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INTEGRATED PLANNING FOR SUSTAINABLE USE OF WATER IN THE MIDDLE EAST

Report on a Training Course Organized under the Auspices of the Mideast Multilateral Working Group on Water Resources

June 4 to 16, 1994

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International Science and Technology Institute, Inc.
Training Resources Group
The University of Arizona

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August 1994

ISPAN

IRRIGATION SUPPORT PROJECT
FOR ASIA AND THE NEAR EAST

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Ms. Laurie Dacus
Ms. Judi Kaleh

This report was prepared by Mac McKee, Lee Jennings, and Kathy Alison.

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ACRONYMS

ANE	Asia/Near East Bureau of USAID
bcm	billion cubic meters
CDM	Camp Dresser & McKee
CEC/EC	Commission of the European Community/European Community
CU	Consumptive Use
CWR	Crop Water Requirement
EC	European Commission
ISPAN	Irrigation Support Project for Asia and the Near East
IRM	Integrated Resources Management
JWU	Jerusalem Water Undertaking
mcm	million cubic meters
ME	Middle East
MEPP	Middle East Peace Process
MERC	Middle East Regional Cooperation Program
MWR	Ministry of Water Resources
NGO	Nongovernmental Organization
NEA	Bureau of Near East Affairs (U.S. State Department)
TSC	Technical Support Center (ISPAN)
UAFW	unaccounted-for water
USAID	United States Agency for International Development
WUA	Water Users Association
WW	Water Withdrawal

EXECUTIVE SUMMARY

Under the auspices of the Middle East Peace Process (MEPP) Multilateral Working Group on Water Resources, the U.S. Agency for International Development (USAID) sponsored a two-week training course, *Integrated Planning for Sustainable Use of Water in the Middle East.* The course was designed and implemented by the USAID-funded Irrigation Support Project for Asia and the Near East (ISPAN) and conducted June 4 to 16, 1994 in Orlando, Florida.

The *Integrated Planning for Sustainable Use of Water in the Middle East* course was the first of fourteen courses designed to address critical Middle East water resources issues and topics. The fourteen recommended courses resulted from a training needs assessment jointly supported by the European Commission, USAID, and the U.S. State Department. ISPAN provided one of the three needs assessment team members who identified and prepared initial scopes for the fourteen priority training courses in September 1993 following a visit to the region.

At the April 1994 meeting of the Multilateral Working Group on Water Resources, held in Oman, the United States, the European Commission, and seven other donors made commitments to fund all fourteen courses.

The *Integrated Planning for Sustainable Use of Water in the Middle East* training course served as a forum for interaction among top-level water managers from the Middle East, particularly among Israelis, Palestinians, and Jordanians. Sixteen representatives from the region participated in the course, including six Palestinians, three Israelis, four Jordanians, and one Egyptian, one Omani, and one Moroccan. The participants were all senior water resource managers, and many were directors of water planning agencies.

Prior to the course, the five members of the multi-disciplinary training team spent five days with a facilitator designing the training course. Trainers reviewed the results of the Priority Regional Training Action Plan and developed detailed session outlines, including session objectives and expected outcomes, exercises and activities, visuals and handouts. The objective of the design week was to develop interactive, participatory sessions for the course and provide an opportunity for the training team to develop a cohesive training plan.

The central theme of the course was Integrated Resources Management, a systematic approach to decision making that involves problem identification, goal setting, and various analytical techniques. The course focused on environmental, economic, social, and engineering concerns related to water use and allocation at both the national (urban and rural) and municipal levels in the Middle East.

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The course introduced new skills in analyzing the factors needed to allocate water resources and to use this new information on the job. The major objective was to provide managers who have primarily engineering backgrounds with a broader perspective on water resources issues, including such factors as allocation of water from low to higher valued uses, reuse of treated wastewater, and management of groundwater and demand management using pricing.

Trainers and course organizers designed the training to provide participants with skills and tools that could be applied when they returned to work. During the design phase, course organizers distributed the course outline to the regional parties and requested comments and suggestions. Course sessions provided opportunities for those attending to share information with and learn from each other.

A major part of the course was a final project, produced by each of the participants. Working alone or in teams, participants prepared project papers on water resources problems in their organizations. Some of the projects included a report by a Palestinian group on restructuring and establishing Palestinian water-sector institutions; a Jordanian and Moroccan team report on artificial groundwater recharge; the Gaza representative report on alternatives for Gaza city wastewater treatment and reuse; an Israeli group report on the same topic for the Dan River Region stressing the concerns about salinity in treated wastewater; and a report by the General Manager of the Jerusalem Water Undertaking (JWU) on the issue of water pricing based on JWU's experience of supplying water and sanitation services to parts of East Jerusalem, Ramallah, and approximately forty villages in the area.

The training course was held in Florida because of the state's extensive experience with wastewater reuse, water quality concerns, and heavy reliance on groundwater. Part of the course included field trips and panel discussions that highlighted the state's experiences in these areas. Local resource people also discussed their experiences with public participation efforts during the course.

The five technical trainers and course facilitator received excellent ratings on the evaluations completed by the participants.

Course logistics were arranged by ISPAN with the assistance of Camp Dresser and McKee's local office in Orlando.

Chapter 1

INTRODUCTION AND BACKGROUND

1.1 Assessment of Regional Training Needs

In June 1993, the core party members of the Middle East Peace Process (MEPP) Multilateral Working Group on Water met in Washington, D.C., and agreed to a joint United States and European Commission (EC) proposal to conduct a regional training needs assessment of the Middle East water sector. A team of three training and water resources specialists spent two weeks interviewing representatives from the West Bank and Gaza, Israel, Jordan, and Egypt. The team's task was to identify and prioritize water-related regional training needs for personnel working in the water sector in the Middle East.

The needs assessment team found that, while the sizes and functions of the water-related organizations in the region vary greatly, those working within the water sector face a number of similar dilemmas as they strive to manage their limited water resources. A number of common water resources and organizational issues were identified:

- Rapidly increasing populations
- Limited water resources for domestic, agricultural, and industrial uses
- Limited hydrological data
- Limited new sources of water
- Older municipal water distribution systems and poorly maintained systems
- Limited sewage treatment facilities
- Increasing water-related health problems
- Poorly managed irrigation systems; outdated equipment and techniques
- Decreasing water quality
- Increasing soil salinity
- Saltwater intrusion
- Fragmented and uncoordinated organizations
- Limited long-range strategic planning and policy-making capabilities

- Lack of efficient management systems and operating procedures
- Insufficient number of trained professional staff
- Inefficient institutional frameworks and organizational structures
- Limited human resource development and staff training programs

On the basis of their assessment, the team proposed a Regional Priority Training Action Plan of fourteen courses. The proposed courses address strategic water resources issues and would be designed for senior water resources managers and professionals from the region.

The courses proposed in the Priority Regional Training Action Plan are:

Water Sector level courses

Course 1:	Concepts of Integrated Water Resources Planning and Management
Course 2:	Water Resources Assessment, Planning, and Management
Course 3:	Water Quality Management
Course 4:	Data Collection and Management Systems
Course 5:	Alternatives in Water Resources Development
Course 6:	Principles and Applications of International Water Law

Water Sub-Sector level courses

Course 7:	Management of Municipal Water Supply Systems
Course 8:	Rehabilitation of Municipal Water Supply Systems
Course 9:	Management of Wastewater Collection and Treatment Systems
Course 10:	Development of Efficient Irrigation Systems

Specialized courses

Course 11:	Environmental Impact Assessment Techniques
Course 12:	Groundwater Modeling
12a	Modeling of Groundwater Flow in Multi-Aquifer Systems
12b	Modeling of Groundwater Pollution
12c	Modeling of Seawater Intrusion
12d	Modeling of Groundwater Flow in Fractured Rocks
Course 13:	Public Awareness Campaigns for the Water Sector

Course 14: Development, Management, and Delivery of Training Programs in the Water Sector

At the October 1993 Beijing meeting, members of the Multilateral Working Group on Water Resources approved the U.S./EC training needs assessment for the water sector.

At the April 1994 meeting of the Working Group held in Oman, the United States, the European Commission, and seven other donors made commitments to fund the fourteen courses. The United States announced that the first course, *Integrated Planning for Sustainable Use of Water in the Middle East*, would be conducted in June 1994.

1.2 A Training Course on Integrated Planning for Sustainable Use of Water in the Middle East

The first course proposed in the Priority Training Plan was intended for an audience of fifteen to twenty senior policymakers in the water sector. The suggested course objective and proposed subject matter included:

Objective: Decision makers will have a better understanding of the concepts and tools required for integrated water resources management with special emphasis on approaches for sustainable development.

Subject Areas: Concepts and tools in integrated water resources management, the need for an integrated approach, sustainable development, water demands, demand management, water resources systems, water quality management, institutional requirements and restructuring, economic planning, international issues.

1.3 Report Overview

The first training course, *Integrated Planning for Sustainable Use of Water in the Middle East*, was held in Orlando, Florida, June 4 to 16, 1994. The course was designed and implemented by the USAID-funded Irrigation Support Project for Asia and the Near East (ISPAN).

This report summarizes the design, implementation, and results of the course. The following chapters discuss the course conceptualization and planning process, course technical content and the methodology and organization of its presentation, evaluation of the course by the participants, and recommendations from the organizers.

Chapter 2

CONCEPTUALIZATION AND PLANNING OF THE COURSE

2.1 Overview

The Regional Priority Training Action Plan proposed broad objectives and subject matter areas to be covered in each of the fourteen courses. Additional work was needed to identify the technical personnel who would constitute the training team, provide detailed definition and content for the subject matter areas, construct a flexible but detailed course design and schedule, and identify needed resources and anticipated logistical requirements for the course.

2.2 Course Content and Technical Team

During the first quarter of 1994, discussions among representatives of USAID, ISPAN, the U.S. State Department, and other water resources technical experts further refined the course objectives and possible subject areas. These discussions concluded that the overall goal of the course should be to introduce new skills in analyzing the factors needed for the allocation of water resources and to plan to use this new information on the job. Integrated Resources Management (IRM) was selected as the central theme. The overall course objective was to provide the participants with an improved ability to analyze and make more informed decisions about national and municipal level water resources planning and allocation issues, with emphasis on a better understanding of how to use economic, environmental, and engineering tools and concepts. Using knowledge of the region and current thinking in water resources planning, organizers identified critical issues to be addressed in the course, including:

- Balancing competing agricultural, industrial, and municipal demands
- Managing municipal demand
- Economic considerations applied to wastewater treatment
- Balancing increasing demand for water with the need for sustainable water quality
- Enhancing human health, well-being, and productivity
- Forecasting water supplies
- Construction and maintenance of water resources systems

ISPAN recruited and identified technical personnel in the required disciplines for the training team. Five water resources professionals were selected: Rick Albani (integrated water resources planning), Herb Fullerton (water demand, pricing, and cost recovery), Mac McKee (water quality, integrated river basin planning, and management), Dan Okun (water reclamation and reuse), and Jim Wolf (irrigation and environmental uses). Lee Jennings was selected as the course facilitator.[1] Biographical data for the course trainers are provided in Appendix B.

