INTEGRATED WATER MANAGEMENT

EGYPT'S EXPERIENCE

POLICY & IMPLEMENTATION

BY:

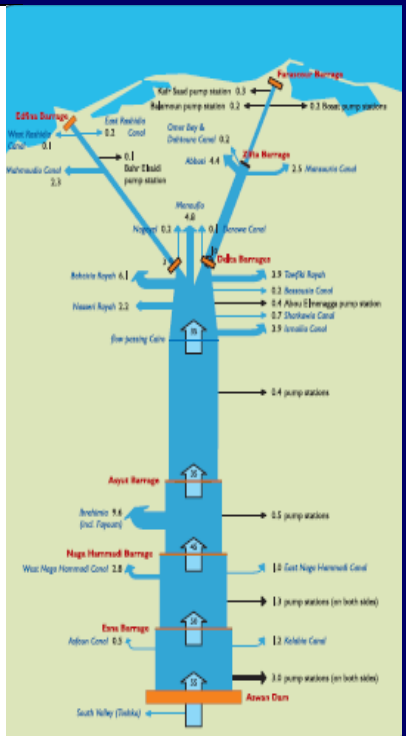
Dr. Moamen Mohamed Said Ali El-Sharkawy

Planning Sector

Ministry of Water Resources & Irrigation

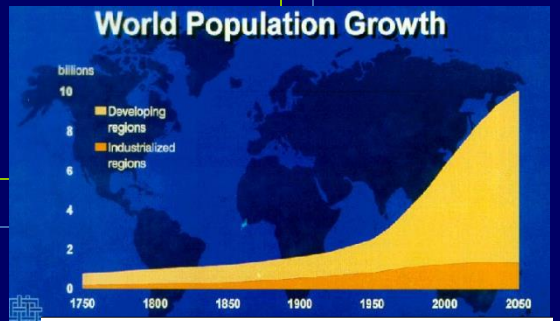
Outline of Presentation

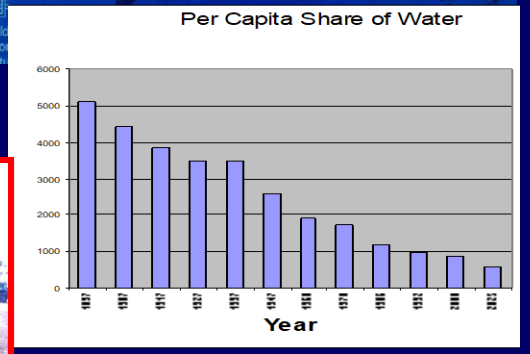
- Major Challenges To Water Resources in Egypt
- Major Challenges To Water Resources Management in Egypt
- IWRM Framework Problem/Introduced Solution
- IWRM Implementation Components
- Conclusion

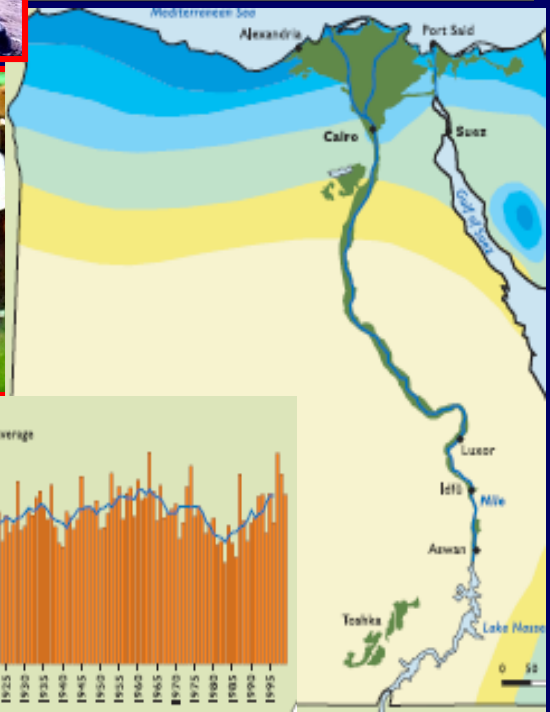


Major Challenges to Water Resources

- Expected Population Growth (Municipal, Agricultural, Industrial, Power, etc..)
- The Fixed Water Quota
- Deterioration of Water Quality
- Spatial and Temporal Distribution of Resources
- Climate Change and Nile Water Availability in Egypt







