

Environmental Management of the Iraqi Marshlands

ESTs FOR DRINKING WATER PROVISION

TRAINER'S HANDBOOK



**UNITED NATIONS ENVIRONMENT PROGRAMME
DIVISION OF TECHNOLOGY, INDUSTRY AND ECONOMICS
INTERNATIONAL ENVIRONMENTAL TECHNOLOGY CENTRE
UNEP-DTIE-IETC**

With the cooperation of

Global Environment Centre Foundation

**Training Kit
ESTs FOR DRINKING WATER PROVISION**

This training kit responds to the following need:

The improvement and protection of public health in the Iraqi Marshlands through the application of Environmentally Sound Technologies (ESTs) particularly for Drinking Water Provision

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SUPPORT FOR ENVIRONMENTAL MANAGEMENT OF THE IRAQI MARSHLANDS

A. Overview of the Iraqi Marshlands and their environmental priorities

The Iraqi Marshlands constitute the largest wetland ecosystem in the Middle East, with considerable environmental and socio-cultural significance. Recent assessments of environmental conditions in Iraq, as reported by UNEP and the UN/World Bank Needs Assessment Initiative for the Reconstruction of Iraq, have identified the destruction of the Iraqi Marshlands as one of the major environmental and humanitarian disasters facing Iraq (United Nations and World Bank, 2003). Critical problems and associated priority needs for the Iraqi Marshlands identified by the Iraqi authorities and the UN assessments include, among others, the following:

Marshland degradation: While the re-flooding of dried areas started in 2003, only 20 to 30 per cent of the original area has been re-inundated to date, with varying degrees of ecosystem recovery. Marsh water is contaminated with pesticides, salts, and untreated industrial discharges and sewage from upstream. Haphazard breaching of embankments has also resulted in contaminated water stagnating in some areas, impacting the recovery of both vegetation and fish. Water quality and marshland management is an urgent priority to protect human health and livelihoods, and to preserve biodiversity and the ecosystems.

Lack of drinking water: The 2003 UN/World Bank Needs Assessment and a public health survey by the US Agency for International Development (US AID) found that the provision of safe drinking water is the critical priority for the residents of the Iraqi Marshlands (United Nations, 2003). While some residents are able to purchase tanker water, many, particularly those living within the marshes, currently obtain drinking water directly from the marshes without treatment (US AID, 2004).

Lack of sanitation: Assessments found that most settlements lack basic sanitation systems, and wastewater is often drained through open channels to the nearest stream or to the street. The presence of human waste in the streets was noted in 50 per cent of villages in the region. Outbreaks of water-borne diseases are prevalent. The provision of wastewater treatment services is therefore a critical necessity for protecting the public health. In addition, the return of displaced persons to the marshland area continues to place an increasing burden on the provision of drinking water and sanitation.

The Iraqi authorities have recognized the above issues as priorities, and have submitted the following as project priorities, among others, to the Donor Conference: Management of Biodiversity in the al Hwaize Marshland (Project number 706), Provision of Treatment Units for Water and Sanitation (Project numbers 592 and 594), and Training Programme Development (Project number 704).

The need for immediate environmental relief in the Iraqi Marshlands was also raised as a priority by the high-level Iraqi delegation to Japan. In December 2003, Prime Minister Koizumi was requested in person to prioritize marshland management and restoration by a visiting Iraqi dignitary. In March 2004, the Iraqi Minister of Environment met with the Japanese Foreign Minister and Environment Minister and, again, requested that Japan prioritize support for marshland management and restoration. **Specifically, the Iraqi Minister of Environment requested assistance in the improvement of water quality, as well as in the provision of technologies, equipment, and training.** To respond to such requests, the Government of Japan

made contributions to the UN Iraq Trust Fund, and earmarked funds for this project. In addition, within the UN Iraq Trust Fund framework, the need for coordination of activities and strategy formulation for longer-term marshland management has been identified.

B. Project goal and components

Owing to the uniqueness of the Iraqi Marshlands ecosystem and its socio-cultural heritage, the technical and programmatic responses needed to address the above priorities may be quite different from those most appropriate for other settings. Also, an underlying factor that hinders the response is the limited capacities of, and availability of credible information for, policy makers, experts, and communities to assess and implement solutions. Given these observations, the goal of this project is to support the sustainable management and restoration of the Iraqi Marshlands by facilitating strategy formulation, monitoring and analysing current conditions, raising capacities for policy and technical management, and implementing environmentally sound technology (EST) options on a pilot basis. This project is an integrated package of five component activities, as follows:

- **Component 1: Support for strategy development and coordination**
This component facilitates strategy development for marshland management by analysing the current policy and institutional frameworks, and by providing initial support to assess the integration of environmental dimensions into the national marshland management coordination mechanism. Stakeholder and donor coordination activities also are supported.
- **Component 2: Data collection and baseline analysis**
This component addresses the need to establish a baseline for the marshland environment, and to collect and analyse the data needed to determine the potential intervention options required to meet the immediate needs for water, sanitation, and marshland management.
- **Component 3: Capacity building**
This component addresses the need to raise the capacity of Iraqi decision-makers in government and communities to develop and implement a policy and strategy framework for marshland management, as well as technical options for immediate mitigation of critical concerns.
- **Component 4: Pilot implementation**
This component addresses the need to identify suitable options, and provides support for the pilot implementation of such options in drinking water, sanitation, and marshland management.
- **Component 5: Awareness raising and follow-up**
This component addresses the need to raise awareness of marshland conditions, and the efforts to manage and restore this critical ecosystem. These issues are described in more detail in the project approach section below.

UNEP experiences relevant to the project, as well as indications of UNEP's implementation capacity, are summarized below:

- **Promotion of environmentally sound technologies (ESTs):** UNEP, through the International Environmental Technology Centre (IETC) of the Division of Technology, Industry, and Economics (DTIE), has provided technical and policy expertise for applications of ESTs in water and wastewater management and wetland management in developing countries. IETC has also supported related capacity-building activities, and provides guidance for decision-makers on appropriate policies and strategies (UNEP IETC, 2004). The Division has directly implemented over 1,000 cleaner technology assessments and demonstrations in 24 developing countries (UNEP DTIE, 2004).

- **Assessments of the Iraqi Marshlands:** Assessments carried out by UNEP have catalogued the degradation of the Iraqi Marshlands for several years, and alerted the international community to its potential destruction. UNEP has been the lead agency in monitoring and reporting on the recovery of the Marshlands (UNEP, 2001 and 2003).
- **Post-conflict assessments:** UNEP has provided environmental assistance to post-conflict countries since the late 1990s by investigating the environmental impacts of conflicts and pre-existing conditions, supporting decision-making, and initiating follow-up action. Locations of post-conflict operations include Afghanistan, Albania, Bosnia and Herzegovina, Kosovo, Liberia, and the Occupied Palestinian Territories (UNEP PCAU, 2004).

UNEP also has the experience and mandate to coordinate policy dialogue so as to ensure that environmental issues are adequately addressed within the scope of problems that encompass both environmental and non-environmental dimensions. Further, given the special constraints on local implementation in Iraq, additional measures taken to ensure the implementation of the Iraqi Marshlands project include the following:

- Establishment of a Project Implementation Unit (PIU) to be anchored within the Ministry of Environment, to provide technical support, to liaise with national and governorate institutions, and to oversee the project at the local level
- Employment of a national project coordinator, to operate out of the PIU
- Building the capacity of Iraqi experts and decision-makers first, and utilizing that capacity for implementation during the second stage of the project
- Contracting with UNOPS for assistance in local implementation, monitoring, and evaluation
- Coordination within Cluster 5 to evaluate the development and use of a common implementation framework
- Coordination with other UN agencies operating in Southern Iraq to carry out pilot projects in complementary and mutually beneficial locations, and to employ their local staff and contractors for implementation assistance on an as-needed basis.