2.3 Detailed Course Design

From April 11 to 15, 1994, the five technical trainers met at the ISPAN Technical Support Center (TSC) in Arlington, Virginia, to formulate the detailed course design. These meetings were organized by Kathy Alison, the ISPAN activity manager, and included discussions with USAID representatives Herb Blank and Marjorie Shovlin. Bruce Purdy facilitated the design meetings. The team produced the following outputs during the design week:

- A list of major topic areas and subjects to be presented in the course
- Specific assignments and responsibilities for all technical trainers
- Detailed course design outlines and agenda
- Suggested qualifications and criteria for selecting course participants
- Recommended materials for participants to bring to the course
- Detailed course logistical and equipment requirements

The seven primary subject matter areas identified for the course included:

- Integrated resources management
- Forecasting water demand and supply
- Competing uses of water: agriculture, industrial, municipal, and environmental

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[1] In the summer of 1993, two team members—Lee Jennings and Mac McKee—were involved in the *Workshop on Wastewater Treatment: Alternatives for Small Communities in the Mideast*, a workshop held as a part of the Middle East Peace Process under the joint auspices of the Multilateral Working Groups on the Environment and on Water Resources, with support from USAID. Their participation in the course provided a mechanism to maintain continuity of technical approach with the earlier, successful workshop and apply lessons learned from a similar, USAID-supported activity.

- Balancing increasing demand for water with the need to maintain water quality
- Water pricing: efficiency, income distribution, and cost recovery
- Operations and maintenance of water systems
- Participant projects in integrated resources management

Brief discussions of the technical details of these seven topics, their relation to integrated resources management, and their treatment during the course are presented in the following chapter. Appendix A contains the course agenda.

The course was designed around the needs of water-sector professionals who were identified during the training needs assessment and reflected in the Regional Priority Training Action Plan. In addition, during the design phase, course organizers distributed the course outline to the regional parties and requested comments and suggestions on the content. Flexibility was built into the course design to further tailor the course to the needs of those who actually participated in the course.

The trainers developed learner-centered objectives and identified specific outcomes for each session. Adult learning methodology used during the course included case studies, simulations, group projects, and back-home applications, as well as short lectures and brief technical presentations. The course design provided daily opportunities for participant presentations, small group discussions, and problem-solving sessions. The course promoted interaction among the participants and fostered an atmosphere where they could learn from each other's experiences.

2.4 Course Participants

The training team identified specific criteria and qualifications that were used to help identify and select course participants. The training team suggested that each participant bring data from his agency, or information about a problem related to his responsibilities. The data were to be used during the course to help in the development of participant projects on the potential applications of IRM concepts to their back-home work situations. In addition, it was suggested that participants:

- Represent various water subsectors and have urban water supply, urban sewerage, irrigation, or environmental expertise
- Work for water-related government agencies, municipal authorities, or utilities
- Hold mid- to upper-level professional positions, preferably in engineering and planning
- Be proficient in English

- Have rudimentary computer skills, including basic keyboard skills and an understanding of the basics of MS-DOS, spreadsheet programs, and wordprocessing

Sixteen representatives from the Near East participated in the training course, including six Palestinians, three Israelis, four Jordanians, one Egyptian, one Omani, and one Moroccan. The participants were all senior water resources managers, and many were directors of water planning agencies. Biographical data for the course participants are provided in Appendix B.

2.5 Course Venue and Logistics

Orlando, Florida, was chosen as the site of the course because it offered excellent opportunities for field trips related to water shortage, water supply, wastewater treatment, water reclamation and reuse, groundwater recharge, and water quality issues. A cross-section of federal, state, and local water managers was available to participate in panels and field trips for the course. Environmental issues and public participation programs were also discussed during meetings with local experts.

The course was held at the Sheraton Orlando North Hotel. Facilities and logistical support provided by the hotel were excellent, as were the administrative, secretarial, and computer support furnished by the Orlando office of Camp Dresser & McKee, which was five minutes from the course site. CDM staff did an excellent job of collating the course materials and preparing the course handouts and folders in the three days before the arrival of the participants. Other important roles played by the CDM/Orlando office included:

- Arranging field trips to the City of Altamonte Springs water reclamation system, the Orange County Southwest Florida water reclamation and reuse facilities, and the water treatment and reuse facilities of Disney World
- Lining up speakers for a panel on institutional arrangements for water management in Central Florida and for the presentation on conflicts between water supply for municipal use and environmental/aesthetic/recreational uses in the City of St. Petersburg Water District
- Engaging a temporary secretary so that a complete record of the course proceedings could be produced daily and then photocopied and collated at CDM/Orlando so that each participant could put the proceedings and the results in his binder on the following day
- Contacting a local travel agent who helped reconfirm and change several participant return plane reservations

Chapter 3

COURSE IMPLEMENTATION

3.1 Technical Content

Seven major subject matter areas, listed in the previous chapter, were presented and discussed in the course. Integrated Resources Management (IRM) provided the central theme of the course. Other topic areas were designed to supply additional detail and insight into the IRM components that are of particular importance for water resources planning and management conditions in the Middle East.

Following are overviews of the seven technical areas that made up the basic structure of the course. Session objectives, short technical write-ups, case study material, small group discussion questions, handouts, references, and other supporting materials for each topic were developed for a course manual, the contents of which are listed in Appendix C.

3.1.1 Introduction to Integrated Resources Management

The objectives of the session that introduced the concept of Integrated Resources Management were to:

- Acquaint water managers with the concepts of IRM
- Assist water managers in the development of skills to implement an effective IRM process in their organization.

Integrated Resources Management (IRM) is a concept that is relatively new to the water resources public utilities sector. The objective of IRM is to to provide a safe, adequate and reliable supply of water at a reasonable cost to consumers. An Integrated Water Resources Management plan is a comprehensive plan that combines engineering, economic, political, legal, and environmental factors and includes a least cost analysis of supply and demand management practices, identifies planning alternatives and competing uses of water, and satisfies organizational and regulatory policy goals.

IRM represents a paradigm shift away from traditional water resources planning and management schemes that emphasize development of supply options only. IRM is also an alternative for least-cost schemes that have a narrow view of the interrelatedness of resources (e.g., water, land, and capital) and that limit planning and management activities to water professionals who are internal to the industry. IRM expands the set of water management alternatives to include demand management as well as supply

augmentation; it includes the full range of water-related resources that might be involved in a planning situation; it addresses a diverse set of selection criteria beyond economic development, including environmental and social considerations; and it conducts the planning process in public and invites participation of interested parties. Table 3.1 provides a comparison of the traditional, least-cost, and integrated approaches to resources management in this paradigm shift.

The fundamental tenet of IRM is that resources should be used as efficiently as possible. It recognizes that, as resources become scarce because of increased demand, shifts in allocation must be allowed between users in space and time, and across economic sectors, to ensure that the greatest value is produced from use of the water resources. It seeks to counter market failures in resources allocation, such as water pollution, groundwater overdraft, salt water intrusion, and loss of valuable wildlife habitat, by obtaining public input and by explicitly addressing multiple goals and objectives in the water resources decision process. IRM is an ongoing process where issues and constraints are recognized, alternatives are formulated and evaluated, plans are selected and implemented, performance is monitored and achievement of objectives is evaluated, and modifications and corrections are identified and made. It uses modern analytic approaches for data collection, analysis, and archival uses and for forecasting the consequences of resources management alternatives.

The basic concepts of IRM were introduced on the first day of the course through a panel presentation by the technical trainers and through a lecture on the content and process of developing an IRM master plan. The participants then worked in small groups to discuss IRM in terms of issues, problems, and opportunities they face in their own working environments.

3.1.2 Forecasting Water Demand and Supply

Future demands for water and the quantity of water that could be made available from any given water management alternative are critical pieces of information for effective water resources planning and management. The topics of demand and supply were addressed separately.

TABLE 3.1: COMPARISON OF PLANNING PROCESSES*

Dimension	*Traditional*	*Least-Cost*	*Integrated*
Resources Options	Supply options (demand is taken as a given)	Demand and supply options (demand can be manipulated)	Demand and supply options (demand can be manipulated)
Resources Diversity	Utility-owned and centralized	Diversity of resources including demand side management	Diversity of resources including demand side management
Resources Ownership	All infrastructure or resources utility-owned	All infrastructure or resources owned by utility	Some infrastructure or resources owned by other utilities and other producers
Resources Selection Criteria	Minimize prices and maintain system reliability	Diverse criteria, including risk reduction, technological diversity, environmental quality, and economic development	Diverse criteria, including risk reduction, technological diversity, environmental quality, and economic development
Focus of Economic Cost Analysis	Ratepayers	Multiple groups (e.g., society, program participants, ratepayers, and individuals)	Multiple groups (e.g., society, program participants, ratepayers, and individuals)
Conduct of Planning	Internal to the utility, mainly system planning and financial planning	Internal to the industry, mainly system planning and water professionals	Several utility departments as well as outside experts, commission staff, public
Role of Public Groups	Intervenors	Intervenors	Participants
Judgement	Vague	Well defined	Well defined
Preferences	Vague	Well defined	Well defined
Objectives	Single	Multiple	Multiple
Reliability	Constraint	Decision variable	Decision variable
Environmental Quality	Constraint	Constraint	Objective
Risk	Should be avoided	Should be managed	Should be managed

* Adapted from M. Hanson, D.R. Kidwell, R. Stevenson. 1991. "Electrical Utility Least Cost Planning." *Journal of the American Planning Association,* 57(1), pp. 34-43.

Forecasting Water Demand

The objectives of the session on forecasting water demand were to:

- Rationalize water demand analysis as an element of IRM
- Specify, estimate, and interpret water demand functions for selected water uses
- Demonstrate selected applications of demand analysis for water demand projections and for assessment of water demand management

IRM must be concerned with the timing, location, quantity, quality, and reliability of water use across all water sectors. These are the principal subjects of water demand analysis, and, as a consequence, forecasting water demand is in important component of IRM. Demand analysis can be applied in both short- and long-term planning situations. Short-term price changes can be used to adjust demand in relation to temporary changes in supply. This might be done, for example, to conserve as a means for delaying investment in new supply or to adjust revenues relative to financial obligations of the supplier. In the long term, within a time frame sufficiently long for nonprice demand determinants to change, demand analysis can be used to support planning for water supply development, changes in zoning and land use classification, and the location and timing of public or private infrastructure investments.

The demand for water is seen not as a single number representing the quantity of water required by a given user, but as a function relating quantity of water demanded to such variables as price, income, population, and climate, depending on the type of water use. Physical, biological, technical, and behavioral relationships in production and consumption processes dictate the shape and predictability of demand functions. Demand forecasting requires quantification of these functional relationships. The components of these functions and the approaches used to estimate them will differ depending on the type of water use. That is, the components of municipal demand will differ from those of industrial, agricultural, and environmental demands.

The basis of water demand estimation was presented in the course through a short lecture on microeconomic concepts as they relate to the water sector. The components of water demand functions were then discussed as a full group activity for municipal, industrial, and agricultural uses. Demand for water for environmental uses was recognized and discussed, but demand estimation approaches based on microeconomics are not yet possible. A video about using a geographic information system for estimating water demand functions and quantifying future water demands was shown and discussed.

