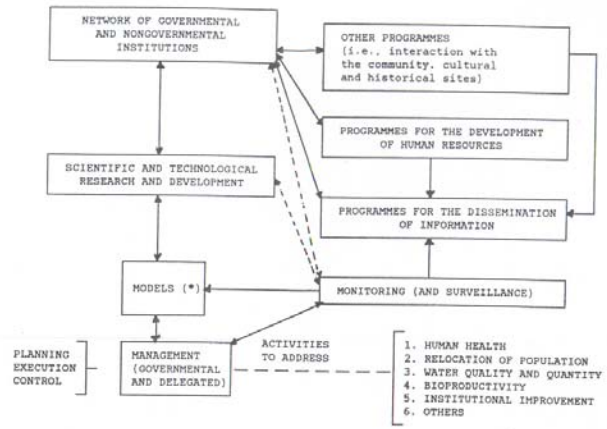
CONCLUSIONS

In order to achieve an appropriate and sound process for the management of water resources in the Basin, the participants in the Workshop concluded that a unified and interactive information system for the entire region is essential so that experiences can be diffused and evaluated, and problems can be better understood.

Taking into account the objective of improving the effectiveness of management for sustainable development, it has been agreed that the application of scientific models is another important tool to attain this purpose. Models should be developed considering processes of permanent states, as well as sporadic events and necessary mitigating measures. Models are also useful for improving monitoring programmes. Testing the reliability and usefulness of selected indicators and collected data serves to confirm, improve or modify the information system. Many of the models to be applied should be necessarily specific to the region; they require basic research and further refinement.

The management of these actions should be coordinated by a regional network of institutions, supported by human resources development programmes, in order to improve and continuously update the activities. Systematic interchange of information among the nodes of this network should be specially programmed. This entire process should consider feed-back mechanisms (figure 1).

Figure 1. WATER RESOURCES MANAGEMENT: PLANNING, EXECUTING AND CONTROLLING SYSTEM



(*) Models should be developed for prognosis and analysis of steady state processes (normal evolution), and disaster prevention and its mitigation.

Diagram based on a proposal of Working Group No. 2.

RECOMMENDATIONS

General Recommendations

(1) To further encourage interdisciplinary collaborative activities, more opportunities for interaction among experts to interact are recommended to ensure better planning and environmental management in the Basin. For this purpose, a directory of key institutions and experts should be generated.

(2) To encourage the training of human resources at various levels with a basic, all embracing and unified criterion, emphasizing both multidisciplinarity and inter-disciplinarity.

(3) To stimulate scientific and technological research with the view to developing local and regional approaches to water resources management and narrowing the gap between science and technology in the field of water resources management.

(4) To enable measures and actions which enhance the most diversified and efficient information dissemination, intensifying the dissemination of information and data so as to expand the knowledge about the La Plata River Basin, though the creation of mechanisms of interchange and the regular publication of a newsletter or technical bulletin.

(5) To suggest international financial agencies to review their criteria for granting loans to reservoir development projects, so that financing may cover the respective requirements of those projects with significant social and environmental components.

(6) To confront issues of planning for hydroelectric power and other water projects, taking into account not only the economic efficiency objective (i.e. project optimization based on the cost-benefit analysis) but also the environmental, social, political and financial objectives, so as to attain an appropriate balance.

(7) To acknowledge the need of achieving an integrated, environmentally sound and sustainable reservoir development from the initial stage of idea generation, design and through implementation. The following should be especially taken into account: (a) project implementation and monitoring (including potential project delays); (b) predicted environmental problems; (c) participation of all the actors involved (nation, provinces -- states or prefectures -- and municipalities, international agencies, financial entities, non-governmental organizations, etc.); and, (d) encouraging dialogue, communication and joint actions among the different institutions and with local communities.

(8) To promote the harmonization of inter-jurisdictional legislation and the creation of new institutions that could appropriately take the lead in sustainable development processes and management. Moreover, when the undertakings reach significant dimensions, it is recommended that there be an organization of agencies, council, or committees with legal capability to determine priorities of action, control and use of resources.

Recommendations for Action

It is particularly recommended that UNCRD, ILEC and UNEP serve as sponsors, with the agreement of the countries of the region.

The creation of an Expert Committee formed by specialists of the La Plata River Basin is recommended to coordinate and evaluate: (a) the evolution of the development and management of reservoirs (and water resources in general) in the La Plata River Basin; and (b) the level of fulfillment of the recommendations set by this Workshop.

This Committee will be in charge of the following tasks:

(1) Preparation of an inventory of public and private institutions concerned with water resources development and management for the purpose of promoting a continuous exchange of relevant information on environmentally sound development in the La Plata River Basin;

(2) Publication of an information bulletin or a newsletter to facilitate technical exchanges among researchers and practitioners in the field of water resources development and management;

(3) Conduct of regional seminars and workshops on decision-making methodologies and environmental impact assessment (EIA) for the purpose of promoting exchange of relevant experiences of the La Plata River Basin with those of other basins, focusing specifically on social, economic, environmental, institutional and political aspects of reservoir development and management;

(4) Conduct of training courses to develop the necessary technical capacity required at the local and regional levels for effective reservoir management;

(5) Development of interdisciplinary research projects on *ex-post* evaluation of reservoir projects chosen from within the Basin with the view to improving planning and management practices; and

(6) Conduct of workshops on economic and environmental aspects of regional development with special focus on water resource management, directed to planners, resource managers and decisionmakers.

Recommendations for the Immediate Follow-up

The workshop coordinators (Mr. Conrado Bauer, Dr. Dino Luis Bellorio, Dr. Jose G. Tundisi and Dr. Marcius F. Giorgetti) are kindly requested to prepare a summary report based on the final conclusions and recommendations put forward by this International Workshop, in cooperation with UNCRD, UNEP and ILEC and all other agencies and entities concerned, so as to ensure the continuity of the activities so far undertaken, and the fulfillment of the aforementioned conclusions and recommendations. In order to review the progress of the actions recommended by the International Workshop, it is proposed that UNCRD, UNEP and ILEC organize a follow-up meeting in due course, in collaboration with the respective agencies and entities concerned and with the special involvement of Paraguayan and Uruguayan agencies.

REPORTS OF WORKING GROUPS

General Outlines Established for the Working Group Discussions

(1) Synthesis of the main problems and initial aspects referring to the working group assignment.

(2) Main needs for strategic and methodological approaches.

(3) Needs for further advances in respective areas.

(4) Possible procedures for the integration of the activities of the related groups in the five countries of the La Plata River Basin.

(5) Future projects.

List of Working Groups and their Themes

Working Group 1: Population resettlement in rural and urban areas

Working Group 2: Water flow regulation and water quality

Working Group 3: Sanitation and water borne diseases (Human health and reservoirs)

Working Group 4: Bioproductivity -- focus on fisheries

Working Group 5: Planning and evaluation

Working Group 6: Institutional aspects

REPORT OF WORKING GROUP 1: POPULATION RESETTLEMENT IN RURAL AND URBAN AREAS

Chairperson: Leopoldo Bartolome

Rapporteurs: Yara Vicentini and Luis Jacobo

Members: Michael Cernea
Hidehiko Sazanami
Carlos Basaldua
Fermina Perez Rodas
Juana de Duran
Kenji Oya
Angela Benke
Luis Maria Hauron

Introduction

Reservoir development projects often involve the critical problem of involuntary resettlement of population, which entails:

(1) Impoverishment of population due to loss of productive areas, loss of houses, social marginalization, and social disarray in the region;

(2) Loss of employment and related access to social services and infrastructure;

(3) Loss of traditional lifestyles and forms of production, together with food supply insecurity; and

(4) Loss of cultural assets and traditions.

The planning and implementation of reservoir development projects must consider, with the participation of the population involved, the best way to overcome the above-mentioned problems.

Directions for Future Research and in Support of Current Projects Being Executed

(1) The integration of urban and rural resettlement programmes is needed, in consideration of the total area affected by the reservoir project.

(2) Project planning must allow for a process of *political* gestation of the water projects together with the participation of affected population. It starts with a population resettlement programme as a first phase. This programme should contain a permanent implementation and updating process which lasts for a reasonable period after the end of work. The population resettlement programmes should include cultural and anthropological aspects (namely, way of living and work as well as cultural and

historical traditions).

(3) Extensive discussion must be undertaken with affected populations about alternative resettlement areas, considering basic sanitation criteria, quality of life and cultural aspects of adaptation to new living and working conditions, with emphasis on aspects related to cultural memory.

The case of urban and rural resettlements in Yacyreta should be especially emphasized. This working group emphatically recommends the following:

(4) The process of discontinuity of the urban resettlements should not be allowed to happen, especially in the cities of Posadas and Encarnacion. This working group also pointed out the excellent work conducted by the involved teams, demonstrating measures taken for integration with the existing urban scheme and the social participation of the affected population as well as the quality of housing in the region.

(5) Joint programmes, including health and sanitary aspects, and studies and actions interrupted so far, must be resumed under a continuous process. It is necessary because of the existence of the risk of serious damages on the population's health in those rural and urban areas which are directly affected by resettlements and in the larger areas surrounding them.

Regarding rural resettlements, it is recommended that currently developed programmes should be enhanced in those areas affected by the Yacyreta reservoir, with emphasis on methodological questions which would allow the promotion of a permanent process of participation and monitoring of the resettled population.

Main Needs of Strategic Development and Methodological Considerations

(1) Environmental projects and programmes -- where urban and rural resettlements are the most important items -- should be part of the over-all project in all its steps, from the beginning of the process of project identification and its planning through the implementation and operation.

(2) Considerations about project feasibility, in general, should emphasize social and political feasibility, taking into account the minimization of negative social and environmental impacts. That is, the project proponents should maintain a correct balance about decisions regarding costs and benefits, taking into account social and political aspects.

(3) The various technical, political and social alternatives in terms of project feasibility should be widely discussed *a priori* with the direct participation of the population, and the local and regional governments concerned.

(4) In such a case, the integration of all sectors relating to decisions on programmes and projects should be specially emphasized in consideration of joint actions and political articulation of local aspirations.

(5) The implementation of regional investment programmes should create employment and development opportunities, especially for resettled populations. The corresponding projects should give priority to resettled people and should consider environmental aspects in project management and monitoring.

(6) It is recommended that agencies and proponents of water projects (especially hydroelectric power undertakings) should consider the possibility of locating facilities -- particularly housing accommodations, health and educational facilities -- in the vicinity of urban areas so that people living in these areas, can utilize them and make permanent social programmes.

(7) Finally, it is recommended that the construction of hydroelectric power facilities should not be started until enough financial support is assured, so that the work would not be discontinued halfway.

