



**LIFE Integrated Water Resources Management
Task Order No. 802
EPIQ II: Contract No. EPP-T-802-03-00013-00**

Assessment of Year 1 Information System Activities

Report No. 20

October 2005

IRG International Resources Group
In association with EPIQ II Consortium

**Ministry of
Water Resources and Irrigation**

**US Agency
for International Development**

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Acronyms and Abbreviations

AAU	Agricultural Administrative Unit
AED	Academy for Educational Development (a US-based entity providing USAID-funded assistance regarding environmental education and awareness)
APRP	Agricultural Policy Reform Program
BCWUA	Branch Canal Water User Association
CAD	Computer aided design
CD	Central Directorate
CDA	Community Development Association
CTO	Cognizant Technical Officer (the USAID person responsible for supervising a technical assistance contractor)
CY	Calendar Year
DAI	Development Alternatives, Inc. (a Washington DC-based consulting firm working with IRG to implement the project)
EEAA	Egyptian Environmental Affairs Agency
EEPP	Egyptian Environmental Policy Program (a USAID-funded program aimed at achieving environmental policy reform)
EPADP	(MWRI) Egyptian Public Authority for Drainage Projects
EPIQ	Environmental Policy and Institutional Strengthening Indefinite Quantity Contract
ET	Evapotranspiration
GB	Gigabyte
GIS	Geographic Information System
GOE	Government of Egypt
GPS	Global Positioning System
GW	Groundwater
GWS	Groundwater Sector
HD	(Aswan) High Dam
IAS	Irrigation Advisory Service
IBRD	International Bank for Reconstruction and Development or World Bank
ID	Irrigation Department
IDS	Irrigation and drainage system
IIIMP	Integrated Irrigation Improvement and Management Project
IIP	Irrigation Improvement Project
IRG	International Resources Group (a Washington DC-based consulting firm that is prime contractor for the IWRMP)
IRMU	Integrated Water Management Unit
IRs	Intermediate Results
IRU	MWRI Institutional Reform Unit
IS	Information Systems
IT	Information Technology

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IWMD	Integrated Water Management District
IWMU	Integrated Water Management Unit (A unit of MWRI)
IWRM	Integrated Water Resources Management
IWRMP	Integrated Water Resource Management Project
jpg, jpeg	Joint Photographic Expert Group (computing)
KB	Kilobyte
LAN	Local Area Network
LIFE	Livelihood and Income from the Environment (project)
LOE	Level of Effort
M&E	Monitoring and Evaluation
MALR	Ministry of Agriculture and Land Reclamation
MED	MWRI Mechanical & Electrical Department
MIC	MWRI Ministry Information Center
MISD	Matching Irrigation Supply and Demand
MOE	Ministry of Education
MOH	Ministry of Housing
MOU	Memorandum of Understanding
MSEA	Ministry of State for Environmental Affairs
MWH	Montgomery Watson Harza
MWRI	Ministry of Water Resources and Irrigation
NASA	(United States) National Aeronautics and Space Administration
NGO	Non governmental Organization
NSCE	North South Consultants Exchange
NWRC	(MWRI) National Water Research Center
O&M	Operation and Maintenance
OJT	On-the-Job Training
PC	Personal Computer
PM&E	Performance Monitoring and Evaluation
RSC/WP	Red Sea Coastal/Water Project, short name for USAID Red Sea Coastal and Improved Water Resource Management Project
RWS	Relative Water Supply
SIRs	Sub-Intermediate Results
SOs	Strategic Objectives
STTA	Short-term Technical Assistance
TA	Technical assistance
TOR	Terms of Reference
TRG	Training Resources Group
UPS	Uninterruptible Power Supply Device
USB	Universal Serial Bus (computing)
USAID	United States Agency for International Development
WCU	MWRI Water Communication Unit
WDC	MWRI Central Water Distribution Center
WPRP	Water Resources Results Package
WQU	MWRI Water Quality Unit
WUA	Water User Association

1. Introduction

1.1 Authorization

Under the United States Agency for International Development (USAID)/Egypt-funded Livelihood and Income from the Environment (LIFE) Integrated Water Resources Management (IWRM) Project (Contract No. EPP-I-802-03-00013-00 Task Order 802), International Resource Group (IRG), in association with the Academy for Educational Development (AED), Development Alternatives, Inc. (DAI), ECODIT, Environmental Quality International (EQI), Montgomery Watson Harza (MWH), and Training Resources Group, Inc. (TRG) is responsible for assisting the Government of Egypt (GOE) to promote integrated water resources management. The period of performance for the contract is October 1, 2004–September 30, 2008.