Forecasting Water Supply

The objectives of the session on forecasting water supply were to:

- Rationalize water supply forecasting as an element of IRM
- Specify, estimate, and interpret selected water supply models
- Demonstrate an application of a water supply forecasting model in coordinated management and operation of water control structures.

Water is a critical factor in the support of life, and its dependable availability in sufficient quantity and quality is often a necessity for economic development. Dependability, however, is not a characteristic commonly associated with water resources. The hydrologic cycle and hydrologic processes in general, e.g. precipitation and streamflow, are stochastic or random. As a result, water resources planners and managers must deal with a high degree of uncertainty about future water availability. When the consequences of water shortfall (or excess) are serious, this uncertainty can create unacceptable levels of economic or social risk for investments or developments that require a dependable water supply. Therefore, methods for quantifying and reducing uncertainty in water resources availability can be important planning and management tools, and are critical for IRM.

The use of available water resources often requires construction and operation of water diversion, storage, treatment, delivery, distribution, and collection systems to provide required quantities of water of sufficient quality. These systems represent hydraulic interventions in the hydrologic cycle with the specific intention of reducing the uncertainty in the quantity and quality of water that will be available for future use. These water management systems are often very complex, affect water users over a wide geographic area and across economic sectors, change the timing of water availability, and require substantial and ongoing public investment. Therefore, the ability to deal with system complexity, to forecast future system behavior, and to determine optimal facility size and operational policies is critical for IRM.

Concepts associated with forecasting water supply were introduced during the course in a short lecture. The session included a discussion of the uses of water supply forecasting in IRM, the types of models that are available for analyzing hydrologic uncertainty, simulating hydrologic processes, and modeling the operation of complex surface and groundwater management systems. Data needs and data collection issues were also discussed. A case study involving conjunctive use of surface and groundwater for irrigation supply was examined by the participants in small groups using a spreadsheet linear programming computer model. A water system management model, applied to irrigation and municipal and industrial supply problems in a river basin in India, was demonstrated to interested participants in an optional evening session.

3.1.3 Competing Uses of Water: Agricultural, Industrial, Municipal, and Environmental

The objectives of the discussions on competing water uses were to:

- Demonstrate the traditional dominance of agriculture in water withdrawals and the emerging and future importance of the municipal sector
- Show the importance of environmental use as a competing demand and the need to satisfy that demand
- Illustrate options for intersectoral water realignments

As the economy of a region develops, water use tends to shift from lower-valued uses to higher-valued uses. These reallocations represent improvements in the efficiency of water use and are therefore of concern to IRM. Generally, as a region becomes more urbanized and industrialized, less water is allocated to irrigated agriculture and more to municipal and industrial uses. These shifts in water demand happen gradually through time and have major implications for the operation and management of existing diversion, storage, treatment, and distribution systems. For example, agricultural demand is largely seasonal, but municipal and industrial demands are more uniform throughout the year. Some shortfall in water supply can usually be accommodated in the agricultural sector, but shortfalls of similar magnitude might be economically catastrophic to the industrial sector and politically unacceptable for urban users. Industrialized economies with higher per capita GNP will experience increased public awareness of environmental problems and support for allocation of resources to address those problems. Anticipation of long-term changes in demand, fostering appropriate institutions for shifting water allocations among uses, and planning for structural and nonstructural mechanisms to address those changes are all part of IRM.

The notion of shifts in the allocation of water among competing uses was introduced in the course by a short lecture that discussed the hydrologic cycle and competition for water use in four sectors (agricultural, industrial, municipal, and environmental). Command and market-based approaches were also discussed as alternative institutional mechanisms for achieving water reallocation. A full group discussion of these issues compared and contrasted the situation in the Middle East relative to water allocation institutions. A short lecture presented water use data from several countries in the Middle East to demonstrate the allocation for domestic, industrial, and agricultural uses, and to illustrate possible long-term shifts in allocation of water among those sectors. A short lecture and group discussions examined alternative ways to judge efficiency of water use, contrasting physical efficiency with economic efficiency. This led to a critical reexamination of principles that irrigation engineers rarely question and the development of a water efficiency paradigm that has different planning and management implications for closed and open river systems. A short video about water scarcity and competing

water uses in the state of California was shown and discussed. Finally, a presentation was made by an official from the City of St. Petersburg, Florida, about current conflicts over water supply for municipal and environmental use.

3.1.4 Balancing Increasing Demand for Water with the Need to Maintain Water Quality

The objectives of the session on balancing increasing water demands with maintenance of water quality were to:

- Understand how water quality and water use tradeoffs relate to IRM
- Consider the benefits of water quality maintenance
- Examine methods for quantifying or illustrating tradeoffs between water quality maintenance and other water uses
- Identify institutional problems and requirements for balancing water demand with maintenance of water quality

Integrated Resources Management is concerned with the efficient use of water and related resources, and with maintenance of the long-term productivity of those resources. Water quality and water pollution are concerns in IRM because if water is polluted, it is unusable—least temporarily. This unusable water represents an opportunity cost that reduces the value of the resources to society. Water pollution and water polluters also pass on other costs to society, including higher treatment costs, greater public health risks, and environmental degradation. These costs are borne by everyone in society, including those who do not benefit from the activities that produce pollution. All of these issues represent inefficiencies in the use of water and potential decreases in the long-term productivity of the resource.

Water quality issues are also important in IRM because of their fundamental upstream-downstream nature: upstream polluters benefit, while downstream users pay the costs of pollution. This geographical separation of the source of water pollution and the location of the resultant water quality problem requires an integrated approach to the management of the affected resources.

Pollution of groundwater resources magnifies the time dimension of water quality issues. While all water pollution problems are separated in space and time from the events that produced them, this is particularly the case for groundwater contamination. Pollution is difficult to remove from groundwater. Techniques for remediation are in their formative developmental stages, but costs are prohibitive. This, together with the very slow response of aquifers to hydraulic manipulations, means that groundwater pollution problems are likely to last for years, even after the pollution-producing activity has been

terminated. Polluted aquifers will be lost as productive water resources. This is another example of inefficient use of resources and, consequently, a concern in IRM.

The topic of balancing water demands and water quality maintenance was introduced in the course through a short lecture on problems in developing countries associated with deteriorating water quality and the benefits of maintaining water quality. A short lecture on the relationship between water quality maintenance and IRM led to a demonstration of a water quality computer simulation model of a case study of a water quality problem in the Subarnarekha River Basin in India. A large group discussion considered the policy and institutional considerations of the case study and its implications for conditions in the Middle East. The participants viewed a special slide presentation on water reuse around the world, and a summary was given of last year's workshop on wastewater management and reuse. The latter included a demonstration of the computer program, WAWTTAR, developed with USAID support, for evaluating wastewater treatment approaches and water reuse opportunities for small communities in the Middle East. In addition, field trips were conducted to wastewater treatment and reclamation facilities in the city of Altamonte Springs, water reuse for citrus irrigation and groundwater recharge in Orange County, and wastewater treatment and reuse in Disney World.

3.1.5 Water Pricing: Efficiency, Income Distribution, and Cost Recovery

The objectives of the session on water pricing were to:

- Distinguish the role of water pricing in:
  - recovery of development, interest, administration, operations, maintenance, and energy costs
  - redistribution of income and wealth
  - rationing water use
- Demonstrate and apply equitable pricing and cost recovery among various categories of water use
- Demonstrate economically efficient water pricing

Under principles of pure economic efficiency, direct beneficiaries of a project's services should pay the full long-run marginal cost of providing that service. However, sound economic reasons and political value judgments can provide defensible rationale for departing from full-cost pricing of water under certain circumstances. In the case of externalities (either positive or negative), when there is an explicitly mandated distributional objective which is being addressed by public provision of project services, or when large-scale economies exist, society might be economically justified in subsidizing water supplies.

A major concern in developing nations about water pricing is recovery of capital costs as well as operation and maintenance costs. Many water resources projects are not running as efficiently as possible because of insufficient fiscal support for operation and maintenance activities. Cost-based water pricing at the point of supply, with appropriate modifications to reflect externalities, assures efficient use of water and removes the incentive for unwarranted investment in excess capacity. If estimated and applied appropriately, the cost-based price ensures that water services used by a project's direct beneficiaries will reflect society's valuation of the opportunity cost of resources used in the project to generate those services. New projects should be required to use cost-based pricing because it ensures appropriate incentives for efficient water use as well as providing further assurance of meeting national economic efficiency objectives. Direct beneficiaries' demonstrated willingness to repay full costs provides strong evidence that project benefits exceed costs. Establishing the principle of full cost pricing from the start will preclude the capitalization of subsidies into land and water values and subsequent political pressure on the administrative agencies to continue underpricing the resource. New projects should be required to meet the full cost of operation and maintenance and development costs in the form of capital and interest repayment, as well as on- and off-site externality costs. Efficient marginal cost pricing is approximated when development and recurrent costs, which may vary within a service area and over time, are set to reflect these cost differentials on a divisible or per unit of water service basis to each user or homogenous user group with significantly different costs. The water service, whether represented as property shares within a privately developed water service entity, or as contractual entitlements in a publicly sponsored water project service area, should be freely marketable as any other real property, subject to reasonable protection of third-party interests.

An effective water pricing (cost-recovery) system should observe the following:

- Direct beneficiaries should pay a price approximately equal to the marginal cost, including investment and recurrent costs, as a per unit of service charge.
- Prices should change to reflect real changes in the marginal cost, whether those changes are over time, space, operations, or as an offset for project-imposed externality costs.
- Prices should be adjusted upward or downward to match departures from marginal cost pricing.
- The funding base for administering agencies should be tied to revenues secured to avoid empire building; historical experience demonstrates the merit of leaving full responsibility for securing and allocating operation and maintenance funds with water-user groups who use and manage the water on-farm.

The topic of water pricing was introduced in the course through a short lecture on the fundamental economic principles of income distribution and efficiency as they relate to water pricing. A general discussion of water pricing approaches in the Middle East followed, with emphasis on political, social, and institutional difficulties in employing marginal cost pricing methods. Case studies of cost recovery and paying for water systems, including data from the Jordan Valley Authority, were presented by the technical trainers and discussed by participants. On field trips and when otherwise appropriate, local officials were asked questions regarding the water pricing and cost-recovery situation of water facilities in the Florida area.

3.1.6 Operations and Maintenance of Water Systems

The session on operation and maintenance provided concepts and information to assist water managers in determining how much attention should be devoted to plant facilities to keep them operating efficiently.

Long-term viability of water projects must be ensured so that their contribution toward national economic and social development goals can be realized, and so that their contribution toward debt service can be generated. Assessment of project viability with regard to operation and maintenance requires that numerous questions must be answered:

- Is the water source safe, adequate, and reliable?
- Are there any dangers—existing or potential—from possible sources of contamination (e.g., microbiological, chemical, heavy metals, or radionuclides)?
- What is the condition of the infrastructure system (e.g., pumping, storage, distribution, and collection)?
- Are operators available with sufficient training and skills?
- Are management systems and institutions appropriate for addressing the operation and maintenance issues of the system?
- Is sufficient financing available to ensure that operation and management costs can be met?
- How much do water users understand about the operation and management requirements of the water system, and how would greater understanding change their attitudes about alternatives and policies for future system management?