REPORT OF WORKING GROUP 2:
WATER FLOW REGULATION AND WATER QUALITY

Chairpersons: Marcius F. Giorgetti and Carlos Gomez

Rapporteurs: Hector A. Labollita and Antonio M. Righetto

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Jorge Augusto Callado Afonso
Jose Asuncion Barboza Salinas
Linor Carignano
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Armando Cornazzani

Introduction

The water resources of the La Plata River Basin are used for several purposes such as hydroelectric power generation, drinking water supply, irrigation, navigation and fisheries. This implies multipurpose management actions.

(1) There are a number of watershed management programmes. They include some in Sao Paulo and Parana States (Brazil) and one for the Uruguay river (Argentina jointly with Uruguay).

(2) The absence of a data bank to organize information and the lack of methods of intercalibration and different methodological approaches are some of the problems faced.

(3) The absence of adequate control mechanisms for water quality and water flow regulation produces problems in the main reservoir as well as upstream and downstream (since these are interconnected).

(4) This also implies that a strong political decision is necessary within the countries which share the Basin. A strong political will be also required to assure the allocation of adequate financial resources to implement the scientific, technological and management programmes, which will serve to support management processes.

Aims and Goals

The proposal is to formulate a Master Plan for the management of quantity, quality and water uses in the Basin, considering all aspects (from political and "research and development" ones to those of management, budgeting, legal and organizational matters).

The following are the goals to be attained in the first step, which should be completed in a period of less than one year.

(1) To get general information about institutions, entities and organizations by means of a specially designed survey (see General Recommendations).

(2) To start projects according to long-term programmes of the master plan, which are detailed below:

Programme I: Basic information about entities and analysis of the structure of an information system

Objective: To identify the existing scientific and technological institutions in the Basin and establish a permanent information network using these institutions network.

Programme II: Monitoring and modelling

Objective: To consolidate practices related to monitoring and modelling and disseminate these technologies

The content of this programme should take into account the following:

(a) Development of experimental techniques to be applied;

(b) Development of methodologies and algorithms for model building;

(c) Development of water quality guidelines for multiple uses;

(d) Management of prevention and control actions; and

(e) Development of comparative studies and validation of experimental data using remote sensing.

Programme III: Warning systems

Objective: To formulate procedures for emergency cases.

The content of the programme is as follows:

(a) Hydrological alert;

(b) Alert in cases of accidental contamination; and

(c) Risk evaluation.

Programme IV: Human resources development

Objective: To expand activities in the environmental area, and education/ training of specialists in the Basin.

The programme consists of:

(a) Promotion of environmental education and training of specialized professionals in existing (and, if necessary, new) disciplines in the Basin at all levels and in all possible ways; and,

(b) Promotion of short courses in monitoring and modeling.

Working Group 2 recommends that the generation of technologies in the above-mentioned programmes should support those currently developed at the governmental level (in coordination with the five countries' Ministries of Foreign Affairs) by the "Technical Committee " of the La Plata River Basin.

Synthesis:

Considering what has been stated above, the objective is to define strategies to attain the appropriate management of environmental aspects related to water flow regulation and water quality.

These strategies should aim at fulfilling the following objectives:

(1) To regulate high flow control in order to avoid major flood damages;

(2) To assure water supply for industrial, domestic and irrigation uses, through flow regulation and water distribution by reservoirs;

(3) To make continuous navigation possible;

(4) To diminish the load of suspended and bottom sediments; and

(5) To control water quality in reservoirs by rational means of management based on systems analysis, for example, the application of dynamic ecological models.

REPORT OF WORKING GROUP 3: HUMAN HEALTH AND RESERVOIRS

Chairpersons: M. Helena Marouelli and Henry J. Salas

Rapporteurs: J. Guillermo Gavilan and Juan Estigarribia

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Valentin Leites
Magdalena A. M. Bueno
Ricardo Ronderos
Carlos Jejer
Cora Cotti de la Lastra
Jacobo Finkelman

Introduction

(1) The human health factor has often been introduced *a posteriori* of the physical implementation of the projects. Because of this, projects have generated several problems among the population in the region where they were implemented.

(2) The existing information shows that there are several epidemiological and endemic diseases in the La Plata River Basin and that they are related to the construction of reservoirs, although this information is sparse and not synthesized to a desirable extent.

(3) There is no effective action for prevention of diseases but there are specific only particular studies made after their outbreak.

(4) There are not enough monitoring activities related to the population dynamics of vectors, and to other health problems produced by reservoirs. Programmes of sanitary surveillance and care are insufficient.

(5) Reservoir construction intensifies migration and social disorganization. This influences directly the dynamics of diseases, related or not.

(6) There is no organized database relevant to these problems in the La Plata River Basin nor are there any cooperative international studies.

(7) There are strong interactions among disease, vectors, habitat, water quality and water level fluctuation. This is why there is a need for the management of the water system with an inter-disciplinary view, taking into account the whole basin.

(8) There is a strong need for specialized human resources, trained on the interdisciplinary problems of La Plata River Basin. There is a need also for financial support for the activities related to human health and reservoir construction.

(9) Priority should be given to assigning financial and technical resources in practical health programmes and related activities.

(10) The following are identified as causes of unsuccessful health programmes:

(a) Inadequate interaction and coordination among the decision levels of different organizations (local, provincial, national, and of neighbouring countries) in each reservoir area;

(b) Conceptual lack of knowledge about health problem in a global sense; and

(c) Difficulties to locate areas of influence of diseases.

(11) In urban centres, there are basic infrastructural deficiencies of sanitary and health services. Therefore, reservoir impact should not be limited to the directly affected (resettled) area and to the population. It should be extended to the rest of the inhabitants of the area.

Such circumstances have not been fully understood in some undertakings in the region (e.g., the Yacyreta case). This restricted approach ends in deficient planning and incorrect evaluation of the responsibilities, which should be assumed by public and private enterprises and entities involved in the problem.

Health Aspects Related to Water Quality

(1) Various contaminating agents are located in surface water, as well as groundwater. Underground water courses are potential sources of polluted drinking water supply due to the existence of: (a) Densely populated and industrialized areas with untreated liquid effluents and disposal of solid residues, and (b) Rural areas with intensive practice of monocultures with application of agrochemical products within the Basin region. Thus it is necessary to analyze and take into account processes of eutrophication, toxicity, and contamination by pathogens, and their health implications.

(2) Among the various health problems associated with eutrophication, there is a high production of organic mass resulting in potential precursors of halogenous compounds (THM) -- trihalomethanes -- with carcinogenic and mutagenic effects. Moreover, they can form chemical complexes with toxic substances such as heavy metals and pesticides which are able to pass through the conventional treatment systems without being stopped or transformed into innocuous ones.

(3) Non-toxic algae species may be replaced by harmful species which produce toxins. Without affecting other species, harmful species have an impact on human health such as gastroenteritis and skin irritations.

(4) The proliferation of aquatic plants produces areas susceptible to generate habitats for vectors.

(5) Bioaccumulation of various toxics (organic and metallic) increases within the food chain as a consequence of the water impoundments. The increase in the concentration level of those toxic substances in water necessitates advanced treatment.

(6) Discharges of raw wastewater can lead to an increase of water-borne diseases (viral hepatitis, gastroenteritis, cholera, etc.).

Particular Recommendations

Therefore, it is recommended:

(1) That the health factor must be integrated as an obligatory part of all studies in EIA related to hydroelectric power development.

(2) That priority must be given to the realization of integrated studies which can provide adequate knowledge about the dynamics of diseases, environmental, socioeconomic and cultural conditions that affect the incidence of such diseases.

(3) That the implementation of integrated health programmes, sustained by results of an epidemiological surveillance and environmental routinary monitoring, must be promoted (for example, in the area influenced by the hydroelectric reservoir of Tacuaruru located in the downstream of Rio Paranapanema in Brazil).

(4) That some qualitative models (suggested by ECO/OPS) must be applied from the very beginning, to enable the prediction of epidemiologic behaviour so that preventive and supportive activities can be taken.

(5) That it must be observed that the resettlements of directly affected populations are carried out with the appropriate protective measures from an environmental, sanitary and public health point of view, and with the participation of interested communities.

(6) That hydroelectric power undertakings must be promoted as occasion to serve as a basis for the development, installation and performance of research and information centres related to health and environmental subjects.

(7) That a notification and information system, coordinated within the area, with responsible services so as to obtain an adequate record and flow of data, must be implemented. It is suggested that adequate focal points should be selected with the intention of continuing their activities in the future.

(8) That a study focusing on health must be promoted. This study should analyze the different topics related to the environment of the various hydroelectric power undertakings in the Basin and consider all forms of possible impacts on the ecosystems, with special emphasis on their interpretation for areas not yet affected, such as the Paraguay River.

(9) That environmental education programmes must be implemented with a focus on

health by appropriate institutions.

(10) That specific methodologies must be developed for the evaluation of urban impacts produced by reservoirs in urban areas. In this way the analysis will include not only those aspects related to the resettlement of population (socioeconomic) but also -- from a systemic vision -- to all those that perform the complex structure of urban dynamics (public health, sanitation, infrastructure, transport, housing, etc.).

(11) That special attention must be paid to basic sanitation (urban as well as rural) and that the Basin standard guidelines for water quality related to human health should be established.

(12) That adequate treatment against the disposal of urban and industrial effluents must be carried out.

(13) That the construction of reservoirs must be avoided when water quality is jeopardized thus causing major health impacts. Simplified methodologies can be applied as a technical tool for the analysis of alternatives (e.g., CEPIS models of "Warm Lakes") for the evaluation of future hydroelectric power undertakings.

(14) That studies which characterize the use of chemicals containing toxic substances and their fate --temporal as well as spatial-- in the La Plata River Basin must be carried out. The use of agrochemical products in the Basin must be regulated and controlled so as to minimize contamination in the water system.

(15) That regional biological indicators of pollution must be selected and developed to be comparable to international standards.

REPORT OF WORKING GROUP 4: BIOPRODUCTIVITY (FOCUS ON FISHERIES)

Chairpersons: Takako Matsumura-Tundisi and Norberto O. Oldani

Rapporteurs: Tomas Gutierrez and Dario Perez Chena

Members: Eduardo Nery Huerta
Juan C. Lancioni
Vera R. Estuqui Alves
Fernao Carbonar
Walter Jacobo
Blas Roa

Introduction

(1) The productivity of aquatic ecosystems of the Basin (river, lake and reservoir ecosystems) is related to water quality and the regulation of flow. It is also related to water uses and discharges of human activities in the watershed, particularly in the rivers and lakeshores. The eutrophication and contamination (i.e. mainly, toxicity) of surface waters are problems generally affecting the food chain and ultimately affecting the human population.