1.2 Purpose of Report

The purpose of this report is to present an assessment of information systems (IS) activities carried out under Tasks 2, 3, and during monitoring and evaluation (M&E) reviews in Year 1 (October 2004–September 2005). Furthermore, the report covers recommendations for the Year 2 IS program. All supporting documents are included as annexes.

1.3 Project Objectives

The GOE is implementing an aggressive irrigated agricultural area expansion program in order to reduce the supply of water per feddan. The high cost of operating and maintaining the water delivery infrastructure is a serious strain on the national budget because farmers pay a very low portion of actual costs. This is further compounded by decreasing water quality as the water conveyance system is increasingly used for waste disposal.

The objective of the LIFE/IWRM is to provide technical assistance, training, commodities, and small grants in support of the decentralization of water management decision-making and increased participation of all rural inhabitants in such decision-making in two priority geographical areas and five Irrigation Directorates: Zifta and West Sharkiya in the Middle Delta, and West Qena, East Qena, and Aswan in Upper Egypt, as shown in figure 1.

Figure 1 Priority Areas for the LIFE/IWRM Project



With decentralization and participation, USAID expects greater civic responsibility in maintaining the water conveyance infrastructure and improvements in the quality of local water resources through better management of locally generated liquid and solid wastes. The objectives are expected to be achieved through the formation and development of functional and sustainable Branch Canal Water User Associations (BCWUAs) and Integrated Water Management Districts (IWMDs), and developing the capacity of stakeholders to manage solid and liquid wastes in the targeted directorates.

Sub-objective 1. Rural inhabitants accrue immediate and long-term economic benefits from participating in water-

management decision-making and governance of the water conveyance infrastructure.

Sub-objective 2. Local communities and private associations participate in water resources decision-making, accept responsibility for maintaining the water conveyance infrastructure, and adopt improved management practices for solid and liquid wastes.

Seven tasks under three performance requirement categories are to be implemented under the project:

A.1 Performance Requirement I: Decentralized Management of Water Resources

1. Formation of Integrated Water Management Districts
2. Formation of Branch Canal Water Users' Associations
3. Equitable Allocation of Water Resources

A.2 Performance Requirement II: Stakeholder Engagement in Water Resources Management

4. Improved Maintenance and Upgrading of Water Management Equipment
5. Environmental Services for Improving Water Quality Management
6. Improved Wastewater Reuse Practices

A.3 Performance Requirement III: Capacity Building of Ministry of Water Resources and Irrigation (MWRI) staff

7. Graduate Degree Training for MWRI staff.

There are also a number of issues that are common to all the tasks. These cross-cutting issues include commodity purchases; workshops and training; monitoring and evaluation; donor coordination; public awareness, information, education, and communications; and gender.

The project will work closely with the MWRI Integrated Water Management Unit, the four directorate Undersecretaries and General Directors, the IWMDs, and other key stakeholders.

To facilitate implementation and to resolve any inter-sectoral issues, coordination at higher levels will be through a Steering Committee appointed by Minister MWRI. Members of the steering committee include:

- Eng. Gamil Mahmoud, Chairman (MWRI Special Consultant to H.E. Minister)
- Head of Irrigation Department
- Egyptian Public Authority for Drainage Projects
- Chairman of M & E Department
- Head of Sector, Minister's Office
- Director of Technical Office for Technology and Information, Minister's Office
- Head of Institutional Reform Unit
- Head of National Water Boards Project
- USAID representative
- Project representative.