The topic of operations and maintenance of water systems was introduced in the course through a short lecture. Group discussion of conditions in the Middle East examined operation and maintenance issues from the participants' local perspectives. A panel discussion was organized to consider water system operation problems and management

institutions in the State of Florida. The panel consisted of a representative from the state regulatory agency, an official from the regional water district, the manager of a local municipal water supply facility and wastewater treatment plant, and a water user and former president of a local environmental group.

3.1.7 Participant Projects in Integrated Resources Management

The final major component in the course was the development of short reports on the use (or potential use) of IRM concepts in the participants' back-home work situations. The assignment was made on the first day of the course, and participants worked on their projects throughout the two-week course, incorporating their learnings from each day's sessions. Working alone or in teams, participants prepared project papers on water resources problems they are facing in their own organizations. On the last day of the course, the participants gave written and oral presentations on their projects.

The specific project topics and team members included:

- The Analysis of Two Major Alternatives for the Second Stage of the Dan Region Wastewater Reclamation Project by Yair Levertov and Israel Mantel
- Changes in the Vegetable Import Policy and in Salinity of the Dan Region Reclamation Project Water and Their Impact on Crops Grown in the Negev by David Sadan
- Falaj Inventory Project by Anjab Mohamed Ali Sajwani
- Upgrading and Rehabilitation of Nablus and Hebron Water Projects by J.A.Q. Shaheen, Maher Ghnaim, and Tawfiq Arafah
- Water Costs: Study Based on the Experience of the Jerusalem Water Undertaking (JWU) in Supplying the Ramallah/Eibireh Region since 1964 by Abdelkarim As'ad
- Restructuring of Water Sector Institutions in the West Bank and Gaza by Munif R. Treish, Hazim Tarazi, and Abdelkarim As'ad
- Artificial Water Recharge by Khalid Sheyyab, Salah Belmatrik, and Edward Qunqar
- Requirements for Wastewater Treatment Plant Upgrading and Use of Reclaimed Water for the City of Gaza by Hazim Tarazi
- Unaccounted-for Water in Jordan by Ehsan Sousa and Sa'ad Bakri

Abstracts of all projects are included in Appendix D, and the full project reports can be obtained through ISPAN, the USAID ANE Bureau in Washington, any course participant, or training staff member.

3.2 Methodology

The course methodology was based on experiential principles of adult learning that encourage maximum participation of both the course trainers and participants. Participants interacted in small-group sessions, large-group discussions, computer sessions, field trips, and working-group exercises, sharing information and learning from each other.

Each session was designed around learner-centered objectives and expected outcomes and included a short lecture, small- and large-group discussion sessions, case study exercises with specific discussion questions, and back-home planning exercises. The course also included expert panels, field trips, slide and video presentations followed by discussions, computer simulations and practice, and preparation of individual and team projects.

The course facilitator assisted the technical trainers in planning the overall flow of the course and in facilitating the daily sessions. Each day, the facilitator provided an overview of the day, review of the objectives of the sessions, review of key points at the end of each session, clarifications, and general monitoring of the course flow.

Chapter 4

EVALUATION RESULTS

The complete results of the final evaluation of the course are located in Appendix E. Overall, the participants' assessments of the course were very positive, as reflected in the following ratings on a scale of 1(low) to 5 (high):

4.875	Overall appreciation of course staff
4.563	Introduction to uses of computers and software
4.250	Contents of training manual prepared for the course
4.125	Course Objective: Learn new skills in analyzing the factors necessary for the effective allocation of water resources

Some of the representative comments of the participants regarding the major advantage of the course are the following:

- Learning that team work in analyzing problems results in better work
- Learning new skills in analyzing the factors that affect the water allocation among different sectors of water use
- Learning some new methods, as well as using new computer technology in analyzing practical problems
- Meeting colleagues from neighboring countries
- Learning how to use water in a sustainable way and how to manage and plan water projects

Some of the topics suggested for future courses organized under the auspices of the Multilateral Working Group on Water Resources include:

- Urban water planning and management
- Operations and maintenance
- Supply and demand in regions that suffer from lack of water
- Water policy/strategy and controlling/monitoring water resources

The major suggestions for improving future courses are the following:

- Inform participants as soon as possible (at least two weeks ahead of time) so that they can prepare and bring relevant information with them to the course.
- Organize more field trips.
- Give more days and less working hours so there is adequate time for reading the material and preparing reports.

Chapter 5

RECOMMENDATIONS

1. A major benefit of the course was to bring high-level water management professionals together to begin to discuss common problems regarding the allocation of scarce water resources in the region. These individuals are valuable resources for each other.

   Recommendation:

   Organizers of future courses should consider designing training sessions that include interactions between and among participants to foster learning from each other. Small group discussions, problem-solving activities, and case study discussions should be used as frequently as possible during future courses.

2. The multidisciplinary training team and a facilitator spent five days together before the course to refine the overall course goal and objectives and to design an interactive, participatory course. Trainers reviewed the results of the Regional Training Needs Assessment; refined the course objectives; and developed detailed session outlines, including session objectives and expected outcomes, exercises and activities, visuals, and handouts. Trainers presented the proposed content to each other during the design session so they could build on each other's content presentations and exercises. By the end of the week, the team had a good idea of what the course content would be, who would be presenting it, and what additional work was needed to complete the session designs.

   Recommendations:

   Multidisciplinary training teams, with at least some appropriate field experience in the Middle East, should be identified to design and conduct the training courses. Adult training methodologies and a trained facilitator are essential to achieving course objectives.

   A week of planning for the entire training team, at least one month in advance of the course, is essential to developing a structured, cohesive training course that takes into account the specific needs, issues, and problems facing practitioners in the water sector in the Middle East. It also provides adequate time for feedback from the region on the content of the course.

3. As the training team completed the training course design, the organizers distributed the proposed outline to the regional parties, requesting feedback on the course content.

Recommendation:

To achieve the maximum course impact, it is important to request input from the parties on the appropriateness of the course content during the planning phase. Feedback from the parties can then be factored into the final design of the course.

4. During the one-week design session, the training team developed a list of selection criteria for course participants. These criteria were proposed by the U.S. delegation at the April Working Group Meeting in Oman as part of the announcement of the course.

Recommendation:

Specific selection criteria should be agreed upon by the organizers and trainers and distributed in advance to parties sending participants to the course. This advance information helps identify qualified, appropriate individuals to participate in the course.

5. The course on Integrated Resources Management (IRM) was sponsored by USAID and was the first of a series of water management courses to be offered under the Mulitilateral Working Group on Water. Other courses will be sponsored by other donors.

Recommendation:

When designing training courses that are part of the Priority Regional Training Action Plan, organizers and trainers may wish to review the outline and design of courses that have already been given by the other donors, to minimize overlap and repetition.

6. A major component of this course was the requirement for a participant-generated back-home project related to IRM concepts. The course was designed to allow time and resources for participants to evaluate data and information they had brought with them and to prepare a project report documenting preliminary application of IRM principles to actual water problems. However, most of the participants were not given sufficient time between notice of their acceptance in the course and their departure date to be able to assemble data and information on a water resources problem. This hampered the ability of the participants to prepare projects and greatly limited the extent to which IRM concepts could be

explored by them. However, some group members were able to access data via fax from their home offices, which did help some of the participants prepare their back-home plans.

Recommendation:

In future courses, all involved should allow sufficient time for participants to make adequate preparations before departing.

7. Identification of appropriate local technical resources and field trip sites are an integral part of the course design. Visits to industrial plants, urban water and wastewater facilities, agricultural areas, and water resources institutions are useful to participants. They can see examples of theoretical topics discussed during the course.

Recommendation:

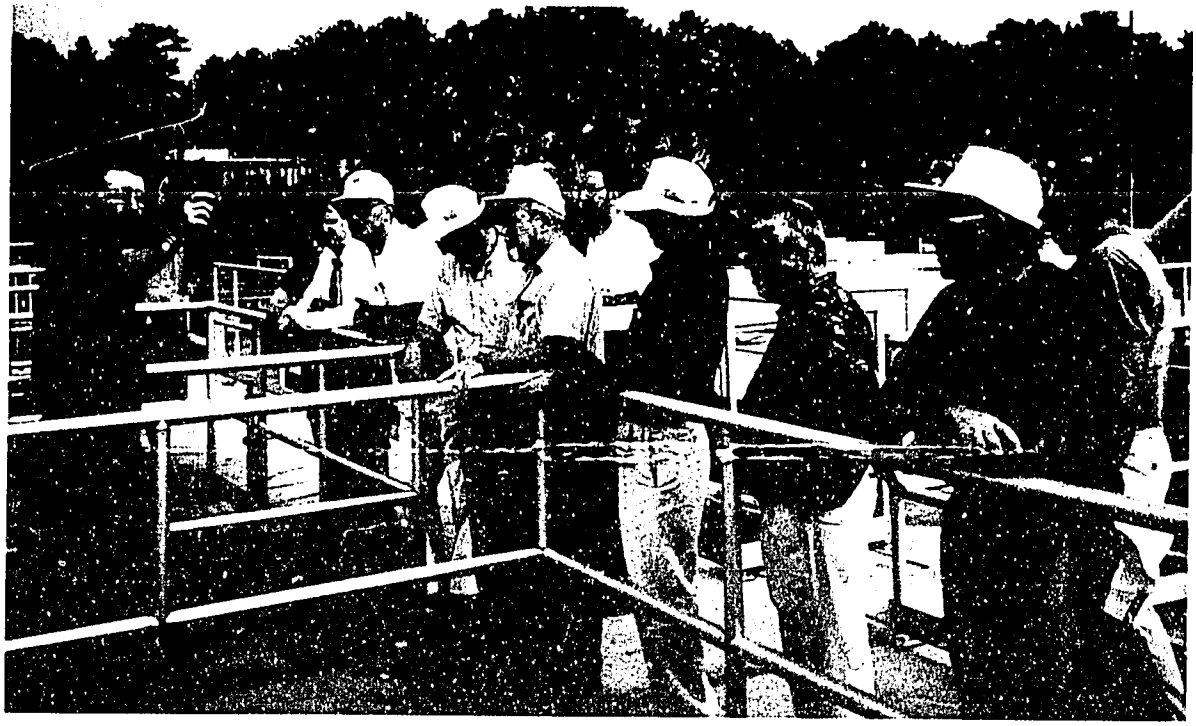
Ideally, future courses should be held in the region. The course venue should be identified well in advance so that a detailed course design can be developed based on the resources available at the training site. This will allow adequate time for briefing local resource people and selection of appropriate field sites to support the course content.

8. Now that the course has been designed and tested, it would be possible to re-offer the course to a wider audience if there is interest in the region and funding were available to pay for additional course delivery.