(2) The main characteristic of the large rivers of the Basin is the ecological variation in time and space. This has effects on the morphology of various aquatic biota.

(3) In the vast areas inundated by the Paraná and Paraguay rivers, there are important ecological regions characterized by aquatic vegetation and nursery ponds for fish production.

(4) Weather conditions and nutrient supply from sedimentary soils reaching the Paraná Potamon promote biota development. In the Paraná Potamon, the fisheries are associated with the main and secondary water channels and tributaries. Fluctuations produced by extraordinary high flows affect the habitation of the La Plata River and of the low Uruguay.

(5) Reservoir construction has a strong impact on the structure of a river biocenosis. In the particular case of fish communities, it is characterized by the decrease in the migratory population which do not find stimulus nor areas for reproduction. The decrease of predators promotes the development of smaller, plankton and insectivorous species.

(6) The adoption of measures, tending to induce the passage of fish through the reservoirs and the biomanipulation of migrators, constitute an indispensable feature to be included in the design and planning of dams.

Brief Report about the Present State and Needs of Knowledge Development

(1) In relation with low trophic levels, there is general information about: primary productivity, secondary productivity of the zooplankton, and the structure of the communities. The most complete information corresponds to the Paraná River, especially the upstream, where some experimental studies on productivity are conducted.

(2) Regarding aquatic biota, there are descriptive studies about biology, sectoral studies about population dynamics, behaviour guidelines and some descriptive models. Particular studies have been developed about ecoengineering information required for fish passage design and induced reproduction.

(3) Existing knowledge about wild fauna is at the descriptive level; there is a lack of quantitative information regarding biological aspects and species behaviour. Similar considerations require studies about the Basin flora.

Possible Interactions of the Experts in the International Context of the La Plata River Basin Countries

(1) The formation of a coordinating group responsible for the collection, processing and retrieval of existing information is recommended. It is to enable interaction between the different groups related to "bioproductivity" in the La Plata River Basin.

(2) A concrete programme should be established for the organization of future workshops for the continuity.

(3) An analysis of environmental legislation at the Basin level should be executed with the participation of "centres of excellence" (universities, research institutes, etc.) existing in the La Plata River Basin.

(4) To improve prognosis and the EIA, it is recommended to intensify "bioproductivity" studies in the reservoirs that are now in operation.

Strategy to Transform Research Proposals into Effective Management Actions

(1) The coordinating group should integrate the studies of the "centres of excellence" with projects so that the results of the research can be applied to the real world.

(2) The coordinating group must establish the mechanisms of association with governmental entities so as to make them aware of bioproductivity problems in the La Plata River Basin, thus technical support can be provided.

Priorities

(1) To create a germ plasm bank;

(2) To create natural reserve areas;

(3) To characterize water resources from a sanitary point of view; and

(4) To carry out bioproductivity studies for reservoirs which already exist and for future hydroelectric projects.

Suggested Projects

(1) To carry out intensive and extensive cultivation of fishes -- both juvenile and adults -- for economic reasons (dorado, surubi, Pseudopimelodus zungaro, pacu, catfish, mandubi) in Itaipu. To encourage the practice of familiar fish culture and of lake repopulation by using net-tanks.

(2) In the area of Yacyreta: (a) To develop sowing programmes and management of juvenile population of medium-sized native species (catfish, mandubi, pacu, armado, bream); this allows the intensive use of remaining natural and flooded areas; and (b) to optimize the performance of the fish ladder.

(3) In the Parana River: (a) To establish breeding and management programs of wild fauna (to encourage private investments, in the case of species of economic importance); (b) to start studies on distribution of the fish population in Paraná Potamon, which are of economic importance, with a view to understand how the population dynamics works; (c) to perform studies in order to establish the main energy flow system of the Paraná Potamon, considering populations from a sanitary point of view; and (d) to encourage intensive cultivation of planktonic organisms and of other invertebrates to make viable the preparation of low-cost food rations for fishculture stations or other uses.

(4) In the Uruguay River: (a) To optimize the operation regime of the fish ladder in Salto Grande, and propose alternatives for periods in which the fish ladder is not operable; (b) to evaluate the impact of Salto Grande reservoir on fish reproduction as a function of water conditions; and (c) to develop biomanipulation techniques and eutrophication models.

General Recommendations Related to Bioproductivity

(1) To perform an intensive cultivation of planktonic organisms and of other invertebrates useful for feeding fish;

(2) To study management of biological production in impoundments and lagoons;

(3) To encourage comparative analysis of primary productivity and studies on specific diversity in reservoirs;

(4) To accomplish the identification of biological indicators to detect qualitative alterations of the medium;

(5) In general terms, it is necessary to deepen basic knowledge of biology and to study ecology quantitatively; and

(6) In particular, synthesis studies should be elaborated to generate new hypothesis and derive mathematical models.

Conclusions

Lack of basic information about the biology of species in the La Plata River Basin system constitutes the main obstacle for bioproductivity studies. The few opportunities for horizontal communication among the groups or professionals involved in the projects under development stands out as something to be remedied. A regional integration would enable a faster advance and optimal use of available resources.

REPORT OF WORKING GROUP 5: PLANNING AND EVALUATION

Chairperson:	Victor Pochat
Rapporteurs:	Oscar E. Natale and Marcelo Pereira de Souza
Members:	Alberto Calcagno Antonio Fernandez Hisataka Kawaguchi

Introduction

(1) There are few practical experiences in the use of tools for planning and evaluation, there is a general lack of basic information to carry out studies on reservoirs in the La Plata River Basin.

(2) There are several incoherencies in methodologies used for data collection and evaluation.

(3) There are no common criteria for the selection of socioeconomic and environmental indicators.

(4) Despite the fact that the results of EIA identified several negative impacts, proposed mitigation measures were not satisfactorily implemented.

(5) The level of public participation in the planning processes of water projects in the region has been low.

General Recommendations

Good planning and evaluation in the La Plata River Basin context must: (a) be based on scientific knowledge, (b) be imbedded within a governmental policy, and (c) take into account the participation of the community concerned. Therefore, it is recommended to:

(1) Promote the adoption of common methodologies for the quality control, storage, retrieval and evaluation of data applicable for the region, to benefit from the utility of such procedures.

(2) Promote the development of reference centres (clearing houses) and data banks at the regional and basin level so as to facilitate processes of standardization, storage and exchange of data.

(3) Make an inventory of data and information, and of the socioeconomic and environmental data of the Basin, so as to improve their availability for planning processes.

(4) Develop a common set of basic and specific environmental and socioeconomic indicators for the Basin, through the establishment of an *ad hoc* working group.

(5) Encourage research, development and diffusion of evaluation and planning tools oriented to wards the Basin, such as optimization models, predictive models, planning matrices and about multicriterion decision-making methods. These decision-making tools should be able to consider information uncertainty and environmental costs.

(6) Promote the formation and participation of interdisciplinary planning teams, including researchers and technicians, in the development of water resource projects in the Basin.

(7) Perform the EIA, as an integral part of environmental management, from the very moment projects are initiated and during the steps of evaluation of alternatives, design, building and operation (This subject is also discussed by other working groups).

(8) Include risk analysis in all EIA.

(9) Consider the different levels in the planning process: Local, regional, sub-basin or basin level, according to the area affected by the project.

(10) Establish a permanent environmental monitoring system from the beginning of project development. Continue to support ex-post evaluations as part of the environmental management of reservoirs and river/lake basins, even when delays should occur during execution, putting feedback mechanisms in place and seeing to it that the objectives were attained.

(11) Promote scientific and technical cooperation among countries in the implementation of common basic policies in order to guide planning processes, which aim at the sustainable use of resources.

(12) Assume that financial requirements for planning and development of projects should be analyzed regarding different alternatives of funding sources and that allocation of specific cost items to projects and socioenvironmental programmes should be explicit.

(13) Promote the development of regional criteria for cost allocation in multi-purpose projects, including environmental costs.

(14) Consider community participation as an integral component of the planning process.

(15) Carry out ex-post environmental assessments based upon long-term monitoring.

(16) Promote the commitment to environmental protection of decisionmakers and of the community by means of adequate environmental educational programmes, including formal and non-formal means.

Specific Recommendations

It is specially recommended that: [1]

(1) A review of planning tools which have been applied up to the present and their outcomes be made, in order to come up with research and development projects in the basin;

(2) A seminar/workshop about decision-making methodologies for water resources projects be organized to deal further with competitive uses of water and environmental aspects of water resource development projects;

(3) Interdisciplinary research projects on ex-post evaluation of selected La Plata River Basin reservoirs be developed, with the aim of improving future planning and management actions; and,

(4) A seminar on community participation techniques for planning teams be organized.

[1] Some recommendations suggested by Working Group 5 have been included in Recommendations for Action (see pages 10-11) and are not provided here.

REPORT OF WORKING GROUP 6: INSTITUTIONAL ASPECTS

Chairperson: Eduardo A. Pigretti

Rapporteurs: Dino Luis Bellorio and Maria Tereza Fernandes Serra

Members: Paulo ALfonso Leme Machado
Jorge A. Franza
Silvia L. Coria
Carlos Cuneo
Ernesto Meza Lagrave
Juan Adolfo Zach
Fernando del Giudice

Introduction

(1) The environment must be protected by constitutional laws. All countries should include in their constitutions the right to a healthy environment, and the way and need to develop the administrative aspect, as well as practical actions to protect it.

(2) Each National Constitution needs to emphasize the responsibility of the government before, during and after the execution of public works (dams and reservoirs, roads, and all other kinds of infrastructure).

(3) National Constitutions must consider that federal systems produce and regulate general rules; on the other hand, local and regional laws must also be introduced at the provincial and local (county) levels.

(4) National Constitutions must emphasize that problems of high environmental significance should be submitted to the control of legislative power.

(5) The environmental impact assessment (EIA) or some other convenient system of environmental planning and evaluation tools must be considered within the national legislation.

Particular Recommendations

(1) When preparing environmental impact studies, the following items should be considered:

(a) The area of influence of the project should be analyzed;

(b) If necessary, the corresponding modifications must be done to the regulations in national and international laws related to the project,.

(c) The study results must be accessible -- as soon as available -- to the public. The public administration and specialists will prepare the aforementioned study. The right of the general public to be informed must be explicit in the legislation.

(d) The public must express its opinion about the projects during the conduct of the environmental impact study. Public hearings and meetings must be utilized for the purpose. In case of transboundary environmental impacts (or if the undertaking is binational or multinational), public meetings must allow the access and participation of people from interested countries, regions and municipalities, where information must be published. Countries should organize bi- or multinational public meetings, as the case may be.