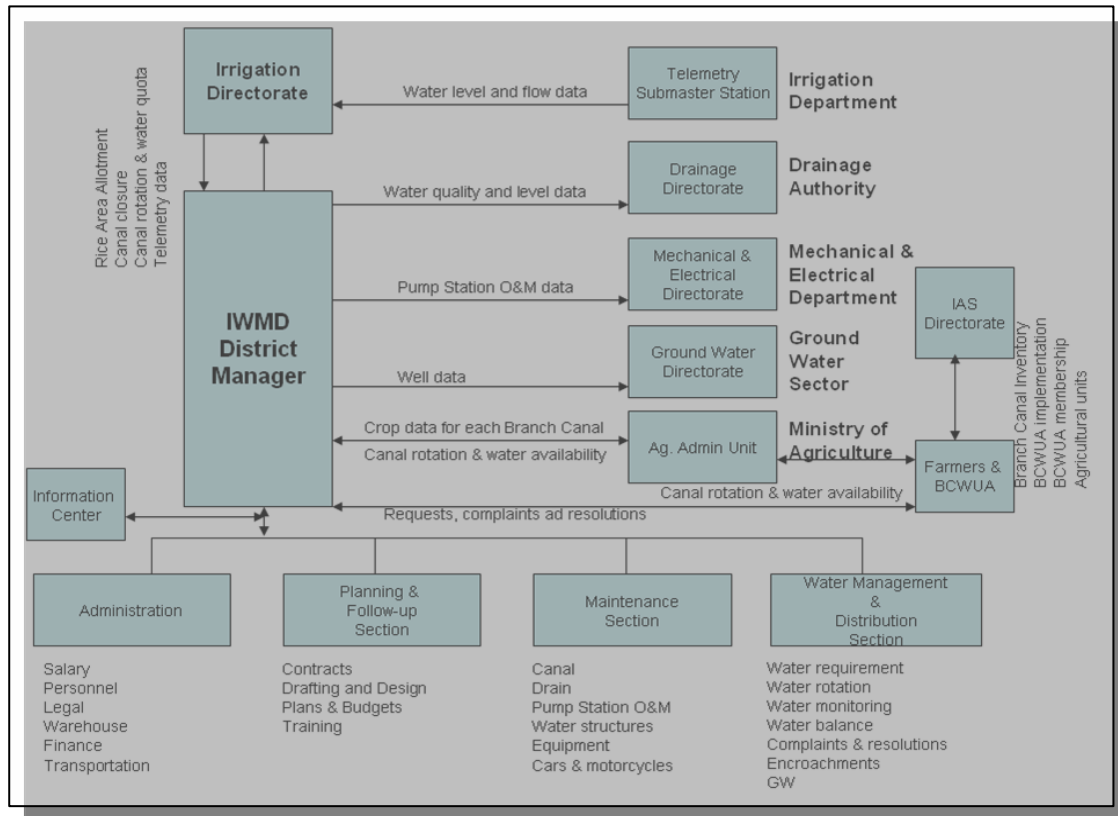
Once decisions are made at the central level, specific information such as 10-day water allocation and seasonal rice area allotments flows downward to the directorates. The directorates then inform the districts and the districts inform the BCWUAs and/or the Agricultural Administrative Units. In turn, the BCWUA and/or agriculture extension officers share the information with the farmers in the districts so they can manage their pumping operation at the *mesqa* (small canals directly serving farms) level. When farmers have issues with water delivery, they file complaints with the districts. The district managers consult with the respective directorate staff and resolve the problems locally.

Currently, non-IWMDs collect data primarily for higher levels to make management decisions for them. For example, non-IWMDs do not prepare their water requirements and rotations. Instead, they are prescribed by directorates about three times a year.

A diagram showing how anticipated future data/information will flow from the district, to the district, and within the district can be seen in Figure 2

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Figure 2 IWMD Data Flow



2. Information Systems Component

2.1 Data Flow

Data generally flows from the districts to their respective directorates. The districts collect, review, aggregate, and summarize the data before forwarding the information to the directorates. The directorates carry out similar data management activities as the districts, and forward the data/information to the central level for planning, operation, and analysis.

2.2 Concepts

With the integrated water management approach, the main objectives are to:

- Integrate all water management functions so the IWMD can manage all water supplies (i.e., Nile water, groundwater, and drainage water) within each district
- Decentralize water management so the district staff can match water supplies with water demands from all sources (agricultural, municipal, and industrial requirements) within each of the districts fortnightly.

The IWMDs now have the authority to make district-level management decisions. In order to implement that, the district managers require timely information and data that provides a greater understanding of the specific situation in their district. The knowledge required to support water management at the districts is inherently spatial and analytical in nature.

Under the project, the information system component consists of two major information technologies: database management and digital mapping systems. The database management and mapping systems have evolved independently but are similar. Both are integrating, analytical, and strategic technologies that are complementary, not competing. The convergence of both technologies offers extraordinary opportunities for producing information management frameworks that connect disparate, but indispensable, threads of spatial and non-spatial data across different information systems and management units. These frameworks will create broader knowledge and understanding for decision makers at the district, directorate, and central levels.