Recommendation:

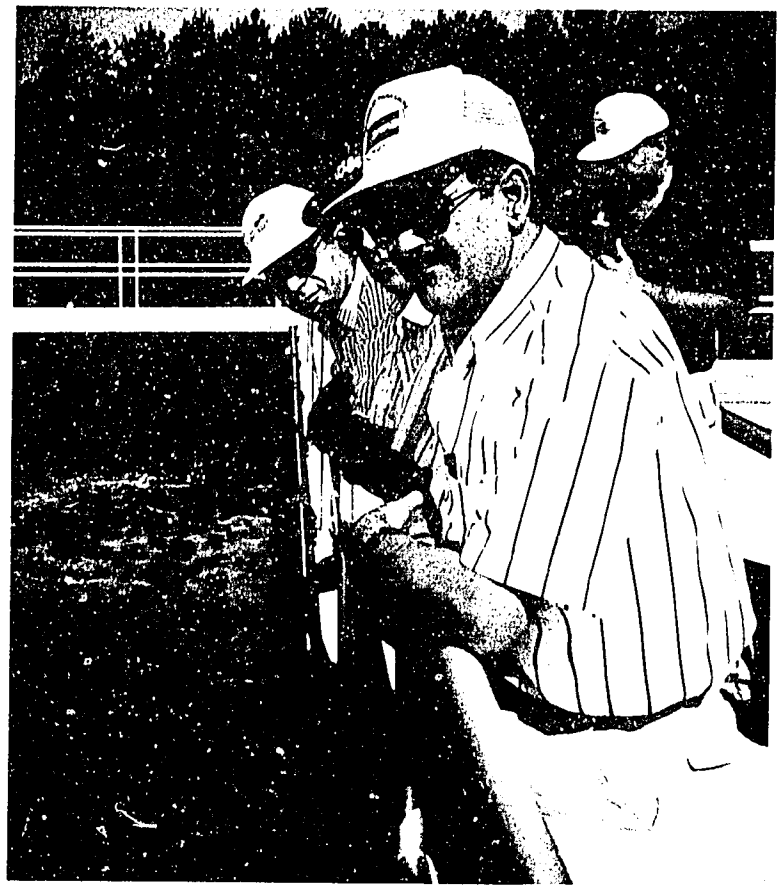
After some of the courses recommended in the Priority Regional Training Action Plan are delivered, a follow-up assessment should be conducted in the region, to evaluate the effect of the courses, carry out another training needs assessment, and determine if any of the original courses should be delivered again, this time in the region.

PHOTOGRAPHS



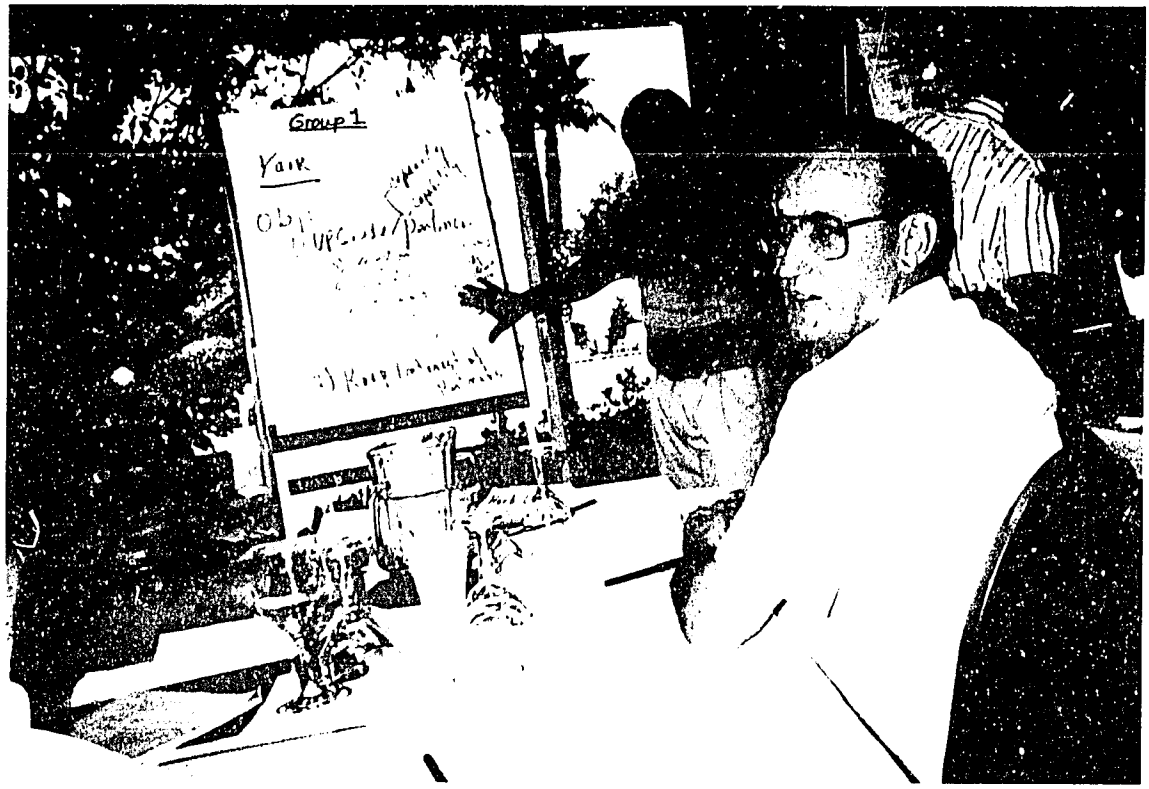
The operator of the Altamonte Springs, Florida wastewater treatment facility describes the operation to training course participants

Training course participants view a wastewater treatment plant in Florida



Disney World plant manager explains the functions
of the water treatment facility to one of the course participants

Members of the training course participate in a
small group discussion session during the course



Trainers and participants discuss applications
of Integrated Resource Planning techniques

Course participants in the training room

Group photo

Appendix A

COURSE AGENDA

COURSE AGENDA

INTEGRATED PLANNING FOR SUSTAINABLE USE OF WATER IN THE MIDDLE EAST

June 4 to 16, 1994
Orlando, Florida

Saturday, June 4, 1994

6:00 p.m.	Ice Breaker and Opening Remarks
	-Official welcome
	-Introduction of attendees
	-Introduction, overview, agenda, and norms for the course
8:00 p.m.	Dinner and Reception

Sunday, June 5, 1994

8:00 - 8:45	Introduction and Welcome:
	-Introductions of each participant and trainer
	-Introduction to the day's activities and the overall course
8:45 - 9:30	Introduction to Topic 1:
	Integrated Resources Management (IRM), A Broad Overview
	Panel discussion including all trainers
9:30 - 10:15	Small Group Breakout: Issues, Problems, Opportunities, and Challenges faced by participants in their working environment
10:15 - 10:30	Break
10:30 - 11:45	Reports from Small Groups
11:45 - 1:15	Lunch

1:15 - 2:00	Content Material and Process Used to Develop and Implement the IRM Master Plan (lecturette)
2:00 - 2:15	Break
2:15 - 4:00	Initial Introduction to Participant's Individual Project -Introduction and overview -Group discussion on possible topic areas -Assign task to participants to prepare proposals for individual projects (in pairs)
4:00 - 4:30	Wrap Up and Review of Day's Activities

Monday, June 6, 1994

8:00 - 8:30	Introduction and Overview of Day's Activities
8:30 - 9:15	Introduction to Topic 2: Forecasting Water Demand and Supply (Part 1 is Forecasting Demand and Part 2 is Forecasting Supply) (lecturette)
9:15 - 9:45	Empirical Approaches to Forecasting Demand (demonstration)
9:45 - 10:00	Break
10:00 - 10:15	Small Group Task
10:15 - 11:30	Small Group Session: Case Studies and Data Sets Relating to Demand Forecasting: Hands-on Applications
11:30 - 12:00	Reports on Small Group Activity
12:00 - 1:30	Lunch
1:30 - 2:00	Issues and Concerns in Forecasting Water Supply (lecturette)
2:00 - 2:45	Full Group Activity: Review and Discussion of the Limitations and Problems in Acquiring Data in Forecasting Water Supply
2:45 - 3:00	Break
3:00 - 3:30	Forecasting Water Supply (case study)
3:30 - 4:15	Small Group Session: Challenges and Opportunities to Solving the Case Study's Supply Problems

4:15 - 4:45	Reports on the Small Group Activity
4:45 - 5:15	Wrap Up and Review of the Day's Activities
7:00 - 9:00	Evening Session: 5-10 minute informal sessions to listen to and discuss individual participant's responsibilities, issues, and ideas that he brings to the course

Tuesday, June 7, 1994

8:00 - 8:30	Introduction and Overview of the Day's Activities
8:30 - 10:00	Reports by Participants on Individual Projects
10:00 - 10:15	Break
10:15 - 10:30	Introduction to Topic 3: · Competing Uses of Water: Agriculture, Industrial, Municipal, and Environmental (lecturette)
10:30 - 11:00	Tools and Approaches Used to Shift Water to Higher Value Uses (lecturette)
11:00 - 12:00	Full group discussion on Irrigation and the Environment: Impact and Assessment
12:00 - 1:30	Lunch
1:30 - 2:30	Competing Demands for Water—Agricultural, Industrial, Municipal and Environmental (role playing exercise)
2:30 - 3:15	Full Group Activity and Lecturette: Options for Improving Water Use
3:15 - 3:30	Break
3:30 - 4:00	Full Group Activity and Lecturette: Institutional Structures for Balanced Water Management
4:00 - 4:30	Wrap Up and Review of the Day's Activities
7:00 - 9:30	Evening Session: Continuation of previous evening's informal session on participant's responsibilities, issues, and concerns that he brings to the course

Wednesday, June 8, 1994

8:00 - 8:30	Introduction and Overview of the Day's Activities
8:30 - 9:00	Introduction to Topic 4: Balancing Water Quality and Water Use: the Relationship to IRM (lecturette)
9:00 - 9:45	Small Group Exercise: Implications of Deteriorating Water Quality and the Benefits of Maintaining Water Quality
9:45 - 10:15	Reports from Small Groups
10:15 - 10:30	Break
10:30 - 11:00	Maintaining Water Quality (case study presentation)
11:00 - 12:00	Small Group Exercise: Providing Practical Solutions to the Problems Presented in the Case Study
12:00 - 1:30	Lunch
1:30 - 2:00	Small Group Exercise (continued)
2:00 - 2:30	Reports from Small Groups
2:30 - 2:45	Break
2:45 - 4:00	Special Session and Slide Presentation on Water Reuse Around the World
4:00 - 5:00	Full Group Discussion: Water Reuse (question and answer session)
5:00 - 5:30	Wrap Up and Review of the Day's Activities

Thursday, June 9, 1994

8:00 - 8:30	Introduction and Overview of the Day's Activities
8:30 - 9:30	Special Session on Feedback from Last Year's Conference on Wastewater and Modelling Reuse
9:30 - 10:30	Individual Participants' Projects (progress report)
10:30 - 10:45	Break

10:45 - 12:00	Introduction to Topic 5:
	Pricing - Efficiency, Distribution of Wealth and Cost Recovery in Water Pricing (3 Separate Lecturettes)
12:00 - 1:30	Lunch
1:30 - 2:30	Cost Recovery: Paying for Water Systems (full group activity)
2:30 - 2:45	Break
2:45 - 4:30	Assessing Individual Modules in Support of Various Projects Including a Discussion and Critique of Benefit/Cost Analysis, Demand Forecasting, Supply Forecasting, and Wastewater Reuse Analysis
4:30 - 5:00	Wrap Up and Review of the Day's Activities