(e) The environmental impact study, with its monitoring programmes, must reveal the cost to be borne by the contractor and other agencies participating in the planning, building and operation of the undertaking. Responsibility for costs also includes the payment to experts that public administration contracts at the moment of project authorization, to make up for the lack of technical or financial capacity to achieve the goal.

(f) In each authorization, a monitoring (and surveillance) plan should be anticipated, specifying terms for the collection, analysis and dissemination of information. Monitoring to-be-done by public powers does not hinder the contractor to produce his own information.

(g) The assignment of financial resources and its application to monitoring must be planned from the initial stage of the environmental impact study. The supply of financial resources should be suspended by funding agencies if the implementation of measures, and preventive, mitigating or compensation actions to cope with the predicted negative effects of the undertaking, or the related monitoring program, are not implemented adequately.

(h) Supervising public powers must be technically and financially qualified to exercise their functions.

(i) It is recommended that the legislation include the viability of judicial actions to assign responsibility to those physical or juridical, private or public persons who do not fulfill their obligations of executing environmental impact studies and implement their recommendations. Those actions may be initiated and prosecuted by citizens, environmental associations, or by the Public Ministry.

(2) It is recommended to dictate rules capable of regulating environmental management of large water projects and works.

(3) The improvement and updating of manuals and rules which sets the direction for environmental management, should include the proposal of a programme for the adjustment and harmonization of standards and rules, which facilitate the fulfillment of projects and management programmes to be included in the environmental

management plans. This programme should include, likewise, organizational alternatives for shared administration or management agreements in basins, sub-basins, and reaches throughout the length of the rivers.

(4) In the case of large projects, it is necessary to revise environmental management plans at the different stages of the project (design, building and operation), adding management and organizational programmes. Management must be agreed on and carried out jointly by the involved parties, including the arrangements to coordinate the management with other projects and the region.

(5) The compilation and ordering of the regulations from each jurisdiction, as well as the adjustment and compatibility of their legislation should be promoted.

(6) Normative programmes must anticipate interjurisdictional treaties or agreements on water policy so that due priority is given to uses and influences, participation and responsibilities, and must agree on management modalities according to the following:

(a) Treaties among provinces within a nation should urge the legislative harmonization between provinces, municipalities and the nation. The sanction of a national law will facilitate this aspect of the programme. Through the Treaty, a set of common objectives would be reached.

(b) The establishment of mechanisms for environmental management (regional council, committee, agency, consortium, etc.) would be convenient.

(c) The organ to be created should have a committee devoted to technical and scientific assistance, and shall consist of an interdisciplinary team. To encourage studies and projects related to the operation of the coordinating mechanism to be created, a Provisional Committee should be proposed.

(7) The above-mentioned right of being informed on behalf of users, consumers and administered people in general should be incorporated into the rules, plans and mechanisms. Its exercise should be regulated through different forms (public meetings, popular participation, environmental education, agreements, etc.) at all steps of the project with special emphasis on the initial stages.

(8) It is recommended that: a) the holder of the political jurisdiction of the right to due compensation for any negative value to the economy arising from the use and exploitation of natural resources should be recognized; and b) public information and awareness about the positive and beneficial aspects of the projects and works, principally at the regional level, should be promoted through wide-ranging programmes on environmental education.

(9) Basin committees or water-coordinating agencies should consider common and interrelated problems, especially those derived from the multiple uses of water, allowing public participation at the municipal, provincial, national and international levels.

(10) The awareness of environmental problems and their alternative solutions will be made effective through the cooperation of public and nongovernmental entities, which will have to efficiently use technical and economical resources.

(11) Decentralization should be promoted to allow the municipalities to fulfill a "proactive role". In ensuring the environment criterion at the municipal level, the creation of protective authorities should be sponsored, such as the People's Defender or Ombudsman, with a competence that could be extended region-wide.

(12) It would be convenient for every undertaking to include the creation of an Agency or Committee, implemented through interjurisdictional agreements or treaties, providing it with the legal capacity to determine priorities on the use of natural resources and forecasting the consequent environmental effects.

REPORT OF OPEN FORUM

In the afternoon of Thursday, 15 August, the participants of the Workshop held successive meetings with authorities of the administrative entities of dams and reservoirs of the La Plata River Basin, and with specially invited representatives from governmental and nongovernmental organizations (see list in Annex D). At those meetings (Open Forum), Provisory Conclusions and Recommendations were explained by speakers of the Working Groups and discussed with the invited participants. Some subjects were emphasized. Various proposed concepts were discussed. They were gathered in the reading of the final report containing the Conclusions and Recommendations.

At the first meeting with decisionmakers from binational entities and managers of hydroelectric power development projects (reservoirs of Yacyreta, Itaipu, Salto Grande), an increasing interest was expressed regarding environmental matters, not only in relation to water quality and natural resources management in general, but also to social aspects, particularly those of health and housing. Deficiencies and limitations caused by lack of financial resources were pointed out.

At the second meeting with representatives from various official private entities including non-governmental organizations (NGOs) from the area of influence of Yacyreta (Corrientes and Misiones provinces from Argentina, in particular), a detailed and active exchange of ideas and proposals took place.

Among the subjects more frequently pointed out, the following could be mentioned:

(1) Large water projects, besides taking care of natural and social environment preservation, could offer a permanent and effective contribution to the integral development of the region. The following were mentioned: (a) reservoirs must be "contributors to regional development", (b) at present "only adverse effects are perceived", (c) there is concern that they may not be corrected, nor other possibilities of productive development stimulated, and (d) in the future local communities would only see "wires transporting electrical energy to other regions."

(2) The attention to make effective communication and cooperation among the Binational Entity of Yacyreta, provincial and municipal governments and nongovernmental entities of the region was stressed.

(3) Discouragement was stated due to programming, finance and decisionmaking attitudes that show a preference for those works destined to hydroelectric power generation at the expense of those of environmental (biophysical) and social concerns ("it seems that, theoretically, only economic aspects are considered to be important").

(4) An active participation of the community in general was insistently demanded; the right of the population to be appropriately informed, consulted and heard in order to obtain better solutions, particularly related to environmental aspects, was also a constant demand constantly mentioned.

(5) Certain inconvenient agricultural practices, which cause processes of soil erosion and the increase of sediments, fertilizers and pesticides to the reservoir were also mentioned.

(6) Special attention to solve sanitary problems was demanded, particularly the treatment of sewage effluent and the proper disposal of solid waste.

DISCUSSION AT THE FINAL PLENARY SESSION

The final plenary session was held on the last day of the Workshop. This meeting was devoted to presenting and discussing the outputs of the working groups and Open Forum. Conclusions and Recommendations were approved and some new questions raised. What follows is a synthesis of the main additional points considered at this discussion (besides the themes included in the final Conclusions and Recommendations mentioned above):

(1) There is a need for a better understanding of the effects of deforestation on water quality and of nutrient load, mainly in tropical reservoirs and their tributaries. Equally important is the measurement of the retention capacity of nutrients by the riparian forest and wetlands.

(2) Intensive studies during the filling phase (impoundment) of reservoirs are needed. These studies should consider the productivity of the new system and the water quality problems produced during this phase.

(3) There is a need for adequate inventory of risk areas in the watershed during the preparation and evaluation programmes.

(4) The use of mathematical models of water quality during the filling phase of new reservoirs is recommended in order to adequately manage this phase, complementing management of the area.

(5) A seminar on methodological planning tools and intercalibration is necessary for training all the groups working on the reservoir problems in the La Plata River Basin. This should include a discussion on criteria for EIA, applied to reservoirs.

(6) The Paraguay river watershed is well preserved, yet this river does not have reservoirs. Therefore, an effort for an in-depth study of the Paraguay river is necessary, learning from the experience accumulated in the Paraná and Uruguay rivers.

(7) There is a need for a better understanding of the concentration of nutrient loads in the reservoirs, analyzing soil types and soil uses. It is necessary to introduce a comprehensive experimental approach to effectively measure the nutrient load. Present estimates based on tables produced in northern temperate regions are not sufficient.

(8) Reservoir construction mainly affects municipal and provincial jurisdictions. Therefore a better communication and legal framework system for the interactions between federal, provincial and municipal authorities are necessary.

(9) The continuity of an environmental policy during and after reservoir construction is fundamental for the adequate and sustained evaluation of impacts.

(10) The social impacts generated by reservoir construction are dissipative and destabilizing, dynamic, and difficult to anticipate and describe. All monitoring should thus take into account these characteristics.

(11) Educational programmes should aim for the following target groups related to reservoir construction:

- Established population (rural, urban, river bank population);
- Transit population (occasional workers);
- Relocated population;
- Population at risk (affected by the reservoir construction and socially marginalized);
- Downstream inhabitants; and
- Visiting population.

ANNEX A: WORKSHOP PROGRAMME

4th August (Sunday)

Arrival of participants in Sao Paulo. Transportation to Sao Carlos

5th August (Monday) Venue: *Centro Recursos Hídricos y Ecología Aplicada* (CHREA), *Escola Eng.*, Sao Carlos

9:00–10:00 Opening Ceremony

Speakers
Roberto Leal Lobo e Silva Filho
Rector, University of Sao Paulo
Hidehiko Sazanami
Director, United Nations Centre for Regional Development (UNCRD)
Rosalvo Tiago Ruffino
Director, School of Engineering at Sao Carlos–USP
Takeshi Goda
Representantive, International Lake Environment Committee Foundation (ILEC)
Jose Galizia Tundisi
Director, Center for Water Resources and Applied Ecology and
Coordinator of the Workshop in Brazil
Conrado E. Bauer
Coordinator of the Workshop in Argentina

10:00–10:15 Coffee break

10:15–13:15 Morning Session

Chairman: Conrado E. Bauer
Co–chairman: Marcelo Pereira de Souza

River/Lake Basin Approaches to Water Resources Management: An Overview
Hidehiko Sazanami
River/Lake Basin Approaches to Water Resources Management: Case Studies and Policy Implications
Kenji Oya
Policy Responses to Water Resources Management: Issues in a River/Lake Basin Context
Antonio L. Fernandez

13:15–14:15 Lunch at CRHEA

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Hidehiko Sazanami
River/Lake Basin Approaches to Water Resources Management: Case Studies and Policy Implications
Kenji Oya
Policy Responses to Water Resources Management: Issues in a River/Lake Basin Context
Antonio L. Fernandez

13:15–14:15 Lunch at CRHEA

14:30–18:15 Afternoon Session

Chairman: Marcius F. Giorgetti
Co-Chairman: Eng. Alberto T. Calcagno

Introduction on the Rationale of Constructing Man-Made Lakes
Takeshi Goda
Sediment Transport and Deposition in Reservoirs
Kenji Sawai

- Discussion -
- Coffee break -
- General information on the workshop structure, working groups, expected results
- Poster session with discussion -