2.3 Objectives

Under the integrated water management approach, the specific IS objectives are to:

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- Establish databases to support measurement-based water management practices and data-based decision making at the district and directorate levels
- Provide specific information systems to support the MISD approach—matching water supplies to demands within each of the districts
- Establish five directorate digital mapping systems to prepare and provide geo-referenced district maps with canal and drain networks for each of the districts
- Utilize satellite imagery (free United States National Aeronautics and Space Administration [NASA] Landsat ETM+) and global positioning system (GPS) data to verify and/or calculate water objects, administrative boundaries, branch canal service areas, and actual cropped areas to improve water management practices.

2.4 Approach

The overall IS development approach of the project consists of three phases: installation, implementation, and integration. For Phase I, the project will:

- Install computer hardware and software at the districts and directorates
- Install seven IWMD databases (MISD, Water Level, Complaint, Violation, Discharge, Groundwater, Water Quality) at all the districts
- Train selected staff from the districts and directorates on computer basics, hardware maintenance, and general GPS use.

For Phase II, the project will:

- Establish seven functioning databases at the districts
- Support district implementation of MISD water management practices with the MISD database
- Support district water monitoring activities with the Water Level and Discharge databases
- Support inventories of water objects (i.e., irrigation and wells/groundwater structures) at each district using GPS receivers
- Introduce and support the district M&E program with data from the databases
- Build capacity for digital mapping at the district and directorate levels
- Produce geo-referenced district maps including water objects such as canals, drains, structures, pump stations, and wells
- Carry out corresponding training events.

For Phase III, the project will:

- Link the tabular database data to the geo-referenced district maps to provide additional integrating and analytical functionalities
- Establish an Intranet framework to connect the tabular and mapping information systems across the district's local area network (LAN) system to create broader

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knowledge and understanding to support decentralized and integrated water management

- Aggregate the district's water resources data at each directorate using the database's import functionality
- Carry out corresponding training events.

3. Review of IS Activities

3.1 Installation of Computer Hardware and Software

The project team initiated the IS task by carrying out the commodity procurement of the information technology (IT) equipment. Over the last 12 months, the IS team worked with the project procurement staff and:

- Assessed hardware and software needs
- Prepared hardware and software specifications
- Solicited bids
- Selected suppliers
- Signed contracts
- Installed computer hardware and software at each of the IWMDs.

A summary of installed computer hardware and software is presented below, and figure 3 shows actual installations.

Figure 3 Installed IT Equipment



- Each of the 23 new IWMDs received:
 - 3 desktop computers (2 standard and 1 database) with Windows XP, Office 2003, and Antivirus software
 - 3 uninterruptible power supply devices (UPS)
 - 3 voltage stabilizers
 - 1 A3 color printer
- 1 black and white LaserJet printer
- 1 LAN
- 2 GPS receivers and 2 personal computer (PC) interface cables
- 2 computer tables and 2 task chairs
- 1 universal serial bus (USB) 2.0 memory stick (256 kilobyte [KB])

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- Each of the five directorates received:
 - 3 desktop computers (1 standard, 1 database, and 1 GIS) with Windows XP, Office 2003, and Antivirus software
 - 2–3 UPS devices
 - 2–3 voltage stabilizers
 - 1 A3 color printer
 - 1 black and white LaserJet printer
 - 1 A4 scanner
 - 1 LAN
 - 1 GPS receiver and 1 PC interface cable
 - 2 USB mobile hard drives (60 gigabytes [GB])
 - 3 computer tables and 3 task chairs
 - 1 DSL Internet connection (2 of 5 directorates)
- IAS received:
 - 3 desktop computers (standard model) with Windows XP
 - 2 A3 color printers
 - 3 black and white LaserJet printers
 - 1 GPS receiver and 1 PC interface cable
 - 2 computer tables and 2 task chairs
- The Integrated Water Management Unit (IWMU) within the MWRI received:
 - 5 desktop computers (3 standard and 2 GIS models) with Windows XP, Office 2003, and Antivirus software
 - 3 laptop computers
 - 5 UPS devices
 - 1 A3 color inkjet plotter
 - 2 black and white LaserJet printers
 - 6 GPS receivers and 6 PC cables
 - 1 A3 color scanner
 - 1 LAN system
 - 5 USB mobile hard drives (60GB)
 - 5 USB memory sticks (256 MB)
 - 1 DSL Internet connection

All the hardware and software are functioning properly. The IS and procurement staff did an excellent job.

