

Professional and Institutional Development

Educational Technology

With the purpose of strengthening the management capacity of the members of the Balsas River Watershed Council, three 24-hour workshops were conducted, with the participation of 72 Council members. The following manuals and teaching materials were designed and developed for the workshops: *Development of the Strategic and Operative Plan of the Evaluation and Follow-up Group of the Balsas River Watershed Council*; *Conflict Negotiation and Work Meetings Management*; and *Sustainable Development of Water Resources*. As a result of this exercise, the Watershed Council has a proposal for its strategic plan.

In order to consolidate the strategies for human resources training and technology transfer in support to the rehabilitation of Lake Pátzcuaro, the methodology of training needs detection was applied in this region to 400 operative technicians from the municipalities, the state, and federal agencies. The results yielded the short- medium- and long-term technical training and instructor education plan. One thousand one hundred and seventy-two training hours were provided to 665 people through 24 workshops on the following topics: *Ferro-Cement Cisterns*; *Biofilters*; *The Trophobiosis Theory*; *Biodiversity and its Importance: Animal Integration in Agricultural–Worm Breeding Systems*; *Recycling Systems*, and *Adequate Use of Water*. The training had an immediate impact locally and regionally, since the use of the topics discussed during the workshops will contribute positively to the care of the environ-



TRAINING OF MEMBERS OF THE BALSAS RIVER WATERSHED COUNCIL

ment and to the rehabilitation of the lake. Social impact is also thought to be high, since seven communities with a total of 17,169 inhabitants will benefit directly or indirectly with the construction of cisterns for water utilization. In addition, a potential benefit to 9,205 inhabitants of nine localities is estimated with the construction of biodigesters, biofilters, and dry latrines.

In order to strengthen the technical and didactic capacities of FIRCO's personnel, the Second and Third National Diploma Course on Micro-Watershed Rehabilitation were given. This diploma course consists of the following modules: *Team Integration and Instructor Training*; *Micro-Watershed Rehabilitation, The Work Method*; *Project Design and Management*; *Environmental Services*; and *Introduction to the ISO 9001: 2000 Standard and its Processes*. Eighty out of eighty-nine students who took the diploma course passed the exam, accounting for a terminal efficiency of 90%. In another regard, Micro-Water-



THE WORKSHOP CONSTRUCTION OF A BIOFILTER:
HOME GRAYWATER TREATMENT IN THE COMMUNITY
OF SAN JERÓNIMO PURÉCHECUARO, QUIROGA, MICHOACÁN

shed Rehabilitation was registered as a specialty before the Directorate General of Professions of the Ministry of Public Education.

In order to create awareness among CNA technical and administrative personnel on the use and preservation of water resources, the manual *Instructor Training on Water Management and Preservation* was designed, and developed with the following topics: "Sustainable Development of Water Resources", "The Importance and Value of Water", "Water Issues", "Actions for the Care of Water", and "Integrated Water Resources Management for a Sustainable Development". Nine 24-hour courses were coordinated and given in CNA's regional and state management offices to a total of 148 trainees.

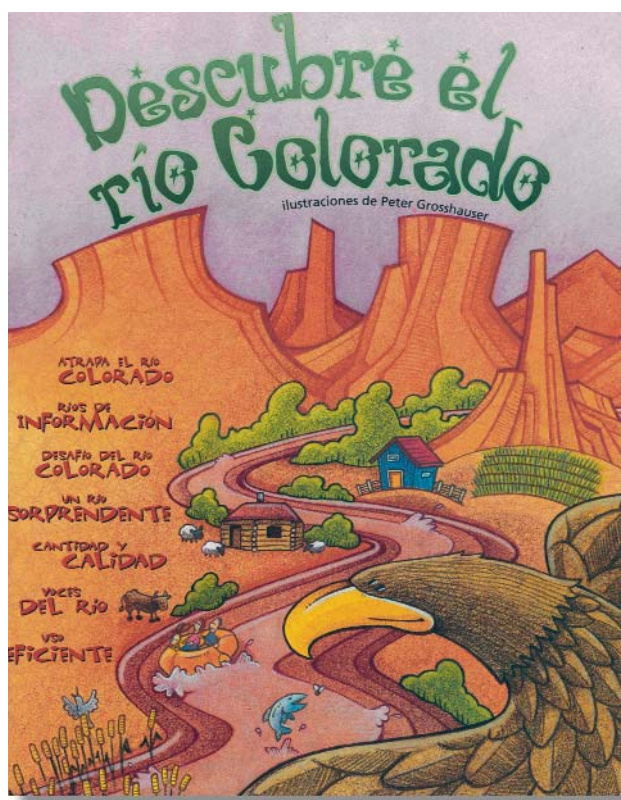
Regarding IMTA's Open Training Program, 8 courses were given to a total of 142 participants and the corresponding training materials were prepared. The courses given were: *Development of Didactic Materials for Training on the Operation and Maintenance of Lake Systems*; *Strategic Planning*; *Efficiency Improvement Through Potable Water Hydrometric Districts*; *Analysis and Structural Design of the Minor Infrastructure of the Canal Network*; *Fee Structure Design for Water Companies*; *Wastewater Treatment*; and *Design of Teaching for Training*.