Major Challenges to Water Resources Management

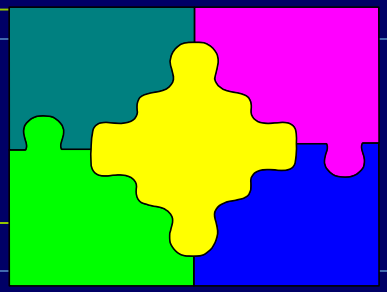
- **Water institutions resources and capacity**
- **Cropping policy and land holdings,**
- **socio-economic conditions,**
- **changing demographic conditions,**
- **Political vs. hydrologic boundaries,**
- **increasing globalization,**
- **climatic conditions.**

- Therefore, frameworks used for water planning in the past can no longer successfully address water problems of the future.

Major Challenges to Water Resources Management

- Social and economic forces, Vs technical considerations, determine the success of management and planning effort.
- Account of uncertainty in the decision making process.
- Value judgments, political confrontation and expensive and time-consuming scientific analysis.

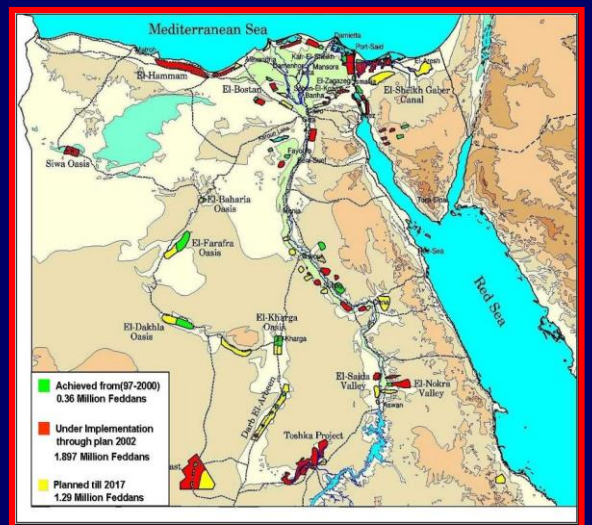
Major Challenges to Water Resources Management

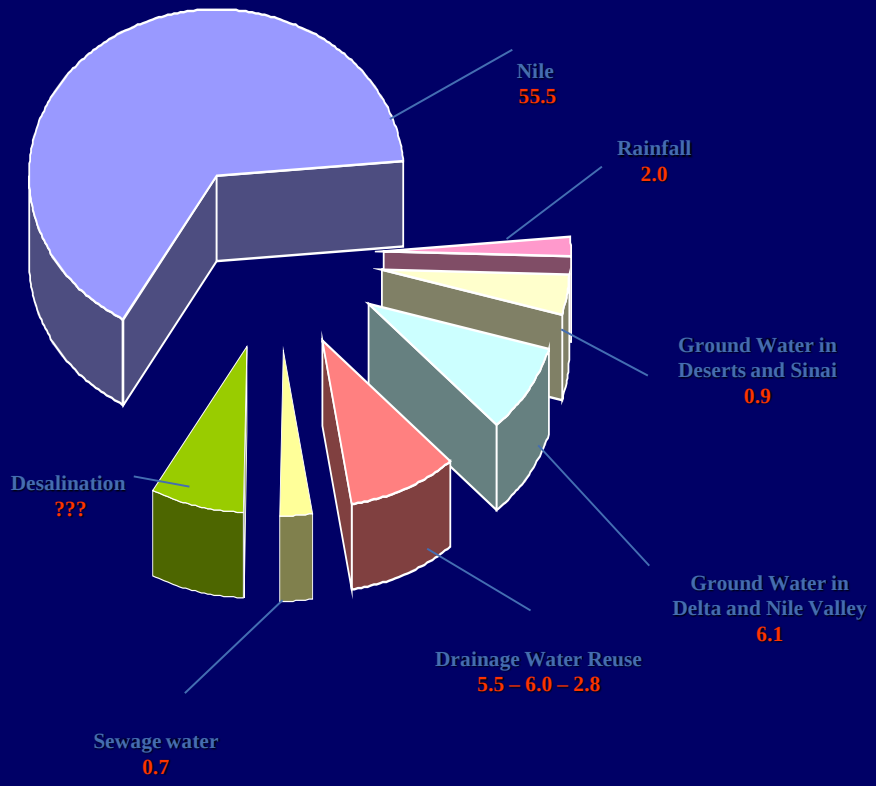


- need to **new** and **different strategy** to confront. What basically happened in the past was somehow missing one or more pieces of the puzzle. **The evidence is simply that the world is still facing many inherited problems in the water sector.**
- Political, legislative, institutional, technical, socioeconomic and technological solutions were individually insufficient to face these problems or to mitigate its complexity.