3.2 Training

Most of the engineers at the district level have limited experience with computers. Training on general computer and information technologies, database management, and digital mapping was essential to improve job performance leading to better water management. The IS training courses addressed real issues of concern to those responsible for data management and communication in the districts. In figure 4, engineers are looking at the inside of a CPU.

Figure 4 Engineers Learn about Computers



An intensive training program was designed by the IS team. The three courses in Year 1 were carried out by the IWMU and MWRI Ministry Information Center staff, and five subcontractors. The courses were conducted at five separate locations (Tanta, Zagazig, Qena, Luxor, and Aswan) from May to September 2005. With as few as three courses, the trained district staff is now able to create documents, worksheets,

and databases to streamline work processes and improve office management and communications. A summary of Year 1 training is shown in table 1.

Table 1 Year 1 IT Training through September 2005

General Directorate	Basic Computer Use (May–June 2005)		Computer Maintenance (July–Sep 2005)		Basic GPS Operation (June–July 2005)		Total
	No.	Participants	No.	Participants	No.	Participants	
New Zifta	2	45	1	18	1	10	73
West Sharkiya	2	50	1	18	1	12	80
East & West Qena	4	80	2	29	1	45	161
Aswan	3	71	1	21	0		92
Grand Total	11	246	5	86	3	67	399

The feedback for the training program from the IWMD staff was positive. Trained staff members have been using their newly acquired skills to build spreadsheets and electronic reports since July.

3.3 Installation of IWMD Databases

The system development approach used by the project was to install databases that have been tested and used by the four original IWMDs, as shown in figure 5. The databases included:

Figure 5 Project Team Member Explains the Use of Databases

- **MISD database** that was developed under the Water Policy Reform Program and updated with a translated user's manual and database from English to Arabic in August 2005
- **Water Level database** originally prepared by MIC under the Red Sea Sustainable Development and Improved Water Resources Management Project and updated in mid-2005
- **Complaint database** originally prepared by MIC under the Red Sea Sustainable Development and Improved Water Resources Management Project and updated in mid-2005
- **Violation database** originally prepared by MIC under the Red Sea Sustainable Development and Improved Water Resources Management Project and updated in mid-2005
- **Discharge database** prepared by the staff from South Zifta IWMD in May 2005.



All five databases were successfully installed at the districts and classroom and on-the job training for each will follow in Year 2.

3.4 Introduction of Digital Mapping Systems

The project purchased 180 sheets (3 sets) of 1:25,000 and 90 sheets (3 sets) of 1:50,000 paper topographic maps from EGSA in May. With the assistance of the IWMU staff, the 1:25,000 paper topographic maps were scanned. Two sets of paper maps (1:50,000 and 1:25,000) plus the digital version of 1:25,000 maps in Joint Photographic Expert Group (jpg or jpeg) format were distributed to the directorates and districts via the two project regional offices. MIC staff geo-referenced and edge matched all the scanned maps (1:25,000) covering the New Zifta Directorate. The IT staff from East Qena Directorate also geo-referenced and edge matched all the scanned maps (1:25,000 and 1:50,000) for both Qena directorates and digitized the

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district boundaries, canals, and drains. As of September 30, 2005, four of the five directorates are using AutoCAD (computer aided design) and/or ArcGIS software for their mapping work. Figure 6 illustrates the result of the mapping work and table 2 summarizes the status of the mapping systems.

Figure 6 Successful Mapping Results



Table 2 Status of Mapping Systems, September 2005

District	Software	Spatial Data	Equipment	Status
New Zifta	- AutoCAD - ArcGIS	- Geo-referenced maps (1:25,000) - Vector layers - Landsat ETM+	- GPS receivers	Functioning
West Sharkiya	- AutoCAD	- Scanned maps - Landsat ETM+	- Hand-held GPS receivers	Not yet
East Qena	- AutoCAD - ArcGIS	- Geo-eferenced maps (1:25,000) - Vector layers - Landsat ETM+	- Hand-held GPS receivers	Functioning
West Qena	- AutoCAD	- Geo-referenced maps (1:25,000) - Vector layers - Landsat ETM+	- Hand-held GPS receivers - GPS-based Total Stations	Functioning

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District	Software	Spatial Data	Equipment	Status
Aswan	- AutoCAD - ArcGIS	- Scanned maps	- Hand-held GPS receivers - GPS-based Total Stations	Not yet