One hundred and fifty-six events took place at IMTA's training center with the participation of 3,561 technicians, 49 of which were courses

attended by 934 participants from FIRCO, CNA, Badger Meter, Inc., IMTA, SEMARNAT, and CONAFOR, while the other 107 were meetings attended by 2,627 technicians.

Institutional Development

On the subject of water education and culture, the Spanish version of *Project WET, Curriculum & Activity Guide*, was reprinted with the sponsorship of *Nestlé Waters*. The guide was distributed among 1,619 educators in 67 workshops. These workshops were given in Mexico City and in the following 17 states: Aguascalientes, Baja California, Baja California Sur, Chiapas, Coahuila, Colima, Durango, Guanajuato, Guerrero, Michoacán, Morelos, Oaxaca, Puebla, Querétaro, Sonora, Yucatán, and Zacatecas. This includes 20 special workshops, where 541 educators from the Pátzcuaro watershed participated as part of the program for its environmental rehabilitation. Also, with the collaboration of educators from the region, a first



FRONT PAGE OF THE SPANISH VERSION OF DISCOVER
THE COLORADO RIVER KIDS BOOKLET



PARTICIPANTS OF THE WORKSHOP FOR THE WRITING OF ACTIVITIES FOR THE *DISCOVER A WATERSHED: LAKE PÁTZCUARO EDUCATOR'S GUIDE*



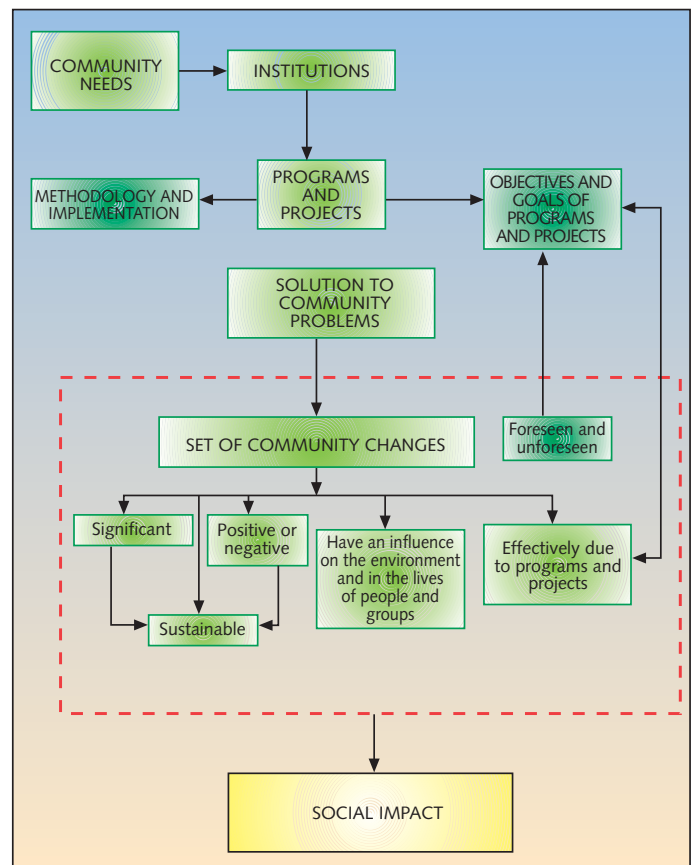
INTERVIEWS IN THE COMMUNITY OF EL MANZANILLAL OR COLONIA ENRIQUE RAMÍREZ, PÁTZCUARO

draft of the book *Discover a Watershed: Lake Pátzcuaro*, was developed. Five workshops of environmental decisions were given to Querétaro teachers, and two workshops of *Discover a Watershed: the Río Bravo/Río Grande* were given in Coahuila. In collaboration with Project WET International, a workshop for the writing of activities for the *Discover a Watershed: The Colorado* guide was organized and given in Glenwood Springs, USA.; the *Discover the Colorado River KIDs Booklet* was developed; the booklets *The Water Story*, and *Healthy Water, Healthy People* were adapted; and the Project WET workshop *¡Encaucemos el Agua!* was given in Panamá. In this latter case, there was also the collaboration of the Water Center for the Humid Tropics of Latin America and the Caribbean and of the United Nations Educational, Scientific and Cultural Organization.