C. Project approach

This project is an integrated package of five components, and specific activities under each component are summarized in the logical framework. The following section provides some key additional information on the linkages among specific activities.

Component 1: Support for strategy development and coordination

The development of a marshland management plan is a long-term process that encompasses various disciplines and perspectives, including transboundary resource allocation, agriculture, industry, food production, land use, socio-cultural heritage, and displaced persons, as well as environmental issues. Formulating such a plan will require individual strategy formulation and coordination within the above areas, consensus building, allocation of substantial resources, political will, and considerable institutional capacity.¹

Nevertheless, there is a current need to strengthen the coordination mechanism, and to provide environmentally sound input and objective analysis. There is also an urgent need to find and apply suitable options for immediate environmental relief, and to build the necessary capacity in Iraq for longer-term environmental management. This project aims to initiate this process by addressing such needs through various activities within this component.

UNEP is in the process of submitting another proposal that focuses on coordination, building upon the results and insights generated from this component. This additional proposal, which is in the UN Iraq Trust Fund pipeline, will support the development of the national, regional, and international strategies and action plans for marshland restoration, utilizing the practical knowledge and capacity from this project as building blocks. Discussions on activities to be undertaken within the next proposal are underway with the relevant Iraqi authorities.

Activities to be undertaken within this component include the following:

- **PIU establishment:** The project will establish the Project Implementation Unit (PIU) within the Ministry of Environment, and provide support to strengthen the institutional capacity of the ministry to address marshland management, and to establish an anchor for this project within Iraq. The PIU will, among other tasks, facilitate dialogue among various line ministries and stakeholders for the coordination of marshland activities, and provide implementation support.
- **Survey of policy and institutional frameworks:** The project will conduct a survey to assess the current policy and institutional frameworks for marshland management, and identify the roles and responsibilities of stakeholders. The clarification of the framework will articulate the decision-making process and actors, and help identify areas where priority actions and support may be needed by the national government and donors.
- **Roundtable organization:** Among UN organizations there is a need for a coordinated response for sound marshland management. To address this need, UNEP organized a Roundtable on Marshland initiatives during 2004 with Iraqi ministries and stakeholders, relevant clusters, and bilateral project personnel. Held in Amman, the Roundtable discussed the current status of various initiatives, both environmental and otherwise, that are taking place in/for the Iraqi Marshlands, and supported the dialogue for management plan development.
- **Support for environmental integration:** UNEP will provide support for assessments that aim to ensure that environmental dimensions are adequately reflected into the ongoing management strategy formulation within the country. Such support is intended to provide objective counter-analyses that are based on sound environmental science and policy perspectives.
- **Donor coordination:** As there are other bilaterally supported initiatives underway for marshland restoration and management, coordination of international activities is important to find and exploit synergies and avoid duplication. (See the section on specific assessments for further detail.) Such coordination has already been initiated, beginning with a meeting in early 2004 sponsored by the Italian government. UNEP participated in this meeting. Additional meetings will be organized regularly, with US AID sponsoring one in mid-2004. UNEP plans to host a further such meeting, scheduled for early 2005, to be confirmed upon full consultation with other organizations.
- **Post-phase needs assessment and strategies:** At the end of this project phase, results and observations will be used to formulate a report that identifies areas where further strengthening of institutional and policy frameworks may be warranted. In addition, the results of the pilot project will be used to develop a strategy for the wider implementation of suitable options for the provision of water supplies, sanitation and marshland management. This strategy will include a listing of priority areas and their current conditions, data on specific applications, current institutional capacities and identified needs, and recommended policies and strategies to support longer-term applications. This strategy will be submitted as a component of the marshland management plan.

Activities to be undertaken within this project cannot be put on hold until the master plan is developed, as immediate relief is needed as soon as possible. UNEP will ensure that this project will not jeopardize the intended objectives and outcomes of a longer-term management plan. UNEP will also ensure that project activities, particularly the pilot implementation activities, are in locations and conducted under operating conditions that will not be impacted by future re-flooding that may be stipulated in the longer-term marshland management plan.

Component 2: Data collection and baseline analysis

This component will focus on the collection of necessary data to establish the baseline conditions of the Iraqi Marshlands.

- **Data and analysis:** The following data collection and analysis will be carried out: analysis of ongoing hydrologic data and biodiversity assessments; water quality sampling and assessment; and monitoring and reporting of re-flooding and ecological changes using satellite imagery. The baseline data will be used to determine the patterns of re-flooding, community locations and changes in size, water quality and water availability for residents, and impacts on biodiversity. For example, various bilateral initiatives have undertaken hydrological assessments, developed models, and analysed scenarios for re-flooding. In addition, biodiversity assessments are being carried out to establish the geographical distributions of plant and animal species, and threatened areas. Such information will be collected and analysed to help identify areas where targeted actions by this project may be warranted. If needed, this analysis may be supplemented with small scale assessments of targeted areas. Based on these data, a water-quality sampling protocol will be established. Sampling and analysis will then be carried out to determine the extent of water contamination in various communities and locales. Such data will be used to determine suitable options and locations for the pilot project, as described in more detail under component 4. Monitoring and reporting on re-flooding will generate regular reports on changes within the Marshlands. Equipment will be provided to the line ministry to support remote sensing and GIS applications, so that the monitoring data on re-flooding will be available for analysis inside the country.
- **Marshland Information Network establishment:** The project will establish a web-based Marshland Information Network (MIN), which will: provide stakeholders with a forum to share information; provide a common point of access to tools for technical assessments and management; and facilitate the identification of solutions and the development of common strategies and partnerships among stakeholders. The system will be available in Arabic and English. The establishment of the MIN is expected to address the barrier of limited availability and sharing of environmental and social information regarding the Marshlands identified during UNEP's discussions with relevant Iraqi ministries. The system will use the EST Information System (ESTIS) framework, developed by UNEP IETC (UNEP IETC, 2003). ESTIS is one of the only information systems in the world with multilanguage compatibility, and is already utilized by various developing countries' agencies and organizations.
- **MIN node establishment:** To facilitate the active engagement of stakeholders at the local level, in data sharing, and monitoring, the project will provide equipment and support to establish MIN nodes at the PIU, and within relevant southern governorates.

Component 3: Capacity building

Identifying and implementing technical and policy responses for sustainable marshland management requires capacity. This project will provide capacity-building opportunities in multiple areas that are deemed necessary to develop a cross-cutting response to sustainable

marshland management. Such capacity building will be carried out in policy and institutional development, technical capability, and data management and analysis areas.

In addition, study tours will be conducted to provide opportunities to examine at first hand the following two areas: community-level actions and capacity-building activities, and EST applications. Given the current security concerns, these training activities will be carried out outside Iraq, in the region and elsewhere. Individual participants will be selected from key government agencies, governorates, and communities. Criteria for the selection of participants will be developed and used to identify suitable candidates. Institutional agreements and arrangements with employers will be negotiated, so that trained experts will be assigned to take part in the actual implementation and management of the pilot projects.