Friday, June 10, 1994 - Day Off - No Sessions

Saturday, June 11, 1994 - Optional Field Trip

Sunday, June 12, 1994

8:00 - 8:30	Introduction and Overview of the Day's Activities
8:30 - 9:30	Emergency Response Planning in Water Systems (lecturette)
9:30 - 10:30	Small Group Activity: Emergency Response Planning—Responding to Various Scenarios and Crises: How Do We Respond and What Are Some Appropriate Responses?
10:30 - 10:45	Break
10:45 - 11:45	Reports from Small Groups
11:45 - 1:15	Lunch
1:15 - 1:45	Introduction to Topic 6:
	Operations and Maintenance (O&M) of Water Systems (lecturette)
1:45 - 3:15	Three Case Studies of O&M: Irrigation, Water Supply, and Wastewater
3:15 - 3:30	Break

3:30 - 4:30	Discussion and Questions and Answers Regarding Individual O&M Case Studies
4:30 - 5:00	Wrap Up and Review of the Day's Activities

Monday, June 13, 1994

7:00 - 3:00	Field Trip to Identified O&M Sites: Up to three separate sectors may be visited displaying very different O&M systems. (Participants may choose which trip they plan to attend.)
3:00 - 5:00	Free Time for Preparation of Individual Projects

Tuesday, June 14 and Wednesday, June 15, 1994

8:00 - 8:15	Introduction and Overview of the Day's Activities
8:15 - 10:15	Report Outs of Participants' Presentations
10:15 - 10:30	Break
10:30 - 12:00	Report Outs of Participants' Presentations
12:00 - 1:30	Lunch
1:30 - 3:15	Report Outs of Participants' Presentations
3:15 - 3:30	Break
3:30 - 4:30	Report Outs of Participants' Presentations
4:30 - 5:00	Wrap Up and Review of the Day's Activities

Thursday, June 16, 1994

8:00 - 10:00	Wrap Up and Review of the Two-Week Course: Full Group Participation-Discussion and Review of Lessons Learned and Experiences Shared
10:00 - 10:15	Break
10:15 - 11:30	Continuation of Wrap Up
11:30 - 12:00	Good Bye and Good Luck! Conference adjourns at noon.

Appendix B

BIODATA OF COURSE PARTICIPANTS AND TRAINERS

LIST OF PARTICIPANTS

EGYPTIAN

Name:	**HUSSEIN ELWAN**
Title/Position:	General Director for Water Distribution
Organization:	Ministry of Public Works and Water Resources
Work Address:	(MPWWR) Embaba, Giza, Egypt
Telephone:	312-3879
Fax:	312-33879
Education:	Civil Engineering
Home Address:	[redacted]
Telephone:	[redacted]
Major Professional Experiences:	Calibration of irrigation structures, physical model studies, water management

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ISRAELI

Name:	**YAIR LEVERTOV**
Title/Position:	Manager Director
Organization:	Israel Water Works Association
Work Address:	8 Shaul Hamelech Blvd., Tel Aviv, Israel
Telephone:	03-695-6138
Fax:	03-695-0530
Education:	B.A., Economics and Management
Home Address:	[redacted]
Telephone:	[redacted]
Major Professional Experiences:	Regional Water Supply Organization Manager

Name:	**ISRAEL MANTEL**
Title/Position:	Manager of the Central District
Organization:	Mekorot Water Company
Work Address:	P.O. Box 56, Ramle 72100, Israel
Telephone:	972-8-27-1550
Fax:	972-8-225-685
Education:	B.Sc., Agriculture, Hebrew University of Jerusalem; M.Sc., Sanitary Sc., Technion, Haifa
Home Address:	[redacted]
Telephone:	[redacted]
Major Professional Experiences:	Water quality treatment, operation and maintenance of water supply systems

Name:	**DAVID SADAN**
Title/Position:	Soil and Water Field Service of the Negev
Organization:	Ministry of Agriculture, Extension Service
Work Address:	Ber-Sheva, P.O. Box 5088-84150
Telephone:	972-7-235-721/206
Fax:	972-7-236-537
Education:	B.Sc., Agronomy, 1976 Agriculture Faculty, Rehovot M.Sc., Biology, 1982 Science Faculty, Ben-Guron University, Ber-Sheva
Home Address:	
Telephone:	
Major Professional Experiences:	Irrigation of field crops, salinity and sodicity hazards in agriculture

JORDANIAN

Name:	**SA'AD AL-BAKRI**
Title/Position:	Director of O&M for the Capital
Organization:	Ministry of Water and Irrigation (Water Authority)
Work Address:	P.O. Box 2412, Amman, Jordan
Telephone:	685-576
Fax:	689-143
Education:	B.S., Civil Engineering
Home Address:	[redacted]
Telephone:	[redacted]
Major Professional Experiences:	Operations and Maintenance

Name:	**EDWARD QUNQAR**
Title/Position:	Project Coordinator
Organization:	Ministry of Water and Irrigation
Work Address:	Ministry of Water and Irrigation
Telephone:	680-100/680-300, ext. 358
Fax:	680-871
Education:	B.Sc., Geology and Hydrogeology
Home Address :	[redacted]
Major Professional Experiences:	Hydrogeology, water resources planning and use of solar energy in water production

Name:	**KHALID AH SHEYYAB**
Title/Position:	Director of Planning/Developing and Information
Organization:	Ministry of Water and Irrigation
Work Address:	Amman, Jordan
Telephone:	680-100
Fax:	680-871
Education:	B.C. and M.S., Engineering
Home Address:	
Telephone:	[redacted]
Major Professional Experiences:	Water, oil, and gas exploration engineering

Name:	**EHSAN SOUSA**
Title/Position:	Head of Water Network Design Section
Organization:	Water Authority
Work Address:	P.O. Box 2412, Amman, Jordan
Telephone:	680-100
Fax:	689-143
Education:	M.S., Civil Engineering and B.Sc., Mechanical Engineering
Home Address:	[redacted]
Telephone:	
Major Professional Experiences:	Water network and pumping design

OMANI

Name:	**ANJAB MOHAMED ALI SAJWANI**
Title/Position:	Acting Director General for Regional Affairs
Organization:	Ministry of Water Resources
Work Address:	P.O. Box 130 Mutrah, postal code 114 Oman
Telephone:	(968) 788-850
Fax:	(968) 707-985 or (968) 714-113 (personal)
Education:	B.S., Engineering (1982), M.B.A. (1988)
Home Address:	[redacted]
Major Professional Experiences:	Organizational/administrative management, development project management

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PALESTINIAN

Name:	**TAWFIQ ARAFEH**
Title/Position:	City Engineer
Organization:	Hebron Municipality
Work Address:	King Abdullah St., Hebron, West Bank
Telephone:	972-2-928-450 and 972-2-928-121
Fax:	972-2-928-293
Education:	B.Sc., Civil Engineering, 1974, and several courses in different subjects
Home Address:	[redacted]
Telephone:	[redacted]
Major Professional Experiences:	City planning infrastructure projects

Name:	**ABDELKARIM AS'AD**
Title/Position:	General Manager
Organization:	Jerusalem Water Undertaking (JWU)
Work Address:	P.O. Box 337, Ramallah, West Bank
Telephone:	956-551
Fax:	956-555
Education:	B.S., Business Administration
Home Address :	[redacted]
Telephone:	[redacted]
Major Professional Experiences:	Personnel management, cost accounting, and accounting techniques

Name:	**MAHER GHNAIM**
Title/Position:	Engineering Expert
Organization:	P.L.O. Department of Economic Affairs and Planning
Work Address:	P.O. Box 45, City Al Mahrajan 1082, Tunis, Tunisia
Telephone:	216-1-86404
Fax:	216-1-787174
Education:	B.Sc., Civil Engineering, courses in irrigation engineering, sanitation
Home Telephone:	[redacted]
Major Professional Experiences:	Projects management, structural engineering water issues

Name:	**JAWAD A.Q. SHAHEEN**
Title/Position:	Water Department General Manager
Organization:	Nablus Municipality
Work Address:	Nablus, West Bank
Telephone:	972-9-375-260
Fax:	972-9-374-690
Education:	B.Sc., Engineering, 1971
Home Address:	[redacted]
Telephone:	[redacted]
Major Professional Experiences:	Planning and supervising water project of Nablus Municipality; four years as water engineer for Water Dept., West Bank; 11 years as manager of O&M and water council, manage water supply authority, Jordan; 15 as years general manager of Water Dept., Nablus Municipality

Name:	**HAZIM F. TARAZI**
Title/Position:	Chief Engineer
Organization:	Gaza Municipality
Work Address:	P.O. Box 16, Gaza
Telephone:	972-7-860-084
Fax:	972-7-866-331
Education:	B.Sc., Civil Engineering, Cairo University 1972; M.Sc., Purdue University, 1975
Home Address:	[redacted]
Telephone:	[redacted]
Major Professional Experiences:	Director of technical department in Gaza Municipality, which has seven divisions (engineering, water, sewage, electricity, town planning, survey, and parks divisions)

Name:	**MUNIF R. TRAISH**
Title/Position:	City Engineer
Organization:	Al-Bireh Municipality
Work Address:	P.O. Box 506
Telephone:	972-2-95-4737
Fax:	972-2-95-4431
Education:	B.Sc., Civil Engineering, North Carolina State University
Home Address:	[redacted]
Telephone:	[redacted]
Major Professional Experiences:	Chief engineer and director of engineering and maintenance, urban planning, wastewater management, road maintenance, and traffic engineering

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MOROCCAN

Name:	**SALAH BELMATRIK**
Title/Position:	Chief of Planning and Management Water Office
Organization:	Public Works Ministry/Admin. De l'Hydraulique
Work Address:	Rue Hassan Ben Chekroun Rabat/Agdal Morocco
Telephone:	212-777-8690
Education:	Engineer-Civil Engineering (Morocco), Hydrology Engineer and Water Management (France)
Home Address:	[redacted]
Telephone:	[redacted]
Major Professional Experiences:	Mathematical modelization of Errachidia Basin, Morocco

BRIEF PROFILES OF COURSE TRAINERS

Name:	**Rick Albani**
Occupation:	Management Consultant to Water Supply and Environmental Industries
Business Address:	Wade Miller Associates 1911 N. Fort Myer Drive Arlington, VA 22209
Contact Numbers:	Telephone 703-524-1888 Fax 703-524-1453
Education:	B.S., Civil Engineering, University of Connecticut M.A., Public Administration, University of Hartford
Experience:	Rick Albani has more than 20 years of management and organization, planning, administrative, civil engineering, and rate design experience in the water and wastewater industries. His areas of expertise include integrated resources planning, conservation and demand management programs, emergency response planning and providing assistance in developing engineering and economic solutions to problems facing small water and wastewater systems.

Name:	**Herbert H. Fullerton**
Occupation:	University Professor/Researcher
Home Address:	
Contact Numbers:	Telephone (office) 801-797-2324 Fax 801-797-2701 Telephone (home) 801-752-8434
Education:	Ph.D., Economics, Iowa State University M.S., B.S., Agricultural Economics, Utah State University
Experience:	His professional work has emphasized the design, conduct, and administration of water and land-related research. Studies have focused on economic issues that arise in the use, management, and development of resources. In developing countries, his work includes water service

pricing and project cost recovery, design and assessment of agricultural production research, resource-based agricultural sector analysis, regional and water resource planning, training in policy and project analysis, and economic feasibility studies.