Computer Information Technology

A model to measure the social impact of water-related environmental and social programs and projects, both quantitatively and qualitatively, was developed. This model was applied to the Lake Pátzcuaro watershed by adequating its parameters and indicators. To do that, information was collected from some 35 projects and four programs, carried out since 1993 to date. To collect the information, questionnaires were developed and applied to the population, and a plan for the statistical analysis of the significance level

of each indicator, by project type and population group, was designed. To validate the information, 425 interviews were applied, with the collaboration of the Universidad Michoacana de San Nicolás de Hidalgo, in 32 localities of the municipalities of Pátzcuaro, Quiroga, Tzintzuntzan, and Erongarícuaro, Michoacán. From this question-



BASIC THEORETICAL MODEL FOR MEASURING THE SOCIAL IMPACT OF ENVIRONMENTAL PROGRAMS AND PROJECTS WITH THE SOCIAL IMPACT ASSESSMENT COMPUTER SYSTEM



UPDATING OF IMTA'S INTRANET *IMTANET*

naire testing, the indicators were defined and incorporated, together with the questionnaires, to a computer system currently in development. Furthermore, the feasibility of applying the statistical analysis plan was determined by structuring the databases.

In another regard, work was continued on the management of IMTA's user accounts and on the supervision of the Institute's servers to offer Internet and electronic messaging services, as well as printer and software sharing to 480 users. E-mail users assigned to the *cenca* mail server were transferred to the *tlaloc* server to manage all e-mail accounts from one server. In support to the Institute's internal communication, IMTA's intranet (*IMTANet*) was redesigned and updated.

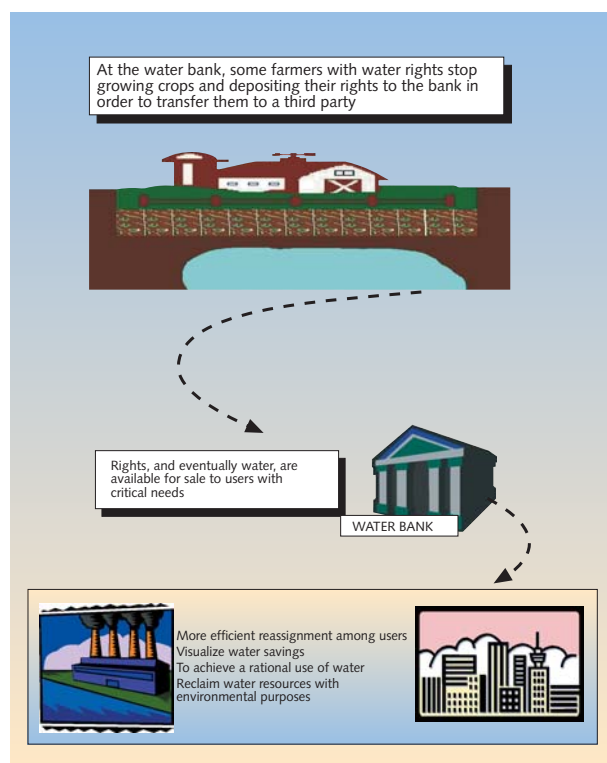
Water Economics and Financing Technology

In order to foster water saving and promote the rational use of water, encourage the efficient reassignment of concessions already granted by CNA, solve water shortage and drought problems through economic incentives, and implement sustainable legal, administrative, and environmental mechanisms, IMTA conducted a study that had as

its main objective to install a water bank model in Mexico to manage and regulate the transmission of rights. In a first stage, the operation rules were defined for establishing the Lerma-Chapala Watershed Water Bank incorporating the experiences of water banks in California, Texas, and Spain, which include several alternatives for buying and selling rights and paying for environmental services. In addition, a computer system was developed to estimate the price of water released in the watershed based on factors such as volumes, distances, and losses due to transportation, which may influence transactions among voluntary parties willing to buy or sell their water rights on a partial or total and/or temporary or definitive basis.