- **Policy and institutional development:** Sound environmental management of marshlands, including EST applications, must be based on an integrated water resource management (IWRM) approach. The relevant Iraqi authorities and decision-makers in communities and NGOs currently have limited understanding of this approach, and the formulation of practical policies and strategies to operationalize IWRM in the Iraqi context. Initiatives for marshland management must be anchored in the local communities. To address this need, capacity building will be conducted within the communities on the following topics: water quality management; wetland management; community-level initiatives; and IWRM policy integration. Thirty placements per topic will be made available to line ministries, communities, NGOs, and other organizations, resulting in a total of 120 training placements.
- **Technical training:** Identification, implementation, and management of EST options to provide water, sanitation, and marshland water quality management require specific skills in four key areas: ESTs for drinking water provision; phytotechnologies for wetland management (i.e. the use of plants and vegetation to manage wetland conditions and water quality – constructed wetlands being a prime example); sustainable sanitation options; and EST assessment methodology and implementation. A training curriculum and training materials will be developed for each area, based on the best current knowledge in the field and drawing, where appropriate, on existing UNEP and other products. For each skills area, a team of 30 technical experts will be selected to undergo this specialized training, resulting in a total of 120 training placements. For both policy- and technical-oriented training, the training curriculum will have a train-the-trainer component, and will supply materials to enable the trained experts to carry out site-specific training of local teams and communities at the pilot sites. Follow-up training on the above subjects will be supported.
- **Study tours:** Two study tours are planned within this project. The first study tour will provide opportunities to see and evaluate the integration of capacity building programmes into policy-making and community-level actions, while the second study tour will provide opportunities to visit and evaluate ongoing EST implementation projects.
- **Data management and analysis training:** Training on MIN utilization will be provided. The MIN system will be used to disseminate regular reports of satellite and remote sensing data on marshland re-floodings and their subsequent ecological changes. A training programme on remote sensing data analysis will also be conducted.
- **Support for local training:** Support will be provided to local organizations that provide training on wetland management, technical response, and community initiatives within Iraq. The aim of this support is to ensure the localization and ownership of training activities to educate a larger number of citizens and communities on the practical options for wetland management. The scope of support

and selection criteria will be established upon consultation by the PIU with relevant local communities.

Component 4: Pilot implementation

The project will identify suitable options for marshland management and for the provision of water supply and sanitation on a pilot scale. Technical options that are considered to be environmentally sound; i.e. environmentally sound technologies (EST), will be the focus of such implementations. ESTs are defined in Chapter 34 of Agenda 21 as technologies that: protect the environment; are less polluting; use resources in a more sustainable manner; recycle more of their wastes and by-products; and handle residual wastes in a more acceptable manner than the technologies for which they substitute (United Nations, 1992). ESTs go beyond individual technologies, and encompass total systems that include the technical know-how, operational procedures, and organizational and managerial procedures. The need to facilitate EST transfer and accessibility, and to build capacity for EST deployment and use, particularly in developing countries, is clearly set out in Agenda 21. ESTs cover a wide spectrum and many can be described as ‘low-tech’ or appropriate technologies that may be widely used in developing countries. ESTs that are suitable for developing countries tend to have low energy intensities, require less maintenance, create increased employment, are culturally acceptable, and often cost less to acquire and operate.

For example, constructed wetlands have been used to treat wastewater before direct discharge, or as part of a more comprehensive treatment process.² Sustainable sanitation, such as urine separation, enables faster and more efficient recovery of nutrients for agricultural applications, with lower risks of diseases and contamination. Grass plots have been used to process human wastes in communities with relatively low wastewater volumes that possess the necessary areas, with highly impermeable soils, for treatment. Figure 1 shows a range of appropriate ESTs. Many of these ESTs could be used effectively in rural areas, such as the Iraqi Marshlands. During the pilot phase of this project, UNEP will identify two or three ESTs for implementation. The selection criteria and strategy are described in the Project Approach section below.

The pilot-scale implementation of ESTs will focus on three areas of application: drinking water provision, sanitation provision, and wetland water quality management. At least three communities will be chosen for pilot projects within each application area. For each community site, up to three suitable EST options will be identified, and one or two will be implemented. The selection of candidate sites for the EST pilot projects will be carried out by the PIU, in consultation with the line ministry, other relevant ministries, and stakeholders, reflecting domestic priorities. The baseline data to be collected under component 2 will be used for the feasibility analysis. The site selection criteria to ensure sustainability include the following:

- Demonstrated need for interventions
- Size of the community
- Probability of re-flooding, and physical and population stability
- Access and security for implementation and monitoring
- Likelihood of replicability and wider application (i.e. how typical are the geographic, population, social, lifestyle, and environmental characteristics? How relevant is the experience at a particular site to other communities?)
- Availability of basic materials, energy, and physical space for technology installation
- Level of community willingness to participate
- Existence of water collection and wastewater discharge systems
- Linkage with ongoing initiatives for synergy and collaboration

Once the candidate sites and EST options have been identified, UNEP will convene a meeting during 2005 with Iraqi and international stakeholders to present and discuss the planned activities, and ensure that they are compatible with the ongoing planning of marshland restoration activities.

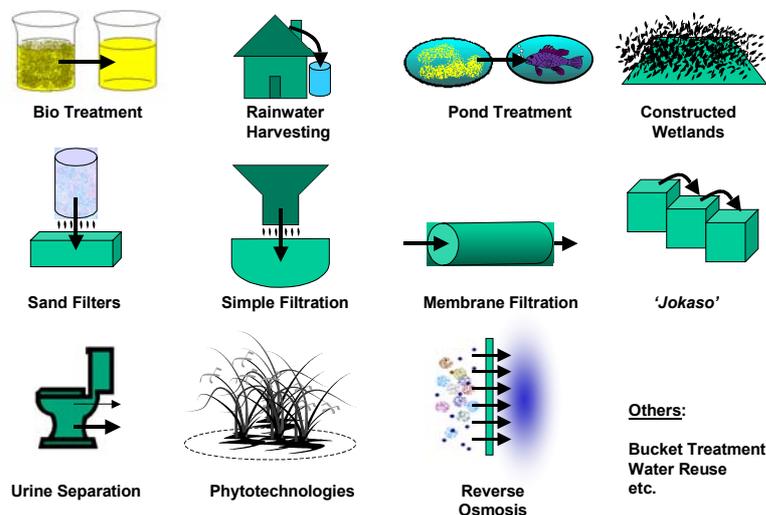


Figure 1: Examples of Environmentally Sound Technologies

The actual pilot implementation is expected to commence during 2005, and will be coordinated by the PIU with guidance from UNEP and UNOPS. Hands-on training will be provided for on-site pilot teams on pilot installations, operations, and maintenance.

The protocol for pilot project assessment and evaluation will be developed and utilized to assess the suitability of the EST options from various angles, including performance, environmental impact, community acceptance, maintenance, and ease of operation. Finally, a monitoring mechanism will be put into place to continue the operation and maintenance of the pilot project technologies, to be coordinated by the PIU.

Component 5: Awareness raising and follow-up

UNEP’s experiences show that the long-term success of pilot applications – and thus the sustainability of the outputs and results of a project – requires the involvement of, and ownership by, the communities. UNEP’s experience further shows that awareness-raising activities are key to ensuring such involvement. Therefore, this project will undertake information dissemination and outreach programmes to inform and involve communities in EST applications. In addition, UNEP believes that broad public understanding of the issues confronting the Iraqi Marshlands and of the programmatic responses to date is critical in two areas: securing further international support for wetlands activities, and securing support within Iraq for moving beyond the pilot stage to broader implementation. Therefore, public relations materials will be prepared and media coverage solicited. Further, two public meetings will be organized to discuss the state of the Iraqi Marshlands and the restoration and management efforts. In these efforts, the project team will develop and disseminate information utilizing a wide variety of media (including audio-visual materials, reports, brochures, and the internet), adapted appropriately to key audiences.

UNEP also expects to consult with stakeholders in the development of a proposal for a second phase of this project. The second phase, which must be demand driven, will build upon the first-phase pilot projects, the lessons learned, and focus on wider implementation. UNEP would seek to mobilize additional international technical cooperation resources for such a second phase.

Development goal and key immediate objectives

The development goal of this project is to support the sustainable management and restoration of the Iraqi Marshlands, with the following immediate objectives:

- To monitor and assess baseline characteristics of the marshland conditions, to provide objective and up-to-date information, and to disseminate tools needed for assessment and management.
- To build the capacity of Iraqi decision-makers and community representatives in the area of marshland management, including: policy and institutional development, technical capability, and analysis.
- To identify EST options that are suitable for the immediate provision of drinking water and sanitation services, as well as wetland management, and to implement them on a pilot basis.
- To identify the needs for additional strategy formulation and coordination for the development of a longer-term marshland management plan based on the results of the pilot project and cross-sectoral dialogue.