18:15 Departure to S. Carlos

6th August (Tuesday)

9:00–13:00 Morning Session (CRHEA)

Chairman: Ricardo Ronderos
Co-Chairman: Maria do Carmo Galijuri

Natural Reoxygenation of Streams - Methodology for the Measurement of Reaeration Coefficients (resource paper)
Marcius F. Giorgetti
A Systemic Approach to River/Reservoir Research and Management
Jose Galizia Tundisi

- Discussion -
- Coffee break-

An Approach to Watershed Management for Environmental Protection: A Case Study of S. Carlos and Corumbatai, Sao Paulo State (resource paper)
Antonio M. Righetto, Marcelo P. de Souza, Rodrigo M. Porto, Dante Contin Neto and Arthur Mattos
Urban Resettlements in the Yacyreta Project: The Case of Posadas (Argentina)
Leopoldo Bartolome

- Discussion -
- Poster session with discussion -

13:00–14:00 Lunch at CRHEA

14:00–18:15 Afternoon Session (CRHEA)

Chairman: Antonio Marozzi Righetto
Co-Chairman: Lic. L. A. Jacobo

Guidelines for the Integrated Management of the Hydrographic Basin of S. Bartolomeu River and Lake Paranoa, Brasilia, D.F., with Emphasis on Eutrophication Control
Vera R. Estuqui Alves
Calidad de las Aguas del Rio Paraná en la Region de la Futura Represa de Yacyretá
J. Estigarribia
Environmental and Health Impact Due to Flood of an Urban Brook (Arroyo Zaiman-Yacyreta Reservoir)
G. Gavilan
Itaipu Reservoir Impacts on the Icthyofauna and Biological Basis for Its Management
Angelo A. Agostinho, Jose Roberto Biorghetti, Anna Emilia Vazzoler and Luiz Carlos Gomes
Water Supplying Reservoir Monitoring: Guarapiranga, Case Study at Sao Paulo City
Darco Brega Filho, Constante Bombonato Junior, Jose Roberto kachel dos Santos and Elida Papella

Comment: Antonio L. Fernandez, and Marcelo P. de Souza.

The Consortium of Piracicaba: Objectives, Organization, Achievements and Perspectives
J. Machado, Mayor of Piracicaba, President Intermunicipal Consortium of Piracicaba

- Discussion -

18:15–21:00 Refreshments and "get together" offered by VARIG Sao Carlos

21:00 Return to Sao Carlos

7th August (Wednesday)

9:00–13:00 Morning Session (CRHEA)

Chairman: Wilson Pintos
Co-Chairman: Vera R. Estuqui Alves

Environmental Management in Salto Grande
Valentin Leite Cartagena (Salto Grande Binational)

Water Quality and Quantity Management in the La Plata River Basin: Persistent Toxic Organics and Reservoir Vulnerability
Oscar E. Natale, Dora Goniadzki and Mabel Estevez
Resettlement of the Community of Quili Malal, Neuquen Province, Argentina
Jorge Jaimez, Javier Castro

– Discussion –

Case Study of Environment and Ecoengineering in the Project of the Mid–Parana"
Tomas Gutierrez, Anita Schwender
Calidad de las Aguas en el Embalse de Paso Severino (Uruguay)
L. Amorin
Corpus Christi Project: Environmental Management Program
Alberto Tomas Calcagno and Jose A. Barbosa Salinas

– Comment: Maria Helena Marouelli
– Discussion –

13:00–14:00 Lunch at CRHEA

14:00–17:15 Afternoon Session (CRHEA)

Chairman: Kenji Oya
Co–Chairman: Odete Rocha

The Problem of Urban Impact of Dams from a Sanitary Perspective: Case of Posadas City and the Yacyreta Reservoir
Luis A. Jacobo
Watershed Inputs to Reservoir Systems: A Methodological Approach
Raoul Henry
Remote Sensing of Large Reservoirs: Scientific and Methodological Approaches
Evlyn Leao M. Novo

– Discussion –

APA Corumbatai/Corumbatai Perimeter: Environmental Zoning and Regulation and Implementation Proposal
Olga Maria Soares e Gross and Stella Goldstein
Environmental Education Project in the Ribeirao Preto Region, S. Paulo State
Luiza A. Silva, M.A.C. Correia Nogueira Rocha, B.S. Abranowicz and Alaor Caffe Alves

– Comment: Alejandro Otaegui, Leopoldo Bartolome, and Angelo Agostinho
– Discussion –
– Dinner at CRHEA –
– Return to S. Carlos –

8th August (Thursday)

8:30–10:00 Morning Session (CRHEA)

Chairman: Jose Tundisi

Aplicacion del Programa de Lagos Cálidos a Embalses Brasileños: Problemas y Perspectivas
Henry Salas
Environmental Management in HIDRONOR S.A.
Hector A. Labollita

– Discussion –
– Coffee break –

10:00–12:00 Working Groups Organization and Methodology

12:00–13:00 Lunch at CRHEA

13:00–21:00 Afternoon Session (Field visit)

13:00	Departure for Lobo–Broa watershed, and field visit to Piracicaba River watershed
19:00	Reception in Piracicaba
21:00	Return to S. Carlos

9th August (Friday) Sao Carlos and trip to Foz do Iguazu)

8:30–10:00 Working Group Session (Hotel at Sao Carlos)

10:30	Departure to Sao Paulo by bus, lunch on the way
16:15	Departure from Sao Paulo to Foz do Iguazu (VARIG at Guarulhos Airport)
	Lodging at Foz do Iguazu

10th August (Saturday) (Itaipu area)

8:30–12:00	Exposition by Itaipu Binational Staff "Itaipu Reservoir Ecosystem Study"
12:00–13:00	Lunch offered by Itaipu Binational
10:30–18:00	Itaipu Ecosystem Study (Field Trip)

11th August (Sunday) (Foz do Iguazu)

Free day to visit Iguazu Falls

12th August (Monday) (Trip Foz do Iguazu– Yacyretá)

8:00 Departure to Yacyreta (Argentina) by bus
On the way: Visit to Corpus Dam Project Site, Jesuitic Colonial Ruins and the main urban areas to be affected by the impoundment of Yacyreta Reservoir: Posadas (Argentina) and Encarnacion (Paraguay)

18:00 Lodging at Ituzaingo (Yacyreta area)

13th August (Tuesday)

9:00–12:45 Morning Session (Yacyreta)

Chairman: Henry Salas
Co–Chairman: Dino Bellorio

Corpus Christi Case Study
Alberto Calcagno and Jose Barboza Salinas

– Discussion –

Yacyreta Case Study
Luis Jacobo, Eng. Carlos Basaldua and Juan Estigarribia

– Discussion –

12:45–14:00 Lunch at Yacyreta Hotel

14:30–18:30 Afternoon Session (Yacyreta)

Chairman: Jose G. Tundisi
Co–Chairman: Jose A. Barboza Salinas

Impoverishment Risks from Population Displacement in Water Resources Development: Policy and Operational Issues
Michael Cernea
Water Quality and Sanitation
Takeshi Goda

Transport and Sedimentation: Practical Aspects
Kenji Sawai
Warm Lakes Program
Henry Salas

– Discussion –
– Coffee break –

Water Quality and Water Borne Diseases in the La Plata River Basin
Ricardo Ronderos
Biological Characteristics of Fish Communities in the Parana River
Norberto Oldani

– Discussion –

14th August (Wednesday)

9:00–13:00 Morning Session (Yacyreta)

Chairman: Wilson A. Pintos Perez
Co–Chairman: Kenji Oya

Toward Environmentally Sound Reservoir Systems
Istvan Bogardi (Paper presented by Victor Pochat)
Institutional Organization on Environmental Protection and Recovery
Paulo Alfonso Leme Machado
The ELETROBRAS Approach in the Reservoir Environmental and Social Problems in Brazil: Institutional and Organizational Aspects
Maria Tereza Fernandes Serra

– Discussion –
– Coffee break –
– Assignment to Working Groups and Comments –

14:00–18:30 Afternoon Session (Yacyreta)
Working Groups Sessions: Discussion, Conclusions and Recommendations

15th August (Thurday)

9:00–13:00 Morning Session

Field Visit at Yacyreta Dam (under construction) and Future Reservoir

13:00–14:30 Lunch at Yacyreta

15:00–20:00 Afternoon Session (Yacyreta)

Chairman: Conrado E. Bauer
Co-Chairman: Raul E. Nery Huerta

Information (provisory Conclusions and Recommendations of working groups) and discussion
- Open Forum with Decisionmakers (15:00 to 16:30)
- Open Forum with Local Organizations from the Yacyreta area (17:00 to 20:00)

16th August (Friday)

9:00–12:00 Morning Session: Field visit at Yacyreta watershed area to observe productive activities in the region (tea and maté) and social programme

12:00–13:30 Rural barbecue ("asado") at "Las Marías", Virasoro (Corrientes Province, Argentina)

15:00–18:00 Afternoon Session (Yacyreta)

Chairman: Carlos Gomez
Co-Chairman: Arnaldo Müller

Presentation, discussion and adoption of the final Recommendations and Conclusions of the Workshop

18:30–19:30 Closing Ceremony

Farewell speeches: Conrado E. Bauer, Kenji Oya, Jose Galizia Tundisi and Juan Adolfo Zach

17th August (Saturday)

Departure of participants

ANNEX B: OPENING AND CLOSING SPEECHES

International Workshop on Regional Approaches to
Reservoir Development and Management in the La Plata River Basin:
Focus on Environmental and Social Aspects, 5–16 August 1991

Opening Speech
by
Hidehiko Sazanami
Director
United Nations Centre for Regional Development

Rector of the University of Sao Paulo; Director, School of Engineering, University of Sao Paulo at Sao Carlos; Secretary of Environment, Sao Paulo State; Director, CRHEA/EESC/USP; Dr. Goda, Dr. Tundisi, Eng. Bauer, Distinguished Participants, Ladies and Gentlemen:

On behalf of the United Nations Centre for Regional Development (UNCRD), I would like to welcome you all to the International Workshop on Regional Approaches to Reservoir Development and Management in the La Plata River Basin: Focus on Environmental and Social Aspects. I am indeed most grateful that despite your busy schedules, you have been able to manage to participate in this Workshop, by preparing the papers to be presented here, and by sharing your dedicated efforts and extensive experiences in our common areas of concern.

I would like to take this opportunity to express our sincere gratitude and appreciation to Dr. Tundisi, Eng. Bauer, Dr. Bellorio and their colleagues for making all necessary collaborative efforts with us in the task of organizing this Workshop. I would also like to express our special thanks to the ILEC and UNEP for their most valuable co-sponsorship.