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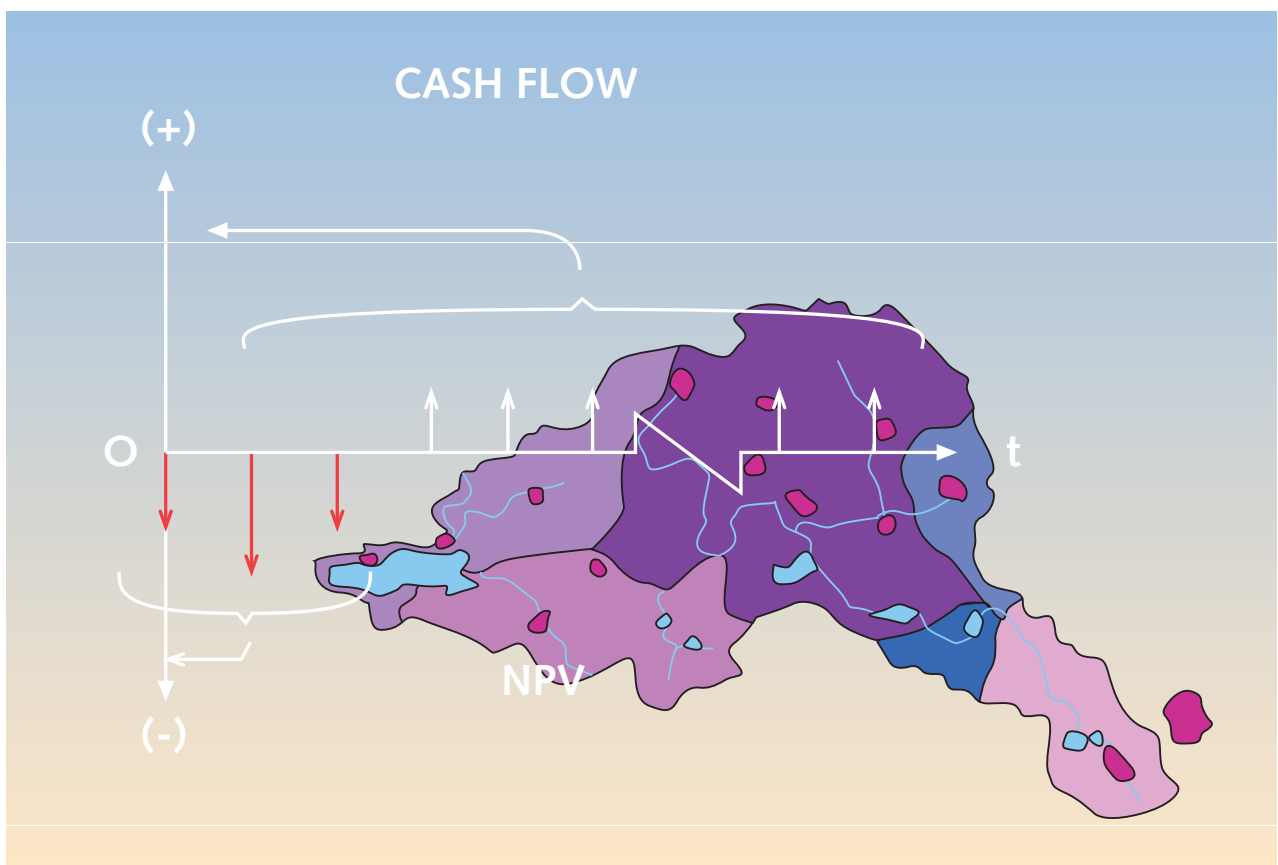


WATER BANK

Chapala watershed, the different water distribution scenarios generated by a simulation and optimization model in the watershed were assessed with economic, environmental, and social approaches. The economic evaluation consisted in determining the cost-benefit relationship for each scenario, taking into account the agricultural use and the storage in Lake Chapala. The analysis for agriculture was made with market prices, whereas in order to determine the price of water related to storage in the lake, the methodology of contingent valuation was applied for all the watershed, with which it was possible to calculate an environmental value for water which does not have a formal established market. With these values, the cash flows of costs and benefits associated to each scenario were constructed, and the cost-benefit, net present value, and internal return rate indicators were obtained. The environmental assessment represents a preservation

value or a non-consumption value of water in Lake Chapala. The methodology used included the application of surveys in the watershed and in the metropolitan area of Guadalajara, Jalisco. The National Public Health Institute's National Survey Center collaborated to ensure the reliability and representativity of contingent values. As a result, the amounts that the population would be willing to pay in order to maintain a stored volume of 2,100; 3,100; or 4,500 hm³ in the lake were obtained. The values were: \$1.00, \$0.66, and \$0.51 per cubic meter, respectively.

The general information for index costs was processed. This allows for a quick estimation of investment and operation and maintenance costs for a wastewater treatment plant. This development solves the parametric equations for the following treatment methods: advanced primary, activated sludge, biological filters, aerated lagoons, stabilization ponds, and wetlands.



CASH FLOW VALUES OF COSTS AND BENEFITS FOR EACH SCENARIO