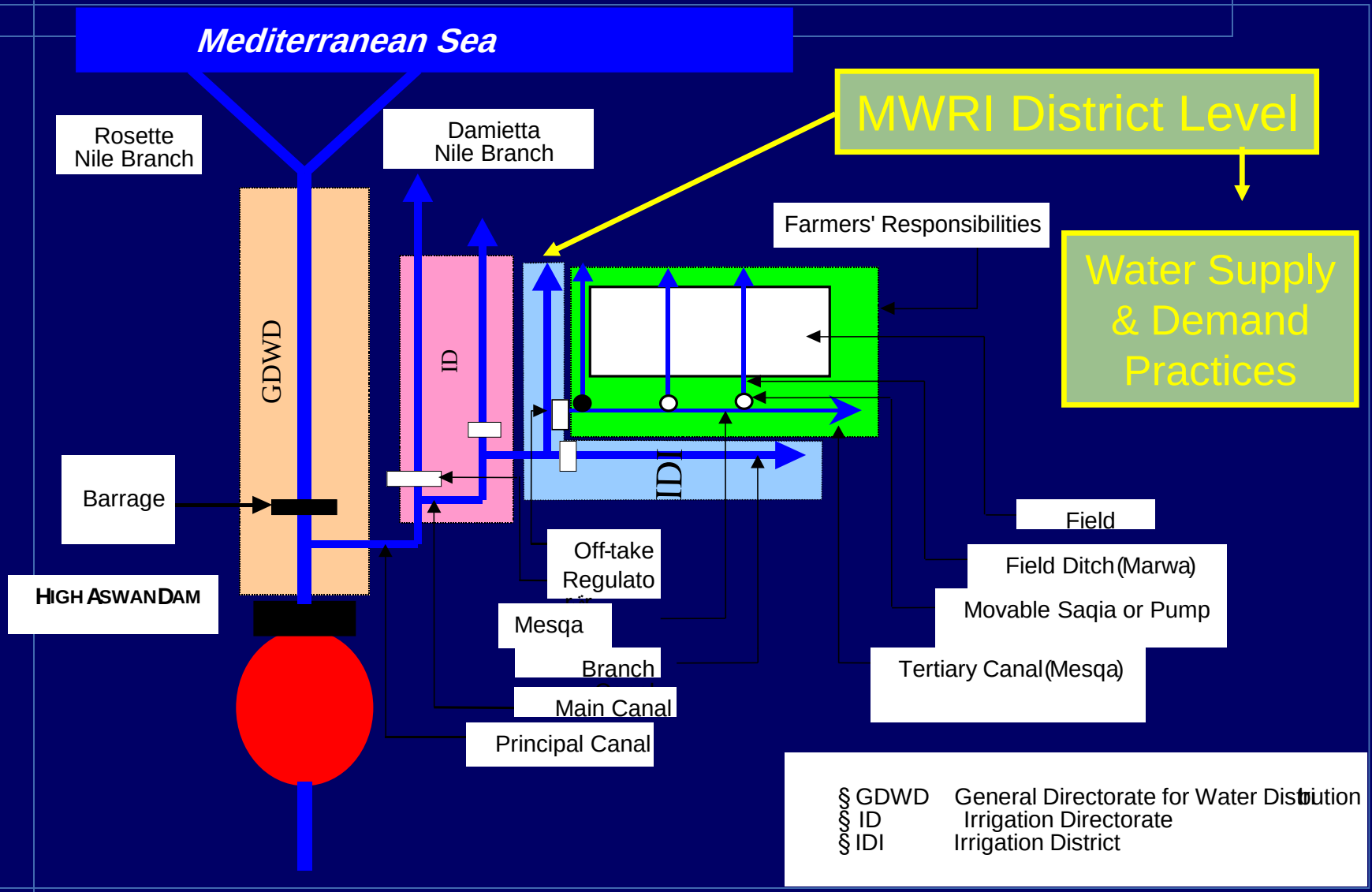
Egyptian Water Resources System

- ≈ 34,000 K.M of Irrigation canals
- ≈ 19,000 K.M of drains
- Total number of water Structures is ≈22,000
- Total number of irrigation and Drainage pump stations is ≈ 1,570