About UNCRD

First of all, I would like to briefly introduce to you our Centre. The purpose of UNCRD is to assist developing countries in strengthening their capabilities for local and regional planning and development. To this end, the Centre has a wide range of training and research activities organized into seven operational programme areas, namely: (1) Urban Development and Housing; (2) Regional Development and Management; (3) Environmental Planning and Management; (4) Regional Disaster Prevention; (5) Information Systems for Urban and Regional Planning; (6) Social Development; and (7) Industrial Development.

The Centre works in close collaboration with administrators, planners, resource managers and scholars. It is our firm belief that national regional institutions, agencies and universities are in a better position to delineate solutions to specific development problems. Providing a forum like this for discussion of emerging key issues and exchange of experiences is one of the ways through which UNCRD hopes to assist developing countries.

As you are well aware, the problems facing developing countries are complex. Thus, there is a great need to enhance our understanding of the situation and identify alternative ways to meet development challenges. To accomplish this, we should accumulate practical

experiences from the field, and systematically compile relevant information. We attempt to integrate the data generated through case studies of specific problems with current theoretical and scientific data to suggest solutions to the problems and issues that developing countries have.

Dealing with key problems in local and regional development should be done in an interdisciplinary way to generate pragmatic solutions to real world problems. We believe that UNCRD's resources can be expanded by pooling the expertise available nationally and internationally and working in close cooperation with national and international institutions.

Background of the Workshop

Please allow me to briefly explain the background to this Workshop. This Workshop is one of the follow-up activities to the "Three-year Project on River/Lake Basin Approaches to Water Resources Management", which was launched in 1987 under the joint auspices of our Centre, ILEC and UNEP. The project aimed at:

(1) Undertaking a study on water resources management problems and issues in a river/lake basin context with a view to drawing therefrom relevant policy implications for considering alternative approaches and strategies to harness national capabilities in promoting environmentally sound management of water resources from a river/lake basin perspective; and

(2) Generating information that can be used for developing training materials useful to water resources managers, regional planners, and administrators in making better decisions on the use and management of water resources for achieving national, regional, and local goals. As an integral part of the project, three workshops were held to review and discuss a series of resource papers on selected issues as well as case studies from nine locations of seven countries, including Brazil, China, Indonesia, Kenya, Philippines, Thailand, and Japan. The major points discussed at the three workshops include, among others: (a) The need for, and the rationale of, river/lake basin approaches to water resources management; (b) the applicability of river/lake basin approaches to land and water resources development and management; (c) issues and problems involved in the efforts to integrate environmental and social concerns in the process of water resources development; (d) policy issues and mechanisms required to promote manpower development in the field of water resources management.

Purpose of the Workshop

As you are well aware, dams are large social investments built to fulfill one or more of the four primary purposes, namely: Energy production, irrigation, domestic and industrial water supply, and flood control. In addition to these direct benefits, there are many associated environmental and social effects, some of which are benefits but more of which are likely to be costs.

I understand that reservoirs, their associated upper watershed areas and downstream areas constitute very important ecosystems in Latin America in general and in the La Plata

River Basin in particular. However, dams and their associated reservoirs have often created changes in the environment as well as in the local communities. It is our firm belief that a better understanding of the dynamic biophysical, economic and social linkages of reservoirs with upper watersheds and downstream areas is essential in order to promote economically viable, socially acceptable and environmentally sustainable development.

This Workshop is organized in response to such a concern to provide a forum for exchange of country experiences and emerging policy issues in reservoir development and management. The Workshop also aims at exploring alternative strategies and approaches to promote environmentally sound and sustainable reservoir development and management.

The papers and reports before us contain extensive information on the concerns, policy issues, and approaches to reservoir development and management to be promoted in a river/lake basin context. The challenge before us is to transform the essence of these contributions to a framework of action which can be of practical relevance to the countries concerned in the La Plata River Basin. I sincerely hope that this Workshop will provide an opportunity not only for discussion and mutual learning, but also generating information that can be of most relevance for promoting necessary policy actions on a regional scale and, at the same time, at the national and local levels.

Finally, let me reiterate my assurance that we, as the organizers of the Workshop, will try our best to assist you in achieving the Workshop objectives. Once again I thank you very much for accepting our invitation to work together with us in this Workshop, and wish you all success in your deliberations. I will follow the Proceedings with the utmost interest. Thank you all.

International Workshop on Regional Approaches to
Reservoir Development and Management in the La Plata River Basin:
Focus on Environmental and Social Aspects, 5–16 August 1991

Opening Statement: Introduction of the International Lake Environment Committee

by

Takeshi Goda
Representative of ILEC Foundation

Distinguished guests, ladies and gentlemen:

Taking the opportunity of the First World Lake Environment Conference, which was held at Otsu, Japan, in 1984, near the lakeshore of Lake Biwa, the establishing of new international committee succeeding the spirits of that world conference was suggested by Dr. Mostafa K. Tolba, Director of UNEP. Inheriting this proposal, concerned Japanese scientists and the prefectural government of Shiga moved to organize a new NGO which may execute the effective activities to rescue lakes from various kinds of dangers and threats.

Fortunately, we could carry out the preparation work smoothly with the cooperation of relevant political agencies. The International Lake Environment Committee was established on February 1986. So until today, for the past five and half years, we could continue the necessary international exchange of information and experiences concerning the characteristics of lakes and their sound and reasonable management, based on the spirit of the "Lake Biwa Declaration" which was issued in August 1984 at the end of The First World Lake Environment Conference.

In order to formulate financially sound management, we chose to form the ILEC Foundation. Its Director–General is Mr. Kei Yamazaki, former Vice–Minister of the Japan Environment Agency. I am the Vice–Director–General and ex–officio member of The Scientific Committee. The core of ILEC is its Scientific Committee and its chairman is Dr. Tatuo Kira. The Scientific Committee consists of nineteen experts in fields including limnology, hydrology, environmental technology, planning, and administration from fourteen countries. From South America, Professor Tundisi of Brazil and Dr. Bauer of Argentina are members of the Scientific Committee, and they have contributed much in many respects to ILEC's activities.

The ILEC Foundation and its Scientific Committee has made efforts to strengthen and disseminate environmentally sound management and sustainable use of natural and man–made lakes together with their whole watershed, as well as their resources.

Following are the major activities of ILEC:

(1) Collection and Organization of Data from Lakes throughout the World.

This is one of the joint projects with UNEP. In collecting data, ILEC is sending the sheets of questionnaire to relevant organizations and researchers. On the other hand, as there are many cases in which the focus point or person has not been identified, surveyors go to

the actual place and collect desired data. Such data not only cover geographical or scientific aspects, but also include those of water utilization and/or social and economical movement.

Throughout the globe, there are 253 lakes whose surface areas are more than 500 km^2. They are all targets of our data collection. In March 1988, we published the "Interim Report I" on the state of world lakes, and in February 1990, "Interim Report II" was issued. "Interim Report III" is to be published in 1991.

Besides, through the publication of the data book, we are checking the history and efforts of environmental conservation; therefore, for several important lakes we are doing in–depth studies for their individual, and remedial effects of environmental conservation. Lake Kariba in Zimbabwe and Lake Balaton in Hungary are typical examples.

(2) Training Seminars on Regional Development and Lake Environment Conservation in Developing Countries.

The following events were held and managed successively:

1) November 1987: Training in "Environmental Planning and Management Focused on Inland Waters" in Otsu and Nagoya (co–sponsors: United Nations Centre for Regional Development(UNCRD) and UNEP).

2) February 1988: The "First Expert–Group Workshop on River/Lake Basin Approaches to Environmentally Sound Management of Water Resources" in Otsu and Nagoya (sponsored by ILEC, UNCRD, UNEP).

3) July 1988: Assistance to Training Seminar for Lake/Watershed in Kunming, China.

4) November 1988: Assistance to Training Seminar on Lake and Reservoir Environment Management in Argentina.

5) January 1989: The "Second Expert Group Workshop on River/Lake Basin Approaches to Environmentally Sound Management of Water Resources" in Bangkok and Hat Yai, Thailand (sponsored by ILEC, UNCRD, UNEP, ONEB and PSU).

6) August 1989: Assistance to Training Course in USSR for Lake Chad Basin Specialists.

7) January–March 1990: The "First Training Course on Lake Water Quality Management" (ten weeks in Otsu).

8) February 1990: The "Third Expert Group Workshop on River/Lake Basin Approaches to Environmentally Sound Management of Water Resources" in Otsu and Okazaki (sponsored by ILEC, UNCRD and UNEP).

9) January–March 1991: The "Second Training Course on Lake Water Quality Management" (nine weeks in Otsu).

(3) Preparation of Guidelines for Lake Environment Management

We are preparing the series of guidelines booklets on Lake/Reservoir Management. This is another cooperative work of ILEC and UNEP, and their readers are considered first to be those officers who are closely related with the practices of Lake/Reservoir Management. Throughout the entire book series, methods and examples of actual management of natural and man–made lakes are regarded most important. The publication is proceeding on the schedule as follows:

1) December 1988: Publication of Guidelines Book Vol. 1 "Principles of Lake Management", edited by S.E. Jorgensen and R.A. Vollenweider.

2) August 1990: Publication of Guidelines Book Vol. 3 "Lakeshore Management", edited by S.E. Jorgensen and H. Loffler.

3) September 1991: Publication of Guidelines Book Vol. 2 "Socio–Economic Aspects of Lake Management" (scheduled), edited by M. Hashimoto.

4) September 1991: Publication of Guidelines Book Vol. 4 "Toxic Substances in Lake Management" (scheduled), edited by S. Matsui.

These booklets are all written in English, but Vol. 1 has been translated into Chinese, and translations into other languages (for instance, Spanish) are being considered.

(4) Assistance in Planning and Organization of Conferences on "Lakes and Their Environments"

We have been promoting the World Conference on the Conservation of Lakes and Their Environment as follows:

The Second Conference was held at Mackinac Island, Michigan, U.S.A. in May 1986 and we had more than 400 participants from forty countries. The main topic of this conference was "Lake–water Pollution by Toxic Substances".

The Third Conference ("Third International Conference on the Conservation and Management of Lakes, Balaton 88") was held at the lakeside of Balaton, Hungary in September 1988. There were seven keynote speeches, eighty–two oral presentations and forty–six posters. The main topics were: Lakes in Africa, Lakes in Asia, Lakes in Europe, Lakes in North and South America, Eutrophication and Its Control, Effects of Acidification and Toxic Substances on the Lake Ecosystem.

The fourth Conference was held at Hangzhou, China, in September 1990. The highlight of this conference was particularly the contribution of an enormous amount of scientific data relevant to the eutrophication of natural and man–made Chinese Lakes.