Name:	**Lee Jennings**
Occupation:	Senior Trainer
Business Address:	Training Resources Group 909 N. Washington Street Suite 305 Alexandria, VA 22314
Contact Number:	703-548-3535 703-836-2415
Education:	M.A. Columbia University, Adult Education, 1968 B.A. College of Wooster, Ohio, Political Science & History, 1962
Experience:	Lee provides training and facilitation services and technical assistance, in English and French, and has worked in over 40 developing countries throughout the Middle East, Africa, Asia and the Caribbean. He is an experienced management development specialist with expertise in technical training course facilitation, training needs assessments, training of trainers courses, management consulting and coaching, strategic and project planning initiatives, project start-up workshops and team planning meetings. His develpment work began in Tunisia as a Peace Corps Volunteer in 1962-64.

Name:	**Mac McKee**
Occupation:	University Professor
Business Address:	Department of Environmental Resources Engineering Humboldt State University Arcata, CA 95521
Contact Numbers:	Telephone 707-826-3184 or 707-826-3619 Fax 707-826-3616
Education:	Ph.D., Civil and Environmental Engineering, Utah State University, 1984
Experience:	Teaching of undergraduate and graduate courses in fluid mechanics, hydraulics, numerical methods, hydrology, water resources planning and management; consulting experience in integrated river basin planning and management (India), flood control (Philippines), irrigation and drainage construction (Sri Lanka), and wastewater treatment and reuse planning (Mideast).

Name:	**Daniel A. Okun**
Occupation:	Professor of Environmental Engineering (retired) and Consulting Engineer
Business Address:	University of North Carolina CB 8060 Chapel Hill, NC 27599
Contact Number:	Telephone 919-966-4898 Fax 919-966-7646
Education:	B.S., Civil Engineering, Cooper Union M.S., Civil Engineering, Cal Tech Sc.D., Sanitary Engineering, Harvard University
Experience:	Teaching and consulting in the United States and abroad for more than 50 years on all aspects of water supply and sanitation. Specialty is water reclamation and nonpotable reuse as an approach to meeting urban water supply problems.

Name:	**James M. Wolf**
Occupation:	Agricultural Engineer
Business Address:	Development Alternatives, Inc. 4811 Chippendale, #701 Sacramento, CA 95841
Contact Number:	Telephone 916-344-5345 Fax 916-344-1611
Education:	Ph.D., Cornell University, Agricultural Engineering (soil and water), 1975 M.S., University of California at Davis, Water Science and Engineering, 1967 B.S., Cornell University, Agronomy, 1962
Experience:	He has worked on irrigation system siting and feasibility studies, design of water management research programs, and operations and maintenance programs for irrigation institutions. His particular interest is in gaining more agricultural productivity from existing irrigation investments. He has held resident assignments in Brazil, Pakistan, and Venezuela and has led or been a member of short-term consulting teams in Latin America, Asia, and Africa. This experience has led to a sensitivity to those factors, human and managerial as well as engineering, that are necessary for more extensive use of irrigation systems.

Appendix C

COURSE MANUAL CONTENTS

COURSE MANUAL
TABLE OF CONTENTS

Purpose of the Training Manual

I. Participant Team Projects

II. Topic 1: Integrated Resources Management
- A. Developing an Effective Strategy for Implementing Integrated Resource Planning in a Water Utility
- B. Planning Approaches

III. Topic 2: Forecasting Water Demand and Supply
- A. Synopsis on Water Demand Models
- B. Peak Period Design Standards for Small Western U.S. Water Supply Systems
- C. Forecasting Agricultural Demand for Water: Irrigation Water Requirements
- D. Forecasting Environmental Demands
- E. Forecasting Water Supply
- F. A Short List of Water Supply Models and Modeling Approaches
- G. A Conjunctive Use Irrigation Problem: The Helga River Irrigation District
- H. An Example Irrigation Planning Problem

IV. Topic 3: Balancing Competing Uses of Water: Agricultural, Industrial, Municipal, and Environmental
- A. Hydrologic Cycle and Competition for Water Use: Agricultural, Industrial, Municipal, and Environmental
- B. Shifting Water to Higher Values
- C. Dominance of Agriculture
- D. Ways to Judge Efficiency of Water Use
- E. Options for Improving Water Use in Agriculture
- F. Water Use Impacts and the Environment
- G. References

V. Topic 4: Balancing Increasing Demand for Water with the Need to Maintain Water Quality
- A. Synopsis
- B. Water Quality/Water Use/Wastewater Treatment Tradeoffs on the Subarnarekha River Basin
- C. A Users Manual for WAWTTAR
- D. Water Quality Management Options
- E. Realizing the Benefits of Water Reuse in Developing Countries

F. A Water and Sanitation Strategy for the Developing World
G. The Role of Reclamation and Reuse in Addressing Community Water Needs in Israel and the West Bank

VI. Topic 5: Water Pricing: Efficiency, Income Distribution, and Cost Recovery
A. Pricing and Cost Recovery on Water Projects
B. Water Irrigation Cost Recovery and Pricing in Multipurpose Projects
C. Calculating the Price of Water
D. Benefit-Cost Module

VII. Topic 6: Operation and Maintenance of Water Systems
A. A Dozen Questions to Assess Viability
B. Emergency Planning/Short-Term Response Planning
C. Sample Sanitary Survey

VIII. Topic 7: Institutional Considerations
A. Capacity Building for Water Resources Management

IX. Daily Notes

X. Project Reports

Appendix D

ABSTRACTS OF PARTICIPANTS' PROJECTS

ABSTRACTS OF PARTICIPANTS' PROJECTS

I. The Analysis of Two Major Alternatives for the Second Stage of the Dan Region Wastewater Reclamation Project

Prepared by Yair Levertov and Israel Mantel of Israel

This paper begins with a brief description of the Dan Region Wastewater Reclamation Project and then discusses the two alternative approaches for the second stage. For each alternative, considerations are discussed that relate to quality issues, hydrological conditions, surface store reservoirs, economic factors, and environmental concerns.

II. Changes in Vegetable Import Policy and in the Salinity of Dan Region Reclamation Project and Their Impact on Crops Grown in the Negev

Prepared by David Sadan of Israel's Soil and Water Field Service of the Negev

This paper raises some "unresolved questions" and "preliminary preferred solutions" to prevent the increase of salinity in the reclaimed water coming from the Dan Region Reclamation Project and to minimize salinity hazards from new citrus crops. An appendix contains information on the present status of soils, farms, quality of irrigation water, and crops in the Western Negev. Eight "penny-worth" recommendations are proposed at the end of the five-page paper.

III. Falaj Inventory Project

Presented by Anjab Mohamed Ali Sajwani of Oman

The purpose of the Falaj Inventory Project is to survey and catalog the aflaj (traditional means of water supply and irrigation in most of Oman; Falaj is singular and Aflaj is plural) throughout the Sultanate of Oman. This inventory is needed in order to establish a database for informed decision making for supporting and conserving the aflaj. Three objectives are sought by this project:

1. To confirm the existence of each falaj and its condition
2. To establish the location of its source(s)
3. To help the Ministry of Water Resources (MWR) give the falaj as much protection as possible

The components of the inventory include:

- Falaj Registration
- Falaj Database and Catalog
- Falaj Inventory

- Falaj Identification

The recommendation is that the MWR should proceed with a complete inventory of aflaj in Oman and that in order to facilitate this happening, a detailed proposal for the project should be developed within the Ministry, followed by the preparation of a project document that will address detailed socioeconomic, technical, and financial issues.

IV. Upgrading and Rehabilitation of Nablus and Hebron Water Projects

Presented by Jawad A. Q. Shaheen, Maher Ghnaim, and Tawfiq Arafeh of the West Bank and Gaza

The purpose of this study is to raise the capability of the water projects of both cities so as to fulfill the water demand with optimum efficiency and the lowest possible cost. The study includes a brief description of the present situation and the population and water demand forecasts for both cities. The conclusion is that there is a shortage of water and a high percentage of unaccounted-for water in both cities. The recommendation is to develop a master plan for upgrading and rehabilitating the water networks and to seek new sources of water so as to meet the demand for both cities. It is also recommended that a training program be developed to improve the managerial status of the two municipal water departments by raising the efficiency of the employees.

V. Water Costs: A Study Based on the Experience of the Jerusalem Water Undertaking (JWU) in Supplying the Ramallah/Eibireh Region since 1964

Prepared by Abdelkarim As'ad, General Manager of Jerusalem Water Undertaking, Ramallah, West Bank

This study provides the basis for a well-developed system of cost control with four major aims in mind:

1. Determination of Unit Water Cost for pricing purposes
2. Development of annual and periodic budgets for cost control purposes
3. Implementation of the outcome of this study by the Palestinian Water Authority during the transitional period after Israeli occupation
4. Reducing costs by implementing new techniques, substituting materials and services

The paper includes an analysis of JWU's expenses and revenues in 1993 and prices recommended for cost recovery. The recommendations are that the JWU take immediate action to raise the efficiency of its activities in order to reduce unit cost by:

- Developing more water resources so as to decrease the high cost of purchased water

- Preparing a schedule for replacing deteriorated networks so as to decrease the quantity of leakages that currently amount to 23 percent

Finally, the paper proposes that new water prices be set by JWU for 1994 based on several stated considerations.

VI. Restructuring of Water Sector Institutions in the West Bank and Gaza

Prepared by Munif R. Treish, Al Bireh Municipality; Hazim F. Tarazi, Gaza Municipality, and Abdelkarim As'ad, Jerusalem Water Undertaking

The objective of this project is to suggest a new organizational structure to replace the existing fragmented and low efficient performance of the water sector in Gaza and the West Bank. A four-step approach is proposed:

1. Survey the existing institutions dealing with water issues.
2. Identify and analyze the political, economic, social, and environmental deficiencies in existing institutions.
3. Set up strategies and guidelines to help in the restructuring process.
4. Develop a model for the future institutions based on IRM on both the regulatory and service delivery functions within the water sector.

The paper describes the current situation and proposes institutional frameworks for both the immediate transition period and the future under a completely independent Palestinian state.

VII. Artificial Water Recharge

Presented by Khalid Ah Sheyyab and Edward Qunqar of Jordan with the assistance of Salah Belmatrik of Morocco

This project examines the feasibility of artificial water recharge as an approach for collecting and conserving water resources in water-scarce countries such as Jordan and Morocco. Information is provided on the existing water situation of the Azraq Basin in Jordan and the Tinjdad Aquifer in Morocco. The recommendation for the former is that a monitoring network be established so as to collect enough data to be used for modeling purposes and to know more about the future behavior of the aquifer and its yield in the case of artificial recharge. The recommendation for the latter is to plan a project for building small retention dams and canals so that surface water from the Atlas mountains can be captured and transported to recharging sites in the Tinjdad area, which is located between the High and Middle Atlas Mountains in southeastern Morocco.