The project is expected to raise the basic capacity of communities, institutions, and key personnel in technical and policy aspects of water quality and wetland management. Utilizing such expertise, suitable EST options will be identified and implemented on a pilot basis to meet the urgent need for water and sanitation in a number of marshland communities. Based on these activities, a strategy for the wider application of technical options for marshland management will be developed. The strategy, as well as relevant expertise and knowledge, will provide valuable input for the eventual development of a master plan for the Iraqi Marshlands, and its subsequent implementation by domestic institutions.

Outputs and key activities

Outputs:

- Establishment of a Project Implementation Unit within the Ministry of Environment to address marshland management.
- Implementation of a satellite-based observation system for marshland monitoring and generation of regular real-time reports.
- Establishment of the Marshland Information Network, adequately equipped and with trained users.
- Publication of training materials on wetland management, water quality management, technical analysis and assessment methodologies, available in English and Arabic.
- Establishment of a cadre of trained decision-makers, experts, and community leaders with on-the-ground experience in technical implementation and the policy and institutional aspects of wetland management.
- Pilot implementation of demonstration projects for drinking water supply, sanitation, and wetland management (totalling US\$3 million, plus monitoring and evaluation costs), for the immediate relief of marshland communities.
- Publication of reports on suitable technological options for wider implementation, and analysis of policy and institutional needs to support longer-term management plan development.
- Dissemination of awareness-raising materials on the Marshlands.

Key Activities:

- **Support for strategy development and coordination:** Establishment of the Project Implementation Unit within the Ministry of Environment. Implementation of a policy and institutional survey to establish the current status of marshland management. Organization of a Roundtable on Marshland initiatives with UN clusters, bilateral donors, and Iraqi counterparts, to share information on ongoing activities and establish collaboration and coordination between donors and Iraqi counterparts. Hosting of one donor coordination meeting. Assessment of policy and institutional strengthening for marshland management based on the project results and observations, as a contribution to the development of a longer-term management plan.
- **Data collection and baseline analysis:** Development of a satellite-based marshland observation system to monitor and report on re-flooding and ecological changes. Water sampling, and provision of support for hydrological and biodiversity assessments. Creation of the Marshland Information Network to provide access to data on marshland management activities (in Arabic and English), and establishment of a regional information network with nodes in the southern governorates and at the PIU for information exchange and project monitoring. Equipping of the network and nodes with equipment and providing appropriate training to staff and users.
- **Capacity building:** Provision of training to decision-makers and community leaders on: policy and institutional development, technical capability, and data management and analysis. Study tours of EST implementation sites, and integration of capacity-building initiatives into policy and community action. Support of local training initiatives.
- **Pilot implementation:** On-site training of local teams. Implementation of EST feasibility analysis, selection and assessment to develop a portfolio of candidate options by organizing a meeting with stakeholders. Implementation of suitable ESTs on a pilot scale (including investments of up to US\$3 million), and utilization of trained experts for project implementation. Provision of operations and maintenance support.
- **Awareness raising and follow-up:** Distribution of information materials to raise awareness on the state of Marshlands and the restoration initiatives. Provision of support to community-level initiatives for awareness raising, convening of public meetings, and provision of assistance in developing the second phase of the project, upon request.

¹ The master plan development tends to be a long-term process that requires consultations and consensus among various stakeholders. While it may include urgently needed actions, development of such a master plan is generally time consuming. For example, the management plan for the Florida Everglades in the United States took approximately 6 years to develop, and entails actions for the next 20 years with budget of US\$8 billion for implementation (Comprehensive Everglades Restoration Plan, 2004). On a smaller scale, the master plan development for Lake Biwa, the largest freshwater lake in Japan, took over 10 years to reach consensus, and entails actions by various stakeholders. For this plan, the coordination and government engagement alone costs approximately US\$1 million per year, not including the costs of the actual lake management measures (Shiga Prefecture, 2000).

² Constructed wetlands are an example of phytotechnology, which is the use of vegetation for environmental benefits such as water quality improvement, remediation of degraded ecosystems, enhancement of biodiversity, improvement of agricultural production, and bioenergy generation. In addition to environmental benefits, its applications can have developmental benefits, providing alternative sources of fuel, forage, and shelter.

BACKGROUND

The Iraqi Marshlands constitute the largest wetland ecosystem in the Middle East, with environmental and socio-cultural significance. Recent assessments of environmental conditions in Iraq, as reported by UNEP and the UN/World Bank Needs Assessment Initiative for the Reconstruction of Iraq, have identified the destruction of the Iraqi Marshlands as one of the major environmental and humanitarian disasters facing Iraq (United Nations and World Bank, 2003). Lack of safe drinking water is one of the major problems that the residents of the Iraqi Marshlands face.

While some residents are able to purchase tanker water, many, particularly those living within the marshes, currently obtain drinking water directly from the marshes without treatment. Outbreaks of water-borne diseases are prevalent. The provision of drinking water services is therefore a critical necessity for public health protection. In addition, the return of displaced persons to the marshland area continues to place an increasing burden on the provision of drinking water and sanitation.

It is therefore important to build the capacity of decision-makers, experts, and community leaders on safe drinking water provision by utilizing environmentally sound technologies (ESTs). This training is aimed to provide such a capacity-building opportunity, focusing on technical implementation, policy-making, and institutional set-ups for the improvement of drinking water provision.

The overall objective of this module is for the student “to enhance the protection of public health through the application of ESTs for drinking water provision in the Iraqi Marshlands”.

To achieve this overall objective, the following particular objectives are to be met:

1. To increase the importance and benefits of applying ESTs for drinking water provision for public health protection of inhabitants of the Iraqi Marshlands;
2. To enhance the knowledge and information on water treatment technologies, drinking-water quality control and prevention of water-borne diseases in order to find appropriate solutions;
3. To encourage the adoption, application, and operation of sustainable drinking water treatment technologies for the Iraqi Marshlands;
4. To establish a sustainable operation and maintenance framework for the water treatment facilities and distribution methods.

Environmental Management of the Iraqi Marshlands – Training Kit Series

1. Environmental Management of the Iraqi Marshlands: Water Quality Management
2. Environmental Management of the Iraqi Marshlands: Sustainable Sanitation
3. Environmental Management of the Iraqi Marshlands: Phytotechnology for Wetland Management
4. Environmental Management of the Iraqi Marshlands: Wetland Remote Sensing
5. Environmental Management of the Iraqi Marshlands: EST Assessment Methodology and Implementation
6. Environmental Management of the Iraqi Marshlands: Marshland Information Network
7. Environmental Management of the Iraqi Marshlands: IWRM Policy Integration
8. Environmental Management of the Iraqi Marshlands: ESTs for Drinking Water Provision
9. Environmental Management of the Iraqi Marshlands: Wetland Management.
10. Environmental Management of the Iraqi Marshlands: Community Level Initiative

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CHAPTER I

OVERVIEW OF WATER SUPPLY: FOCUSING ON DRINKING WATER SAFETY

A Objectives

As it is said that "the 21st century is a century of water", there has been increasing global attention focused on resolving water problems that are especially serious in developing countries.

It is easy to say that assistance and cooperation might be provided using developed countries' abundant experiences, however in reality they are not always classified well enough for utilization in developing countries from both technical and legal points of view.

This lecture explains what kind of policies, technologies, and legal frameworks in developed countries can be applied and utilized in developing countries, especially rural areas, and also Japan's abundant experiences in tackling various water problems for its own modernization.

The objectives of the course are to:

- Present an overview of historical aspects, objectives and development of public water supply systems, setting national guidelines, and current issues in water supply in Japan;
- Present global issues in water sector;
- Present an overview of WHO drinking water guidelines and their application to developed countries and developing countries.