The fifth Conference is now in its planning stage. Perhaps it will be held in Northern Italy in Spring 1993.

(5) Promotion of Lake Environmental Education

In order to disseminate exact knowledge about the conservation of the lake environment and its relation with individual actions, we are preparing suitable teaching aids for their uses in both primary and middle schools. Various kinds of pilot projects have been going on since 1989 in Japan, Denmark and Brazil, and from 1991 new projects will begin in Argentina, Ghana and Thailand.

(6) Cooperation with GEMS/WATER Project

This is a rather new cooperation project for ILEC. After participating in the GEMS/WATER Leningrad Meeting, we have contributed, in several respects, to this global scale project in connection with, for example, UNEP, CCIW, and GRID.

With these general references, I have presented an introduction of ILEC activities.

We will collaborate with all of you to obtain the best outputs of this International Workshop.

Closing Remarks

by

Kenji Oya
United Nations Centre for Regional Development

Eng. Bauer, Dr. Tundisi, distinguished participants, ladies and gentlemen: At the outset, I would like to convey to you all the sincerest greetings from Prof. Sazanami, Director of UNCRD, who was, unfortunately, unable to attend this closing session. As you know, he had to leave for Europe on 12 August due to his other official commitments.

So please allow me to express on his behalf and on behalf of UNCRD, our deepest appreciation for your active participation and contribution to the great success of this International Workshop.

Yesterday afternoon, as well as at the last session of this Workshop, the reports of six working groups were presented and discussed. Each report contained major findings, conclusions and recommendations covering a wide spectrum of issues and concerns which are of direct relevance to us. I believe that these reports, together with the papers presented and discussed during the Workshop, will serve as an important basis for developing a framework of action to enhance our planning and management capabilities in the field of reservoir development and management. The UNCRD will further encourage collaborative activities such as workshops and seminars.

As a matter of fact, we have already initiated consultation with Dr. Tundisi and Eng. Bauer about the possibilities of convening a follow-up workshop in two years from now somewhere in the La Plata River Basin.

During the Workshop, you have shared your experiences and expertise, as well as good intentions and seriousness which are prerequisites to achieving the objectives we have set for this Workshop. You have been most cooperative and have created an ambience of friendship conducive to effective multidisciplinary teamwork. You have encouraged a lively dialogue among yourselves and with us. I was very much impressed with the spirit of your presentations and discussions. Sometimes you expressed your sense of humor, while at other times you expressed very thought-provoking and stimulating ideas; all this has made difficult topics of discussion more easy to perceive, although there may be a few sound disagreements. I hope that each one of us will echo the necessary principles that we agreed upon and keep the spirit that we developed during the Workshop.
by Dr. Tundisi, Eng. Bauer, Dr. Bellorio and their colleagues in making this Workshop a great success. I also wish to express our deepest appreciation for your strong support and goodwill. We look forward to your continued cooperation and assistance in the years to come. Last but not the least, I wish you a happy and safe journey back home. Thank you very much.

Farewell Speech

by

Dr. Juan Adolfo Zach
Head, Education, Health and Ecology Department
Binational Entity of Yacyreta

As Head of the Environment Section of the Binational Entity of Yacyreta (Argentine border), I wish to express deep thanks for your presence here, as well as for having shared these days with us. Thanks to you all, we could overcome our worries and doubts regarding the advancement of this undertaking.

The delay of our environmental programmes is a matter of concern, taking into account the responsibility we now have with the region, which will suffer from profound and diversified impacts over its living quality.

Thus, this interchange of ideas is even more important despite the difficulties the Binational Entity is now facing. For this reason, we accept a compromise in reverting this sad history of work so that it can be made worthy of our country's interests and the region.

The lack of good environmental policies, adequate planning and environmental education in developing countries like ours, with scarce existing mechanisms of participation of affected communities, make it more difficult to make advancements in environmental aspects which are the essence of our own and future generations' existence.

With wishes for a safe trip home, I thank you very much for your visit and hope this will be the beginning of a fruitful interchange between Yacyreta and you all.

(*) Other opening and closing speeches were not written beforehand.

ANNEX C: LIST OF PAPERS AND POSTERS

Papers presented at the "International Workshop on Regional Approaches to Reservoir Development and Management in the La Plata River Basin: Focus on Environmental and Social Aspects

(1) "River/Lake Basin Approaches to Water Resources Management: An Overview of the UNCRD/ILEC/UNEP Joint Research Project (1988/89/90)"
Hidehiko Sazanami and Kenji Oya

(2) "A Systemic Approach to River/Reservoir Research and Management"
Jose Galizia Tundisi

(3) "Natural Reoxygenation of Streams -- Methodology for the Measurement of Reaeration Coefficients"
Marcius F. Giorgetti

(4) "Guidelines for the Integrated Management of the Hydrographic Basins of the Sao Bartolomeu River and Lake Paranoa, Brasilia DF, with Emphasis on Eutrophication Control"
Vera Regina Estuqui Alves, Irene Altafin, Sonia Paulino Mattos, Eliana F.S. Anjos, and Cristine Gobbato B. Cavalcanti

(5) "A Brief Review of Reservoir Development in Argentina: La Plata River System, Focus on Environmental Aspects"
Alberto Calcagno

(6) "Corpus Christi Project: Environmental Management Program"
Technical Department of the COMIP (Committee of the Parana River)

(7) "Entropy as the Measure of Impurity"
Takeshi Goda

(8) "Impoverishment Risks from Population Displacement in Water Resources Development: Policy and Operational Issues"
Michael M. Cernea

(9) "Energy and Environment"
Armando Joaquin Sanchez Guzman

(10) "Policy Responses to Water Resources Management"
Antonio L. Fernandez

(11) "Environmental and Health Impacts Due to Flooding of an Urban Brook"
Juan Guillermo Gavilan

(12) "Environmental Impact on Water Quality, Sanitation, and Water-Borne Diseases in the La Plata River Basin"
Ricardo A. Ronderos

(13) "Case Study of Environment and Ecoengineering in the Project of the Mid-Parana"
Tomas Gutierrez

(14) "The Problem of Urban Impact of Dams from a Sanitary Perspective: Case of Posadas City and the Yacyreta Reservoir"
Luis A. Jacobo

(15) "Water Quality and Sanitation"
Takeshi Goda

(16) "Water Supply Reservoir Monitoring: A Case Study of Sao Paulo City"
Jose Roberto Kachel dos Santos et al.

(17) "Environmental Management in Salto Grande"
Technical Committee

(18) "An Approach to Watershed Management for Environmental Protection: A Case Study of Sao Carlos and Corumbatai, S.P., Brazil"
Antonio M. Righetto, Marcelo Pereyra de Souza, Rodrigo de M. Porto, Arthur Mattos and Dante Contin Neto

(19) "Introduction on the Rationale of Constructing Man-Made Lakes"
Takeshi Goda

(20) "Itaipu Reservoir Impacts on the Ichthyofauna and Biological Bases for Its Management"
Angelo A. Agostinho, Jose Roberto Borghetti, Anna Emilia M. Vazzoler, and Luiz Carlos Gomes

(21) "The Process of Resettlement of Quili Malal's Community in the Province of Neuquen"
Jorge O. Jaimez and Javier Jorge Castro

(22) "Environmental Sound Water Resources Management: Training Handbook"
Kenji Oya and Antonio L. Fernandez

(23) "Sediment Transport and Deposition in Reservoirs"
Kenji Sawai

(24) "Urban Resettlements in the Yacyreta Project: Case of Posadas (Argentina)"
Leopoldo J. Bartolome

(25) "Water Quality and Quantity Management in the La Plata River Basin: Persistent Toxic Organics and Reservoir Vulnerability"
Oscar E. Natale, Dora Goniadzki, and Mabel Estevez

(26) "Simplified Methodologies for the Evaluation of Eutrophication in Tropical Warm Lakes"
Henry J. Salas and Paloma Martino

(27) "APA Corumbatai -- Corumbatai Perimeter, Environmental Zoning and Regulation and Implementation Proposal"
Ministry of Environment -- SMA

(28) "Institutional Arrangements for Environmental Management"
Paulo Alfonso Leme Machado

(29) "Toward Environmentally Sound Reservoir Systems"
Istvan Bogardi and William E. Kelly

(30) "The Brazilian Power Sector's Approach to Reservoir Planning and Multiple Uses", with Separate Appendixes
Maria Tereza Fernandes Serra

(31) "Calidad de las Aguas en el Embalse de Paso Severino (Uruguay)"
Lic. L. Amorin

(32) "Watershed Inputs to Reservoir Systems: A Methodological Approach"
Raoul Henry

(33) "Remote Sensing of Large Reservoir: Scientific and Methodological Approaches"
Evlyn Leao M. Novo (INPE)

(34) "Aplicación del Programa de Lagos Calidos a Embalses Brasileños: Problemas y Perspectivas"
Henry Salas (CEPIS)

(35) "Environmental Management in HIDRONOR S.A."
Hector A. Labollita

(36) "Yacyreta Case Study"
Luis Jacobo, Carlos Basaldua and Juan Estigarribia (EBY)

(37) "Biological Characteristics of Fish Communities in the Parana River"
Norberto Oldani (ONICYTH)

(38) "The ELETROBRAS Approach in the Reservoir Environmental and Social Problems in Brazil: Institutional and Organizational Aspects"
Maria Tereza Fernandes Serra

(39) Presentation of the Binational Entity of Yacyreta's Technical Staff

Left Margin (Argentina):
General Presentation: Dr. Juan Adolfo Zach; Urban Impacts, Posadas: Eng. Carlos Basaldua; Water Quality: Lic. Luis Jacobo; Public Health: Dr. Cora Cotti de la Lastra; Fishery Resources: Lic. Blas Roa (National University of Misiones); Cleanliness of Area to be Flooded, Reforestation: Eng. Armando Cornazzani; Wild Fauna: Dr. Juan Carlos Lancioni; Social Aspects: Lic. Hugo Schamber

Right Margin (Paraguay): Programmes Presentation: Eng. Menandro D. Grisetti Oviedo; Urban Impact, Ecology of Ana-Cua Rm, Aguapey Brook, Water Quality: Eng. Juan Estigarribia; Public Health: Dr. Carlos M. Romero, (Ministry of Public Health and Social Welfare of Paraguay); Fishery Resources, Wild Fauna: Dr. Magdalena de Pirelli; Cleanliness of Area to be Flooded, Reforestation: Eng. Luis Villate; Resettlement Social Aspects (Urban and Rural): Eng. Mariano Espinola, Lic. Fermina Perez Roda, Lic. Juana de Duran

Poster Session - CRHEA/EESC/USP (Sao Carlos)