4. Achievements

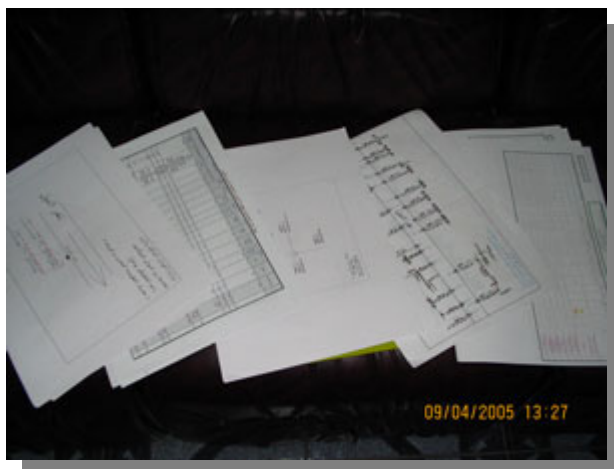
The IS team successfully accomplished many tasks that have permanently changed how the IWMDs and the five directorates will manage, use, and communicate their water resources data in the near future. The major achievements in Year 1 include:

- Establishing a computer unit with assigned IT staff in each district
- Installing 85 computer systems with Windows XP and Office at the districts and directorates and ensuring that all systems function properly
- Introducing and installing five databases (MISD, Discharge, Water Level, Complaint, and Violation, MISD) at each district
- Conducting three IS training courses in five separate locations (Tanta, Zagazig, Luxor, Qena, and Aswan): Basic Computer Use (246 participants), Computer Maintenance (86 participants), and Basic GPS Operation (67 participants) for a total of 399 participants
- Overseeing development of computer applications by the trained IWMD staff to better manage data and information in the districts
- Establishing a digital mapping unit with one GIS computer system and GPS receivers plus the scanned maps (1:25,000) and Landsat images at each directorate.

Figure 7 shows some of the kinds of reports and other materials that the IWMD staff produce.

Figure 7 Samples of Data Produced by IWMD Staff

During the last 12 months, installation of computer hardware, office software, IWMD databases, and mapping systems, and training on computer basics, hardware operation and maintenance (O&M), and GPS use were successfully carried out. Most of the trained district staff members have built applications in



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AutoCAD, Excel, Word, and Access to support their irrigation management activities since the June–July training. The district and directorate staff members are eager to learn and do more with their computer systems.

5. Lessons Learned and Recommendations

Identifying lessons learned from any endeavor is extremely valuable and in this instance, imperative considering IS Phase II “implementation” activities will be carried out in the next 12 months. The following lessons learned are the result of an attempt to objectively identify items worthy of consideration when implementing information systems at the districts and directorates.

- The original four IWMDs were overwhelmed by implementation of 10 databases simultaneously during the Red Sea Sustainable Development and Improved Water Resources Management, Improved Water Resources Management Project. For the next 12 months, a stepwise approach would be more appropriate by implementing one or two of the databases every 2–3 months, not all seven at the same time.
- Field technical support for the districts is weak. The project staff members in Cairo are currently providing most of the technical support and with a plan to implement seven databases at each IWMDs, the long-distance approach will most likely cause unacceptable delays. The project will resolve this issue by strengthening the directorate staff members to assist the districts.
- Information system activities were not fully integrated under Tasks 1, 2, 3, and the cross-cutting components. As a result, most of the task leaders are not aware the functionality of the databases and mapping systems. It is recommended that the task leaders take on the responsibility of implementing and managing the respective information systems at the directorates and districts in the future as follows:
 - Task 1 leader will implement and manage the Complaint Database and Violation Database
 - Task 2 leader will implement and manage the branch canal structure inventory using the Garmin GPS receivers
 - Task 3 leader will implement and manage the Water Level Database, Discharge Database, MISD Database, Groundwater Database, Water Quality Database, and digital mapping systems
 - M&E task leader will implement and manage the project M&E database and the District M&E information system tools
 - The public awareness task leader will maintain and update the project website.
- IWMU and MIC staff members were effective in designing, coordinating, and/or delivering the training in the past 12 months and should continue in the future.

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- Interactions between MIC/IWMU and the IWMDs were useful, and have provided an exchange of experience and ideas as well as a better understanding of district information system needs.

A total of 85 information systems and five databases have been installed to support district-level management decision making and routine data communications with higher MWRI levels. The momentum built under the project needs to be maintained and the data management concepts and procedures that have been tested by the four original IWMDs need to be introduced and implemented in the new districts in Year 2. The IS approach has shown great potential in supporting water management decisions at the district level, and facilitating de-evolution of centralized authority at the national level.