B Learning outcomes

At the end of this course participants are expected to be able to:

- Grasp the essentials of Japan's experiences in developing its water supply;
- Grasp global problems in the water sector;
- Recognize the issues to be studied/investigated specific to Iraqi conditions;
- Consider which concepts and technologies in the global water sector should be applied in Iraq.

C Development of the lecture

The course will be presented in three parts, starting with a brief introduction to the general situation of water supply in the world, to be followed by a discussion on the relationship between water and health, with regard to WHO drinking water guidelines. Concepts used in the development of those guidelines are explained so the participant can relate this to national drinking water standards. In the second part, development of the water supply in Japan is explained, beginning with the introduction of modern water supply systems in the Meiji era. The current status and issues being faced by the water supply sector in Japan are explained. In the final part, a discussion on water supply development plans and national standards will be conducted to improve understanding of the first two parts of the lecture. The lectures on the status of the water supply sector in Iraq by the Municipality and Public Works and the current activities of UNICEF in the marshlands area will have informed and updated the knowledge of participants for the discussion.

1 Water and health – WHO drinking-water guidelines and national guidelines (90 min)

1.1 Objectives

To briefly introduce the general situation of water supply in the world and to discuss the relationship between water and health with regard to the WHO Drinking Water Guidelines, and then to elucidate the underlying concepts of developing those guidelines.

1.2 Methods

Lecture using slide presentation.

1.3 Materials

Lecture notes.

2 Overview of development of water supply in Japan (120 min)

2.1 Objectives

To introduce technical and legal developments in the water sector of Japan.

2.2 Methods

Lecture using slide presentation.

2.3 Materials

Lecture notes and video on water supply during the post-war period.

3 Water supply development plan and national standards (60 min)

3.1 Objectives

Discussion between the lecturer and participants on future plans and national standards for the water sector in Iraq.

3.2 Methods

Lecture using slide presentation and discussion.

3.3 Materials

Lecture notes.

E Materials

Lecture notes, PowerPoint presentation, video.

F Summary

Title:	Overview of water supply: focusing on drinking water safety
Delivery Method:	Lecture, PowerPoint presentation
Training Technique:	Discussion, examples
Total Duration:	4 hours 30 min
Chapter in the Participant's Handbook:	1

CHAPTER II

WATER QUALITY AND CONTROL FOR WATER TREATMENT

A Objectives

Water supply development contributes enormously to improving sanitary conditions and preventing water-borne diseases. Water quality control is very important for the supply of safe drinking water.

The Water Works Bureau of Osaka Municipal Government has systematic water quality control and a monitoring system from water sources to taps. This water quality control system and the development in sewage works improved the quality of water sources and drinking water in Osaka.

The objectives of the course are to:

- Present the purpose and description of water quality control;
- Present water quality control processes in line with water quality standards;
- Present the disinfection process in water purification plants in Osaka;
- Present the change in quality of water sources and drinking water itself and discuss water quality control of pilot projects for drinking water provision in the Iraqi Marshlands.

B Learning outcomes

At the end of this course participants are expected to be able to:

- Grasp the essentials of water quality control;
- Recognize the issues to be studied/investigated specific to Iraqi conditions;
- Consider their application in pilot projects for drinking water provision in the Iraqi Marshlands.

C Development of the lecture

The course will be presented in three parts. Firstly the purpose of water quality control and disinfection is explained. Secondly the activities to protect water quality at source, in the purification process, in the distribution process, and at the tap are presented. The policies and programmes to promote the activities are also introduced. Finally, water quality control in pilot projects for drinking water provision in the Iraqi Marshlands is discussed between the lecturer and participants.

1 Overview of water quality control (45 min)

1.1 Objectives

To introduce the purpose of water quality control and disinfection in water supply.

1.2 Methods

Lecture using slide presentation.

1.3 Materials

Lecture notes.

2 Policy and activities of water quality control (50 min)

2.1 Objectives

To introduce the actual activities for controlling water quality from water resource to taps, policies of water quality control, and the integration of prefectures and municipalities for more effective water quality control in Biwa-Lake and Yodo River Basin.

2.2 Methods

Lecture using slide presentation.

2.3 Materials

Lecture notes.

3 Discussion – water quality control for pilot projects (55 min)

3.1 Objectives

To discuss what kind of activities and policies are required for water supply schemes in the Iraqi Marshlands.

3.2 Methods

Lecture using slide presentation and discussion.

3.3 Materials

Lecture notes.

D Materials

Lecture notes, PowerPoint presentation.

E Summary

Title:	Water quality and control for water treatment
Delivery Method:	Lecture, PowerPoint presentation
Training Technique:	Discussion, examples
Total Duration:	2 hours 30 min
Chapter in the Participant's Handbook:	2

CHAPTER III

OPERATION AND MAINTENANCE OF WATER DISTRIBUTION NETWORK FOR URBAN WATER SUPPLY

A Objectives

For an urban water supply system like that of Osaka City, the operation and maintenance of the water distribution system is very important. Leakage control is especially important from the financial point of view.

The water supply system in Osaka has 5,000km of distribution mains, 50,800 sluice valves, and 5,200 air valves, etc. A centralized control system using telemetry circuits is indispensable in an urban water supply for emergency management as well as daily management.

The objectives of the course are to:

- Present an overview of leakage control in Osaka;
- Present an overview of the maintenance system in Osaka;
- Present the emergency system for water distribution in Osaka.

B Learning outcomes

At the end of this course participants are expected to be able to:

- Grasp the essentials of the operation and maintenance of urban water distribution;
- Recognize the issues to be studied/investigated specific to Iraqi conditions;
- Consider which concepts should be applied in pilot projects for drinking water provision in the Iraqi Marshlands.

C Development of the lecture

The course will be presented in three parts. Firstly the history and overview of leakage control in Osaka are introduced. The change in leakage rate and comparison of leakage control costs and costs of leakage losses are explained. Secondly the framework for the maintenance of distribution networks is explained as well as actual activities. Finally the policy and plan of earthquake preparedness and its monitoring system are explained.

1 Overview of leakage control (30 min)

1.1 Objectives

To introduce leakage control activities, changes in leakage rate, comparison of leakage control costs and costs of leakage losses, and pipeline information systems.

1.2 Methods

Lecture using slide presentation.

1.3 Materials

Lecture notes.

2 Framework for maintenance of distribution networks (30 min)

2.1 Objectives

To introduce normal and emergency operation, line patrols, and equipment and repair parts' preparation.

2.2 Methods

Lecture using slides presentation.

2.3 Materials

Lecture notes.

3 Emergency system – Earthquake preparedness (30 min)

3.1 Objectives

To introduce the policy and manuals for the case of large-scale damage by an earthquake.

3.2 Methods

Lecture using slide presentation and discussion.

3.3 Materials

Lecture notes.

D Materials

Lecture notes, PowerPoint presentation.

E Summary

Title:	Operation and maintenance of water distribution network for urban water supply
Delivery Method:	Lecture, PowerPoint presentation
Training Technique:	Discussion, examples
Total Duration:	1 hour 30 min
Chapter in the Participant's Handbook:	3

CHAPTER IV

DESALINATION TECHNOLOGIES FOR WATER TREATMENT

A Objectives

The concentration of salt in the surface water of the Iraqi Marshlands is too high for it to be used for drinking because of the influence of salt from dried surfaces in addition to its original high salt concentration. Therefore the selection and application of appropriate desalination technologies is very important in the planning of pilot projects for drinking water provision.

In the 1980s and early 1990s, the multistage-flush (MSF) system was widely used for water desalination, however now most newly constructed desalination facilities are reverse osmosis (RO) systems.

In this lecture the participants should obtain the knowledge to enable them to select the appropriate desalination technologies for use in the Iraqi Marshlands.