(1) Linmological studies and Preliminary Classification of six reservoirs of the Parana State, Brazil
L.F. Andrade; C.F. Xavier; R.F. Brunkow; L.N. Dias; L.F. Carignano; J. Dominguez

(2) Preliminary Water Quality Evaluation of Five Branches on the Left Border of the Itaipu Reservoir, Using Benthic Macroinvertebrates as Bioindicators, Parana, Brazil
R.G.N. Loyola; V. Toniollo; J.A. Callado-Afonso

(3) Limnological Studies in the Passauna Reservoir, Araucaria, Parana, Brazil
C.F. Xavier; L.F. Andrade; L.N. Dias; R.E. Brunkow; L.F. Carignano; L.L. Domingues

(4) Passauna Reservoir Zooplanktonic Community Studies, Araucaria, Parana, Brazil
L.N. Dias; C.F. Xavier; L.L. Dominguez; G. Schmidt

(5) Study of Macroinvertebrates Litoral Fauna in Parana State Reservoirs
L.N. Dias; C.F. Xavier; G. Schmidt

(6) Passaunas River Limnological Monitoring, Araucaria, Parana, Brazil
V. Toniollo

(7) Intermunicipal Association of Piracicaba and Capivari River Basins (*Consorcio Intermunicipal das Bacias dos Rios Piracicaba e Capivari*), Brazil

(8) Guarapiranga Reservoir Posters, Brazil

(9) University of the Republic, Faculty of Sciences, Department of Limnology, Uruguay
Limnology of the Rio Negro Reservoirs (Uruguay)
W. Pintos; G. Chalar; D. Fabian; R. de Leon; L. de Leon; D. Conde

ANNEX D: LIST OF PARTICIPANTS

1. List of Participants - Workshop

Argentina

BASALDUA, CARLOS - EBY
BAUER, CONRADO ERNESTO - ILEC
BELLORIO, DINO LUIS - EBY
CALCAGNO, ALBERTO T.D. - ILEC (formerly with COMIP)
CASTRO, JAVIER JORGE FELIX
CORIA, SILVIA L. - UBA
CORNAZZANI, ARMANDO - EBY
COTTI DE LA LASTRA, CORA - EBY
DE CASTRO, JAVIER JORGE FELIX
DEL GIUDICE, FERNANDO - Argentine National Parliament
FRANZA, JORGE A. - UBA
GAVILAN, JUAN GUILLERMO - INCYTH
GOMEZ, CARLOS - INCYTH
GUTIERREZ, TOMAS - AyEE
JACOBO, LUIS ARNALDO - EBY
JACOBO, WALTER - Corrientes Provincial Government
JAIMEZ, JORGE OMAR - AyEE
JEJER, CARLOS S. - M.E. Missiones
LABOLLITA, HECTOR AMADEO - Hidronor Co.
LANCIONI, JUAN CARLOS - Yacyreta
NATALE, OSCAR E. - INCYTH
OLDANI, NORBERTO OSCAR - INTEC
PIGRETTI, EDUARDO A. - UBA
POCHAT, VICTOR - COMIP
RONDEROS, RICARDO ARTURO - Universidad Nacional de la Plata-CONICET
ROA, BLAS HECTOR - UNAM
SCHAMBER, HUGO
ZACH, JUAN A. - EBY

Brazil

AGOSTINHO, ANGELO A. - Universidad Estadual de Maringá
ALONSO DA SILVA, LUISA - SMA
BARTOLOME, LEOPOLDO JOSE - FLASCO
BENKE, ANGELA - EBY
BOMBONATTO, CONSTANTE (Jr.)
BORGHETTI, JOSE ROBERTO - Universidad Estadual de Maringá
BREGA FILHO, DARCY - SABESP
CALLADO AFONSO, JORGE AUGUSTO - SUREHMA
CARBONAR, FERNAO - ITAIPU
CARIGNANO, LINOR FERNANDO - SUREHMA
CORREA NOGUEIRA ROCHA, MARGARITA CECILIA - SMA
DO CARMO CALIJURI, MARIA - EESC/USP

ESTUQUI ALVES, VERA REGINA – Compañia de Agua Esgotos Brasilia
FERNANDES SERRA, MARIA TEREZA – ELETROBRAS
FORJAZ, PAULO –
GIORGETTI, MARCIUS F. – EESC/USP
HENRY, RAOUL – UNESP
KACHEL DOS SANTOS, JOSE ROBERTO – SABESP
LEME MACHADO, PAULO ALFONSO – UNESP
LOPEZ ROMA, WOODROW NELSON – EESC/USP
MAROUELI, MARIA HELENA – EESC/USP
MAROZZI RIGHETTO, ANTONIO – EESC/USP
MATSUMURA TUNDISI, TAKAKO – Universidad Federal de Sao Carlos
MATTOS, ARTHUR – USP, Sao Carlos
MORAES BUENO, MAGDALENA A.
MULLER, ARNALDO CARLOS – EESC/USP
MUSARRA, MARIA LUISA – THEMAG Engenharia Ltda.
NOVO, EVLYN LEAO M. – INPE
PASSARELLI, ROBERTO FLORENCIO – EESC/USP
PATELLA, ELIDE
PEREIRA DE SOUZA, MARCELO – EESC/USP
PORTO, RODRIGO DE MELO – EESC/USP
REIS PEREIRA, VERA LUCIA
RIGHETTO, ANTONIO M. – EESC/USP
ROCHA, ODETTE
RUFFINO, ROSALVO – USP
SABIA, IRENE ROSA
SALATI MANGRINATO, ENEIDA
SUAREZ E. GROSS, OLGA MARIA – SMA
TUNDISI, JOSE G. – EESC/USP
VICENTINI, YARA – EESC/USP

Japan

FERNANDEZ, ANTONIO – UNCRD
GODA, TAKESHI – ILEC
KAWAGUCHI, HISATAKA – ILEC
OYA, KENJI – UNCRD
SAWAI, KENJI – Kyoto Universitty
SAZANAMI, HIDEHIKO – UNCRD

Mexico

FINKELMAN, JACOBO – ECO-OPS

Paraguay

BARBOZA SALINAS, JOSE ASUNCION – COMIP
DE DURAN, JUANA – EBY
DE PIRELLI, MAGDALENA
ESPINOLA, MARIANO O.

ESTIGARRIBIA BAEZ, JUAN P. – EBY
GRISETTI OVIEDO, MENANDRO D.
HAURON GAONA, ARSENIO LUIS MARIA – Municipality of Encarnación
MEZA LAGRAVE, ERNESTO
NERY HUERTA, RAUL EDUARDO – ITAIPU
PEREZ CHENA, DARIO – ITAIPU
PEREZ RODAS, FERMINA – EBY
ROMERO, CARLOS M.
VILLATE, LUIS

Peru

CUNEO, CARLOS – OPS
SALAS, HENRY J. – CEPIS

Uruguay

LEITE CARTAGENA, VALENTIN – Salto Grande Binacional
MALAQUINA, EDUARDO RAMON
PINTOS PEREZ, WILSON ARMANDO – Universidad de la Republica

U. S. A.

CERNEA, MICHAEL – World Bank

2. Lits of participants – Open Forum

(Persons who are not included in the previous list of workshop participants)

(1) First meeting, with decisionmakers:

JOSE ABRAHAM (Argentina)
Executive Director – Yacyreta Binational Entity
CESAR EDIL MENEM (Argentina)
Chief of Resettlement and Environment Department, Yacyreta Binational Entity
ARNALDO CARLOS MÜLLER (Brazil)
Advisor of the Directory, Itaipu Binational
ALCIDES JIMENEZ (Paraguay)
Director, Yacyreta Binational Entity
EDUARDO RAMON MALAQUINA UGOLINI (Uruguay)
Director Delegate, Salto Grande Technical Commission

(2) Second meeting, with representatives of local community in the Yacyreta dam area (Argentina side):

CARLOS J. FERRARIS
Fundacion Facultad Ciencias Exactas, Química y Naturales – Misiones
MARIO NUMA REY LEYES
Rotary Club Leandro N. Alem (Prov. de Misiones)

HECTOR R. RUSSO
Universidad Nacional de Misiones
JOSE ALBERTO N. MEABE
Subsecretaria de Recursos Naturales (Prov. of Corrientes)
ELIAS ANDRUJOVICH
Fundación Zona Centro (Oberá–Misiones)
WALFRIDO ENRIQUE VIEIRA
TERESA AMALIA G. DE VIEIRA
GUILLERMO RETA
Gobernación Distrito O.2. Clubes de Leones (Posadas–Misiones)
JORGE KEMERER
MIGUEL ANGEL STEFANUK
Instituto Profesorado "A. Ruíz de Montoya" (Posadas–Misiones)
FRANCISCO DEGIORGI
Rotary Club Posadas (Misiones)
DANIEL EDUARDO ACEVEDO
Gobernación de Clubes de Leones Distrito O–2 (Chaco)
LUIS A. ESCALLIER
Rotary International (Posadas–Misiones)
MIGUEL GAVIÑA NAON
INVICO (Instituto Viviendas Corrientes)
RAUL ALBERTO VENCHIARUTTI
Fundación Zona Centro (Oberá–Misiones)
GRACIELA DURAN DE RETA
Colegio Nacional No. 1 (Posadas–Misiones)
CARLOS A. ROBERT
Jardín Botánico (Posadas–Misiones)
ADOLFO NAVAJAS ARTAZA
Establecimiento Las Marías S.A. (Virasoro–Corrientes)

ANNEX E: LIST OF ACRONYMS

AyEE	*Agua y Energia Eléctrica S.E.*
CAESB	*Compania de Agua Esgotos Brasilia* Water and Sewerage Corporation of Brasilia
CEPIS	Pan American Center for Sanitary Engineering and Environmental Sciences
COMIP	*Comision Mixta Argentino Paraguaya del Rio Paraná* Joint Argentine–Paraguayan Commission for the Paraná River
EESC/USP	School of Engineering at São Carlos, University of São Paulo
EBY	*Entidad Binacional Yaciretá* Yaciretá Binational Entity
FLASCO	Latin American Faculty for the Social Sciences
M. E.	*Ministerio de Ecologia*
ILEC	International Lake Environment Committee
INCYTH	National Institute for Water Science and Technology
INTEC	*Instituto de Desarolloa Technologico para la Industria Quimica*
ITAIPU	*Itaipu Binacional*
OPS	*Organizacion Panamericana de la Salud*
SGB	*Salto Grande Binacional*
UBA	*Universidad de Buenos Aires*
UFSCAR	*Universidad Federal de São Carlos*
UNAM	*Universidad Nacional de Misiones*
UNCRD	United Nations Centre for Regional Development
UNESP	*Universidad Estadual Paulista*
UNEP	United Nations Environment Programme