VIII. Requirements for Wastewater Treatment Plant: Upgrading and Use of Reclaimed Water for the City of Gaza

Presented by Hazim Tarazi of Gaza

This project provides background on the wastewater, irrigation, public health, and water quality problems of the city of Gaza. It describes three potential technical improvements and proposes three actions for institutional development. After brief descriptions of the technical alternatives and the analyses, the recommendation is that careful estimates of capital and operations and maintenance costs must be obtained for all appropriate long term wastewater treatment alternatives.

IX. Unaccounted-for Water

Prepared by Ehsan Sousa and Sa'ad Al-Bakri of Jordan

This project focuses on the factors that cause the high percentage of unaccounted-for water (UAFW) in Jordan. It examines the reasons for UAFW, the effect on cost and revenue, and also proposes solutions to reduce the UAFW. The study looks particularly at the domestic and industrial sectors. Eight solutions are proposed along with a recommended action for each solution.

Appendix E

OVERALL EVALUATION RESULTS

OVERALL RESULTS

FINAL EVALUATION FORM

RATING SCALE:

1	2	3	4	5
Not Achieved	Barely Achieved	Somewhat Achieved	Fairly Well Achieved	Well Achieved

NOTE: Actual number of responses are shown in parentheses ( ).

I. OVERALL COURSE OBJECTIVES:

1. Learn new skills in analyzing the factors necessary for the effective allocation of water resources.

AVG: 4.125 1 2 3 **(4)** 4 **(6)** 5 **(6)**

2. Plan how to use the new skills to the back-home situation.

AVG: 3.875 1 2 **(1)** 3 **(4)** 4 **(7)** 5 **(4)**

II. KEY SESSIONS AND TOPICS:

1. Opening Session (Welcome Remarks, Get-Acquainted Exercises, Expectations, Objectives, Agenda, and Norms). (Lee)

AVG: 4.813 1 2 3 4 **(3)** 5 **(13)**

2. Opening Panel Discussion on Integrated Resources Management. (Rick, Dan, Mac, Jim, and Herb)

AVG: 4.188 1 2 3 4 **(13)** 5 **(3)**

3. Topic 1: Integrated Resources Management. (Rick)

AVG: 4.267	1	2	3 **(1)**	4 **(9)**	5 **(5)**

4. Topic 2: Forecasting Water Demand and Supply. (Herb and Mac)

AVG: 4.200	1	2	3 **(3)**	4 **(6)**	5 **(6)**

5. Topic 3: Balancing Competing Uses of Water (Agriculture, Industrial, Municipal, and Environmental). (Jim and Herb)

AVG: 4.313	1	2	3 **(2)**	4 **(7)**	5 **(7)**

6. City of St. Petersburg Water Management Issues in West Florida. (Pattie Anderson)

AVG: 4.267	1	2	3 **(2)**	4 **(7)**	5 **(6)**

7. Topic 4: Balancing Increasing Demand for Water with the Need to Maintain Water Quality. (Mac and Dan)

AVG: 4.438	1	2 **(1)**	3	4 **(6)**	5 **(9)**

8. Special Slide Presentation on Water Reuse Around the World. (Dan)

AVG: 4.563	1	2	3 **(1)**	4 **(5)**	5 **(10)**

9. Field Trip to Apricot Project of the City of Altamonte Springs.

AVG: 4.692	1	2	3	4 **(4)**	5 **(9)**

10. Topic 5: Water Pricing (Efficiency, Income Distribution, and Cost Recovery). (Herb and Jim)

AVG: 3.625	1 **(1)**	2 **(1)**	3 **(5)**	4 **(5)**	5 **(4)**

11. Topic 6: Operation and Maintenance of Water Systems. (Rick)

AVG: 4.286	1	2	3	4 **(10)**	5 **(4)**

12. Topic 7: Emergency Response Planning. (Rick)

AVG: 4.286	1	2	3 **(1)**	4 **(8)**	5 **(5)**

13. Field Trip to Disney World's Water Systems. (Mickey)

AVG: 4.333	1	2	3 **(1)**	4 **(8)**	5 **(6)**

14. Panel on Institutional Arrangements for Water Management in Central Florida. (Presentation by four speakers)

AVG: 3.666	1	2	3 **(6)**	4 **(8)**	5 **(1)**

15. Presentation on Customer Involvement. (Rick)

AVG: 4.313	1	2	3 **(2)**	4 **(7)**	5 **(7)**

16. Usefulness of Having Individual/Team Projects.

AVG: 4.188	1	2	3 **(4)**	4 **(5)**	5 **(7)**

17. Videos on Various Topics.

AVG: 3.750	1	2	3 **(8)**	4 **(4)**	5 **(4)**

18. Wrap-Up/Overall Course Review, Including Planning for Back-Home Application.

(Lee)

AVG: 4.625	1	2	3	4 **(6)**	5 **(10)**

III. <u>OTHER ASPECTS:</u>

1. Sheraton Orlando North Hotel, Palm Room and Computer Practice Rooms.

AVG: 4.065	1	2 **(1)**	3 **(2)**	4 **(8)**	5 **(5)**

2. Sheraton Orlando North Hotel's Rooms and Service for Participants.

AVG: 3.750	1	2 (1)	3 (5)	4 (7)	5 (3)

3. Transportation for Lunch Breaks and Optional Evening Activities.

AVG: 4.500	1	2 (1)	3 (1)	4 (3)	5 (11)

4. Optional Field Trip to Orange County, Conserve II Project

AVG: 4.500	1	2	3	4 (5)	5 (5)

5. Overall Appreciation of Course Staff.

AVG: 4.875	1	2	3	4 (2)	5 (14)

6. Appreciation of Individual Staff:

a. Rick Albani

AVG: 4.375	1	2	3 (1)	4 (8)	5 (7)

b. Herb Fullerton

AVG: 3.813	1	2	3 (3)	4 (5)	5 (8)

c. Lee Jennings

AVG: 4.750	1	2	3	4 (4)	5 (12)

d. Mac McKee

AVG: 4.813	1	2	3	4 (3)	5 (13)

e. Dan Okun

AVG: 4.500	1	2	3	4 (8)	5 (8)

f. Jim Wolf

AVG: 4.188	1	2	3 (3)	4 (7)	5 (6)

7. Secretarial/Logistic Support from CDM/Orlando, Daily Notes.

AVG: 4.313	1	2	3 (3)	4 (5)	5 (8)

8. Contents of Training Manual Prepared for the Course.

AVG: 4.250	1	2	3 (3)	4 (6)	5 (7)

9. Introduction to Uses of Computers and Software. (Mac)

AVG: 4.563	1	2	3	4 (7)	5 (9)

IV. COMMENTS/SUGGESTIONS:

1. What was the major advantage of this course for you and your work?

- Learning that team work in analyzing problems results in better solutions.
- Developing our knowledge and experience.
- Learning more about reclaimed water and reuse.
- Learning new skills in analyzing the factors that affect the water allocation among different sectors of water use.
- As an expert in old-age, learning how knowledge was transferred on students in such an excellent way in such a short time.
- Learning some new methods in many aspects, as well as using new technology (computers) in analyzing practical problems.
- The major advantage was to learn new methods in management and apply what was learned in different projects, if at all possible.
- Introducing the computer skills.
- Meeting colleagues from neighboring countries.
- Water reclamation techniques.
- The main advantage was reorganizing issues in my mind.
- How to use water in a sustainable manner, planning management and the environment.
- Teamwork, experience gained and reuse of water.

- Increasing my knowledge in planning and analyzing encountered problems.
- Learning how to use water in a sustainable way and how to manage and plan water projects.
- Analyzing the factors for water allocation.
- Experience gained from staff and participants on management of water resources and water treatment.

2. Specific comments/suggestions for improving team projects.

- It is better if the team projects were announced to prepare better information to benefit them.
- More time and more integration between different participants.
- More time is needed and early announcements are essential.
- Team project studies need to start earlier.
- More time is needed for computer exercises.
- The team projects should be based on actual and solid data.
- Practical steps and their approach on having to design the work of doing the project.
- More team work.

3. What suggestions do you have for planning and organizing future courses?

- Inform participants at least two weeks ahead.
- More field trips should be organized.
- Weekends should be free for everyone.
- Have a larger training room.
- The period of course should be longer.
- More practical work should be exercised within the group work.
- Inform ahead of time (i.e., as soon as the list of nominees for training is completed).
- Concentrate mainly on urban water planning and management.
- Supply a wordprocesser more efficient for foreign students (with correction of phrase mistakes and spelling).

- Some of the subjects that were addressed at this workshop need their own workshops, e.g. (1) Operations and Maintenance, (2) Supply and Demand in regions that suffer from lack of water.
- Practical subjects should be given more time.
- More practical methods and applications, including field trips in different areas.
- More attention should be given for shared aquifier and the methods to improve it.
- More practical topics (including field trips) in operation and maintenance of water supply systems and wastewater treatment plants.
- The participants must be given the same fields (irrigation groups, water domestic groups, etc.)
- More field trips are needed.
- Practical solutions to problems.
- Participants should be informed well in advance about the course topics and data they may want to bring with them.
- Specify Middle East water problems—all topics should be related to those problems.
- More practical concentration of solving problems like water policy/strategy and controlling/monitoring the water resources.
- One should be able to write topics suggested in the area of water resources.
- Site of building should be near shopping centers.
- Course time should be more days and less working hours.
- To give more time for practical cases and problems.
- To give more time for reading the distributed material.
- Give more time for preparing reports.
- Decreasing the daily working hours and lectures.

ISPAN
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December 1, 1994

Dear Colleague,

The enclosed report highlights the results of a two week training course called *Integrated Planning for Sustainable Use of Water in the Middle East* that was designed and conducted by ISPAN in June, 1994. The course was sponsored by the U.S. Agency for International Development (USAID), under the auspices of the Middle East Peace Process Multilateral Working Group on Water Resources.

The *Integrated Planning* training course was the first of fourteen courses designed to address critical Middle East water resources issues and topics. The fourteen recommended courses were identified during a joint U.S. State Department/European Commission training needs assessment carried out in the Middle East in August, 1993. The ISPAN human resources development program manager was one of the three team members who met with senior Israeli, Palestinian, Jordanian and Egyptian water resources experts and developed the priority training plan.

A number of international donors are now planning to conduct twelve additional courses in the next year. The Canadians and Japanese are each planning to conduct a course before the end of this year.

The *Integrated Planning* course trainers and facilitator included Rick Albani (Vista Consulting Group, Inc.), Herbert Fullerton (Utah State University), Lee Jennings (Training Resources Group), Mac McKee (Humboldt State University), Daniel Okun (University of North Carolina Emeritus), and Jim Wolf (Development Alternatives, Inc.). Sixteen senior level water managers from the Middle East participated in the course, including six Palestinians, three Israelis, four Jordanians, one Egyptian, one Omani and one Moroccan. The course was held in Orlando, Florida.

The central theme of the course was Integrated Resources Management, a systematic approach to decision making that involves problem identification, goal setting, and various analytical techniques. The course focused on environmental, economic, social, and engineering concerns related to water use and allocation at both the national (urban and rural) and municipal levels in the Middle East.

I hope you find the enclosed training course report useful. Please let me know if you have any questions.

Sincerely,

Kathy Alison

Kathy Alison
Human Resources Development Program Manager

P.S. For your information, the ISPAN project will end as of 31 December 1994.