The objectives of the course are to:

- Present an overview of desalination technologies, especially RO;
- Present the design concept of water purification systems using the RO process;
- Present the important points on the operation and maintenance of an RO system.

B Learning outcomes

At the end of this course participants are expected to be able to:

- Grasp the essentials of the characteristics of desalination technologies;
- Grasp the design concepts and understand the operation and maintenance of an RO system;
- Recognize the issues to be studied/investigated specific to Iraqi conditions;
- Consider which concepts should be applied to pilot projects for drinking water provision in the Iraqi Marshlands

C Development of the lecture

The course will be presented in three parts. First, an introduction to various desalination technologies will be provided, focusing on reverse osmosis (RO) membranes for various applications including that for wastewater treatment. Trends in technology development will be highlighted. Second, the design and O&M aspects of an RO system will be introduced citing specific examples. Finally, issues related to the application of an RO system for drinking water provision in southern Iraq, including that for sites in the Iraqi Marshlands, will be discussed with the participants. **Description of a site visit to an RO plant in Japan is provided, to enable the organization of similar site visits to existing facilities in southern Iraq.**

1 Overview of desalination technologies (50 min)

1.1 Objectives

To introduce the merits and demerits of each desalination technology; the RO system should be explained in great detail.

1.2 Methods

Lecture using slide presentation.

1.3 Materials

Lecture notes.

2 Design concept and O&M of RO system (50 min)

2.1 Objectives

To introduce the design concept of an RO system and important points on O&M of RO such as measurements for fouling and cleaning.

2.2 Methods

Lecture using slide presentation.

2.3 Materials

Lecture notes.

3 Discussion – Application of RO system in Iraqi Marshlands (50 min)

3.1 Objectives

Discussion between the lecturer and participants on the application of an RO system for pilot projects for drinking water provision.

3.2 Methods

Lecture using slide presentation and discussion.

3.3 Materials

Lecture notes.

D Materials

Lecture notes, PowerPoint presentation.

E Summary

Title:	Desalination technologies for water treatment
Delivery Method:	Lecture, power point presentation
Training Technique:	Discussion, examples
Total Duration:	2 hours 30 min
Chapter in the Participant's Handbook:	4

DESCRIPTION OF SAMPLE SITE VISIT

A Objectives

An overview of desalination technology such as RO and its operation and maintenance has already been given.

Santou Municipal Government (Maibara Municipal Government) applied RO for the demineralization of drinking water in 2004 because of the hardness of its underground water resource.

The objectives of the site visit to the Water Demineralization Plant in Maibara City are as follows:

- To present an overview of the water supply in the Santo Area, Maibara City;
- To present the background of the application of the RO system in Maibara City;
- To observe the RO facility and its design concept;
- To present features of the operation and maintenance of an RO facility.

B Learning outcomes

At the end of this course participants are expected to be able to:

- Grasp the essentials of designing an RO facility for drinking water provision ;
- Understand the features of operation and maintenance for the reduction of running costs and durability of RO elements;
- Consider the application of an RO facility for drinking water provision in Iraq.

C Development of the lecture

The course will be presented in two parts. The first is an overview of the water supply in the Santo Area, Maibara City; the background of the application of an RO system; and basic information on the operation and maintenance of an RO facility.

The second part is the observation of an RO facility and learning its design concept.

1 Overview of water supply in Santo Area, Maibara City (20 min)

1.1 Objectives

To introduce water resource, water purification, and water distribution in the area.

1.2 Methods

Lecture.

1.3 Materials

Lecture notes.

2 Background of application of RO system (20 min)

2.1 Objectives

To introduce why an RO system was applied in this area.

2.2 Methods

Lecture.

2.3 Materials

Lecture notes.

3 Outline of RO Facility (20 min)

4 Observation of RO Facility (90 min)

4.1 Objectives

To observe RO Facility and layout of each piece of equipment.

4.2 Methods

Site visit and discussion.

4.3 Materials

Lecture notes.

D Materials

Lecture notes, video.

E Summary

Title:	Site visit – water demineralization facility in Maibara City, Shiga
Delivery Method:	Lecture, Video, Site visit
Training Technique:	Discussion, Site visit
Total Duration:	2 hours 30 min
Chapter in the Participant's Handbook:	4

CHAPTER V

WATER SOURCE PROTECTION – RESEARCH AND APPLICATION

A Objectives

The Biyo Centre was established in 1997 to undertake an extensive research programme with a view to improving the technology of water purification of large water resources.

The increase in sewer service rate has improved the water quality in the Lake Biwa-Yodo River Basin compared with that of the 1960s and 1970s. However the water quality has remained unchanged recently because there has been little progress in non-point source pollution in this area. The Biyo Centre places emphasis on experiments for the removal of non-point source pollution of Lake Biwa.

The objectives of this site visit are to:

- Present the change of water quality in the Lake Biwa-Yodo River Basin;
- Present various experiments to remove non-point source pollution of Lake Biwa.

B Learning outcomes

At the end of this course participants are expected to be able to:

- Grasp the essentials of various technologies to remove non-point source pollution;
- Consider their application in the Iraqi Marshlands.

C Development of the lecture

The course will be presented in two parts. First, details of basin characteristics and water use in the basin are explained. This is followed by an explanation of the historical change of water quality in the Lake Biwa-Yodo River Basin to substantiate the need for water quality preservation. The importance of non-point source control measures and the necessity for experimental data for the design of actual facilities is also explained. Secondly, the various experimental facilities to obtain design data for field applications are explained at the site.

1 Overview of Lake Biwa-Yodo River Basin (30 min)

1.1 Objectives

To introduce the basin characteristics, water use characteristics within the basin, water quality trends and the needs/measures for water quality protection.

1.2 Methods

Slide presentation.

1.3 Materials

Lecture notes/brochures.

2 Outline of experimental facilities and development of design criteria (60 min)

2.1 Objectives

To introduce experimental facilities.

2.2 Methods

Explanation at site.

2.3 Materials

Brochure.

D Materials

Lecture notes, brochure

E Summary

Title:	Water source protection – research and application
Delivery Method:	Lecture and Site visit
Training Technique:	Discussion, Site visit
Total Duration:	1 hour 30 min
Chapter in the Participant’s Handbook:	5

CHAPTER VI

INTRODUCTION TO PROJECT CYCLE MANAGEMENT (PCM) AND ITS APPLICATION

A Objectives

The PCM (Project Cycle Management) Method is a methodology for the entire cycle of a development project, i.e. from planning and implementation to evaluation, which utilizes a project format termed the Project Design Matrix (PDM). The PDM shows the essential elements of a project, such as objectives, activities, inputs, indicators etc., together with their logical interrelationships. One of the major characteristics of the PCM Method is the participation approach, which leads to effective planning incorporating the needs of the target group, enhancing ownership by the people and organizations concerned.

It is quite useful for those who are or will be involved in development projects for effective project management to understand the basic concept and methodology of PCM. Also some parts of the method, such as Stakeholders Analysis and Problems Analysis, are helpful in analysing the present situation in the target area and sharing the same information and recognition among the people concerned, while Objectives Analysis is useful for considering possible solutions to the identified problems.

The aims of the course are to:

- Present an outline of the PCM Method;
- Present how to conduct Stakeholders Analysis and identify the present situation in terms of people and organizations concerned with the project being looked at by the participants;
- Present how to conduct Problems Analysis and identify the problems in pilot project sites in the Missan, Basrah, and Thi-Qar governorates being looked at by the participants;
- Present how to conduct Objectives Analysis and identify possible solutions to problems identified in the Problems Analysis;
- Present how to conduct the Project Selection and formulation of PDM.

B Learning outcomes

At the end of this course, participants are expected to understand the essentials of the basic concept and methodology of PCM, and understand the present situation in the pilot project sites in Missan, Basrah, and Thi-Qar governorates and possible solutions to those problems. This could be demonstrated by ensuring that the participants conduct the following analyses and exchange their knowledge and views in a concise and logically consistent way:

- Stakeholders Analysis
- Problems Analysis
- Objectives Analysis

C Development of the lecture

The course will present a brief outline of the PCM Method, and a more detailed explanation of Stakeholders Analysis, Problems Analysis, and Objectives Analysis, which are three of the four analytical steps leading to formulation of the PDM. Discussion and group exercises on the current problems and possible solutions in the Iraqi Marshlands are included.

1 Introduction (60 min)

1.1 Objectives

To clarify the purpose and schedule of the PCM session, and to have the participants introduce themselves.

1.2 Methods

Explanation, self-introduction using PCM cards.

1.3 Materials

Itinerary, PCM cards, pens, boards and craft papers.

2 Outline of PCM method (60 min)

2.1 Objectives

To present an outline of PCM method to provide basic knowledge on the methodology.

2.2 Methods

Lecture.

2.3 Materials

Textbook, PowerPoint slides.

3 Stakeholders Analysis (100 min)

3.1 Objectives

To present how to conduct Stakeholders Analysis, and to have group discussions for Stakeholders Analysis, the result of which will be presented by each group.

3.2 Methods

Lecture, group discussions, presentations of the results.

3.3 Materials

Textbook, PowerPoint slides, PCM cards, pens, boards and craft papers.

4 Problems Analysis (300 min)

4.1 Objectives

To present how to conduct Problems Analysis, and to have group discussions for Problems Analysis concerning pilot project sites in Missan, Basrah, and Thi-Qar governorates, the results of which will be presented by each group.

4.2 Methods

Lecture, group discussions, presentations of the results.

4.3 Materials

Textbook, PowerPoint slides, PCM cards, pens, boards and craft papers.

5 Objectives Analysis (200 min)

5.1 Objectives

To present how to conduct Objectives Analysis, and to have group discussions for Objectives Analysis based on the problems identified in the previous session, the results of which will be presented by each group.

5.2 Methods

Lecture, group discussions, presentations of the results.

5.3 Materials

Textbook, PowerPoint slides, PCM cards, pens, boards and craft papers.

6 Project Selection, Formulation of PCM and wrap-up (90 min)

6.1 Objectives

To present how to conduct Project Selection and formulate PDM, mainly the Narrative Summary, i.e. the most essential part of the PDM. Wrap-up including Questions and Answers session is included.

6.2 Methods

Lecture.

6.3 Materials

Textbook, PowerPoint slides, PCM cards, pens, boards and craft papers.

D Materials

Textbook:

PCM – Project Cycle Management, Management Tool For Development Assistance – Participatory Planning, 6th Edition, March 2004, FASID

Others: PCM cards, pens, boards and craft papers.

E Summary

Title:	Introduction to Project Cycle Management (PCM) and its application
Delivery Method:	Lecture
Training Technique:	Group work including discussions
Total Duration:	14 hours
Chapter in the Participant's Handbook:	6

CHAPTER VII

EXPERIENCES WITH POST-EVALUATION OF WATER SUPPLY PROJECTS IN DEVELOPING COUNTRIES

A Objectives

The importance of ODA evaluation is recognized for improving a project's quality and ensuring better accountability. ODA evaluation is practised by applying Result-Based Management using DAC's five evaluation criteria (**relevance, efficiency, effectiveness, impact and sustainability**). However the evaluations for water supply projects remain qualitative results owing to undeveloped evaluation items and indicators.

From questionnaires and interviews conducted with local beneficiaries of several water projects in developing countries, various data on the current and potential water demand, the water usage pattern of residents, and the actual amount and quality of water have been supplied. As a result, the benefits of the projects were understood and quantitative evaluation indicators of **impact** and **sustainability**, which are important in water supply improvement, were established.

In this lecture, an overview of the above survey and the method of evaluation are introduced.

The objectives of the course are to:

- Present an overview of the questionnaires and the interviews with beneficiaries of several water supply projects;
- Present an overview of a newly developed evaluation method for water supply projects.

B Learning outcomes

At the end of this course participants are expected to be able to:

- Grasp the importance of surveys of residents before and after water supply projects;
- Learn the newly developed evaluation method for water supply projects and utilize its concept in planning and designing UNEP-funded pilot projects for drinking water provision in the Iraqi Marshlands.

C Development of the lecture

The course will be presented in two parts. Firstly the results of questionnaires and interviews with beneficiaries of several water supply projects are introduced. And secondly, the overview of a newly developed evaluation method for water supply projects is explained and the possibility of its application and utilization in planning and designing pilot projects for drinking water provision in the Iraqi Marshlands is discussed between the lecturer and participants.

1 Overview of questionnaires and interviews with beneficiaries of several water supply projects (60 min)

1.1 Objectives

To introduce the results of questionnaires and interviews with beneficiaries of several water supply projects, and the importance of these surveys.

1.2 Methods

Lecture using slide presentation.

1.3 Materials

Lecture notes.

2 Evaluation of water supply projects (90 min)

2.1 Objectives

To introduce a newly developed evaluation method for water supply projects and to discuss the possibility of its application and utilization in planning and designing pilot projects for drinking water provision in the Iraqi Marshlands.

2.2 Methods

Lecture using slide presentation.

2.3 Materials

Lecture notes.

D Materials

Lecture notes, PowerPoint presentation.

E Summary

Title:	Experiences with post-evaluation of water supply projects in developing countries
Delivery Method:	Lecture, PowerPoint presentation
Training Technique:	Discussion, examples
Total Duration:	2 hours 30 min
Chapter in the Participant's Handbook:	7

CHAPTER VIII

AN NGO'S EXPERIENCE IN OPERATING AND MANAGING WATER SUPPLY PROJECTS IN DEVELOPING COUNTRIES

A Objectives

The Japan Asian Association & Asian Friendship Society has been providing wells and small-scale water supply projects in tropical Asian countries.

In order to develop self-sustaining small-scale water supply projects, it is important to improve community participation in facility planning, operation and maintenance, and revenue collection.

The objectives of the course are to:

- Show the importance of a community's cooperation in planning small-scale water projects;
- Present technical training for community residents to operate and maintain water distribution networks;
- Show how to achieve financially sustainable small-scale water projects;
- Present a good example of using solar and/or wind power for power generation.

B Learning outcomes

At the end of this course participants are expected to be able to:

- Grasp the essentials of how to involve the community in the planning and construction of small-scale water projects;
- Understand the role of national and local governments in technical cooperation for small-scale water projects;
- Recognize the issues to be studied/investigated specific to Iraqi conditions.

C Development of the lecture

The course will be presented in three parts. In the first lecture, an introduction to low-cost sewerage systems will be made, tracing their development and presenting a system description. In the second lecture, planning considerations for low-cost systems will be highlighted, comparing them to conventional sewerage systems' planning. The third lecture is intended for discussion on the applicability of low-cost sewerage systems in the Iraqi Marshlands. In the first two lectures, time will be provided to answer questions from the participants to consolidate their understanding. With the brief introduction on the sanitation situation prevailing in the Iraqi Marshlands and Iraq in general, participants will be encouraged to express and discuss any foreseeable issues related to the application of low-cost sewerage systems.

1 Introduction of The Japan Asian Association & Asian Friendship Society's activities to provide small-scale water supply projects in Asian countries (20 min)

1.1 Objectives

To introduce an NGO's activities in the water sector.

1.2 Methods

Lecture using slides and PowerPoint presentation.

1.3 Materials

Lecture notes.

2 Community participation in planning and construction of small-scale water supply projects (40 min)

2.1 Objectives

The objective is to present the important role of the community for successful water supply projects.

2.2 Methods

Lecture using slides and PowerPoint presentation.

2.3 Materials

Lecture notes.

3 Technical training for the community (30 min)

3.1 Objectives

To present what kind of technical training is required for the sustainable operation and maintenance of small-scale water supply projects.

3.2 Methods

Lecture using slides and PowerPoint presentation.

Materials

Lecture notes.

4 Revenue collection (30 min)

4.1 Objectives

To show how to increase revenue collection from small-scale water supply projects.

4.2 Methods

Lecture using slides and PowerPoint presentation.

4.3 Materials

Lecture notes.

5 Examples of successful small-scale water supply projects (30 min)

5.1 Objectives

To present examples of successful projects including the application of solar and wind power generation.

5.2 Methods

Lecture using slides and PowerPoint presentation.

5.3 Materials

Lecture notes.

D Materials

Lecture notes, PowerPoint presentation.

E Summary

Title:	An NGO's experience in operating and managing water supply projects in developing countries
Delivery Method:	Lecture, PowerPoint presentation
Training Technique:	Discussion, examples
Total Duration:	2 hours 30 min
Chapter in the Participant's Handbook:	8

Appendix I Sample Training

1. Programme and Timetable (Sample)

Training Course on ESTs for Drinking Water Provision organized for Support for Environmental Management of the Iraqi Marshlands Project UNEP DTIE IETC				
Date		16 – 27 May 2005		
Venue		UNEP DTIE IETC (Osaka and Shiga, Japan)		
Facilitator		GEC (Global Environment Centre Foundation)		
Date	Time	Content of Lectures & Activities	Lecturer(s) and organization(s)	
5/16	Mon	AM	Opening ceremony Orientation and project overview	UNEP DTIE IETC, GEC
		PM	Water Demand and Supply in Iraq	Mr. Mahmoud A. Ahmad, Director General, Water Directorate, Ministry of Municipalities and Public Works (MOMPW), Iraq
			Water Supply in Southern Iraq (Basrah)	Mr. Jabbar H. Abdulla, Basrah Water Directorate, MOMPW
		Water Supply Interventions in Basrah, Missan and Thi-Qar	UNICEF	
17	Tue	AM	Water Quality and Control for Water Treatment and Supply	Mr. Sadamitsu Shiode, Water Quality Laboratory, Water Works Bureau, Osaka Municipal Government
		PM	Operation and Maintenance of Water Distribution Network for Urban Water Supply Site Visit (Water Museum)	Mr. Hirofumi Hashiyama, Water Distribution Department, Water Works bureau, Osaka Municipal Government Mr. Toshiaki Tanaka, Water Museum
18	Wed	AM	Pilot Project Activities	S. Kugaprasatham, UNEP DTIE IETC
		PM	Water Treatment Technologies for Drinking Water Source Protection (Site Visit to Biyo Centre)	Ms. Keiko Wada, Biyo Centre
19	Thu	AM	NGO's and Community's Effort in Operating and Managing Water Supply Projects in Developing Countries	Mr. Kimihiko Murakami, Executive Director, The Japan Asian Association Asian Friendship Society
		PM	Desalination Technologies for Water Treatment	Mr. Hiroyuki Yamamura, General Manager, Water Treatment System Department, TORAY Industries Inc.
20	Fri	AM - PM	Site Visit to small water works using RO	Mr. Yutaka Marumoto Maibara Municipal Government
21	Sat	AM-PM	Introduction to Marshland Information Network (MIN)	Robert Rodriguez and Kyle Barrow UNEP DTIE IETC
22	Sun	PM	Social visit (Kyoto)	GEC

23	Mon	AM	Summary of Training, Information on Pilot Project Sites Water Contamination in Basra	S. Kugaprasatham, UNEP DTIE IETC Mr. Mohammad A. K. Alkazar, Basrah Governorate Council
		PM	Meetings on Pilot Projects and Community Level Initiatives	UNEP DTIE IETC & Participants
24	Tue	AM PM	Water Supply in Developed and Developing Countries	Dr. Shoichi Kunikane, Director, Department of Water Supply Engineering, National Institute of Public Health
25	Wed	AM	Experiences with Post Evaluation of Water Supply Projects in Developing Countries	Prof. Kiyoshi Yamada, Department of Civil and Environmental Systems Engineering, Ritsumeikan University
		PM	Introduction to Project Cycle Management and Stakeholder Analysis	Mr. Naonobu Minato, Mr. Masanori Yagi, Mr. Yazushi Hayashi and Mr. Shuichi Suzuki FASID
26	Thu	AM	Problem Analysis	Mr. Naonobu Minato, Mr. Masanori Yagi, Mr. Yazushi Hayashi and Mr. Shuichi Suzuki FASID
		PM	Problem Analysis / Objective Analysis	Mr. Naonobu Minato, Mr. Masanori Yagi, Mr. Yazushi Hayashi and Mr. Shuichi Suzuki FASID
27	Fri	AM	Project Selection & Project Design Matrix (PDM)	Mr. Naonobu Minato, Mr. Masanori Yagi, Mr. Yazushi Hayashi and Mr. Shuichi Suzuki FASID
			Wrap-up of Training Course	UNEP DTIE IETC, GEC
		PM	Closing ceremony	UNEP DTIE IETC, GEC

EST - Environmentally Sound Technology

FASID - Foundation for Advanced Studies on International Development

Appendix II

Structure of Participant's Handbook

1. Overview of the UNEP Project “Support for Environmental Management of the Iraqi Marshlands”
2. Background for the Training Course
3. List of Training Kits “Environmental Management of the Iraqi Marshlands”
4. Table of Contents
5. Lecture Papers and Presentations

Appendix III

Evaluation Questionnaire Template

QUESTIONNAIRE TO BE COMPLETED AT THE END OF THE TRAINING

1. Course objectives, contents and design

1.1 To what extent did the content correspond to the objectives of the course?

	1	2	3	4	5	6	
To a small extent							To a large extent

1.2 To what extent were the objectives of the course were achieved?

	1	2	3	4	5	6	
To a small extent							To a large extent

1.3 What improvements to the content do you suggest?

Topics to add:

Topics to omit:

Topics to deal with more thoroughly:

1.4 How do you judge the level of the course?

Adapted to your level

Adapted to a level below yours

Adapted to a level above yours

1.5 Did the duration chosen seem to you to be

Appropriate

Too short

Too long

1.6 How do you judge the distribution of time between the different subjects?

Unsatisfactory

1	2	3	4	5	6
---	---	---	---	---	---

 Very satisfactory

Between theory and practice?:

Unsatisfactory

1	2	3	4	5	6
---	---	---	---	---	---

 Very satisfactory

1.7 Have you had enough opportunities to exchange your experiences with:

The lecturers yes no

The other participants yes no

1.8 Are you satisfied with the materials distributed?

Not at all

1	2	3	4	5	6
---	---	---	---	---	---

 Very satisfactory

2. Impact of the course

2.1 Looking back, did the course come up to your expectations?

Not at all

1	2	3	4	5	6
---	---	---	---	---	---

 To a large extent

2.2 In what way will it help you to improve your work?

It will help you (tick two boxes corresponding to the two biggest advantages):

To make better decisions

To better understand the range of possible options

To apply methods or techniques

To widen your responsibilities

To improve the capabilities of others

Others

2.3 In which area do you think you will encounter most obstacles in applying the knowledge acquired from the course?

Reluctance on the part of hierarchical superiors

Reluctance on the part of colleagues

Constraints at the procedural and political level

Financial constraints

Others

2.4 To what extent was the content of the course adapted to the needs and practices of your country?

Not at all

1	2	3	4	5	6
---	---	---	---	---	---

 Entirely

3. General organization

3.1 Were you satisfied with:

The welcome?

Not at all

1	2	3	4	5	6
---	---	---	---	---	---

 To a large extent

The accommodation?

Not at all

1	2	3	4	5	6
---	---	---	---	---	---

 To a large extent

The help provided by the organizers of the course?

Not at all

1	2	3	4	5	6
---	---	---	---	---	---

 To a large extent

4. Other comments