Egyptian Water Resources System



Previous & Future Water Policies

- Water Policy (1975)
- Water Master Plan (1980)
- Water policy (1982)

Supply Management

- Water Policy (1997)

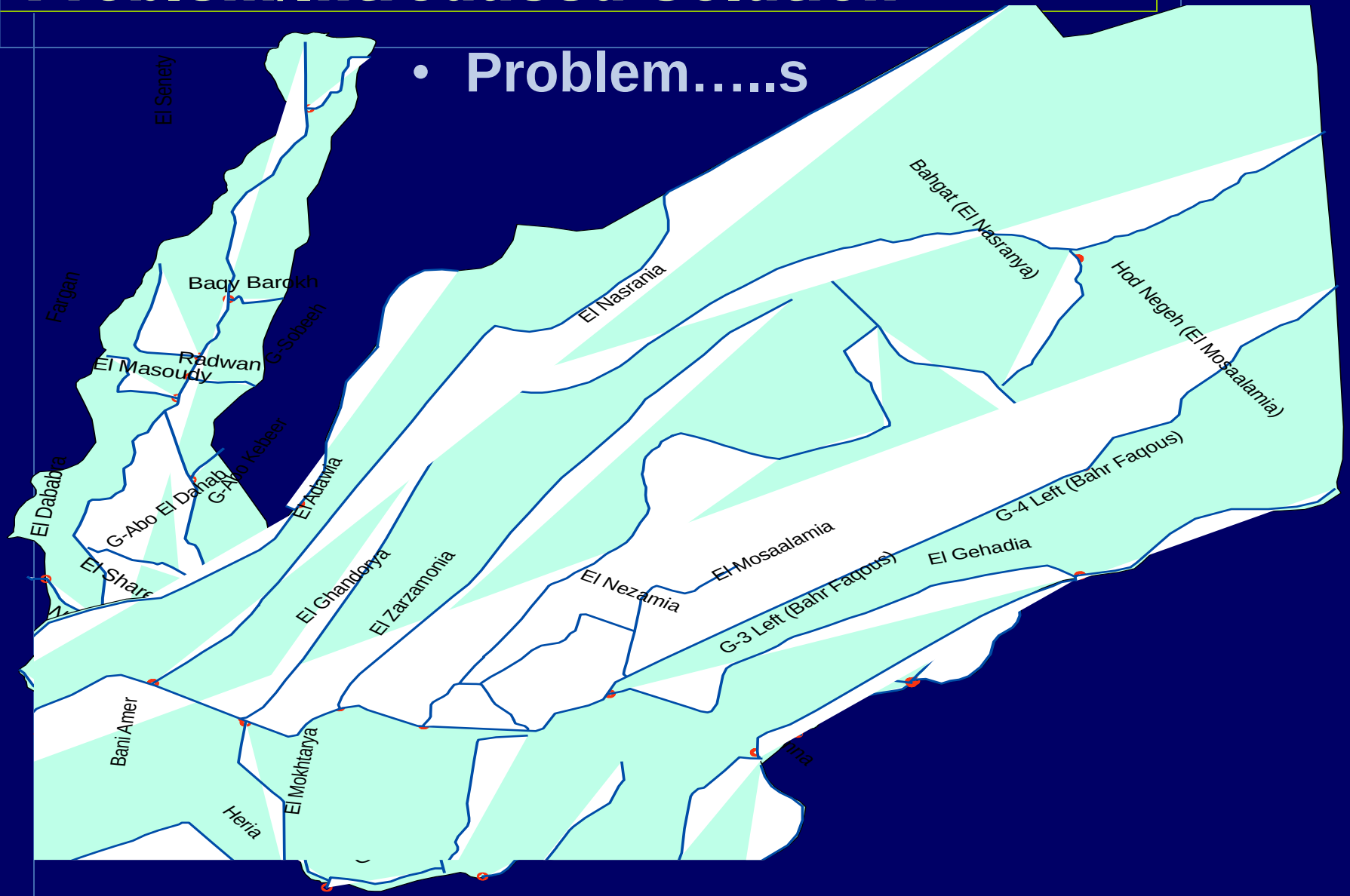
Supply & Demand Management

- National Water Resources Plan (2005)
- Facing Water Scarcity in Egypt (2008)
- Strategy 2050 (2010)

IWRM

IWRM Framework
Problem/Introduced Solution

- Problem…..s



IWRM Framework
Problem/Introduced Solution

- Problem…..s

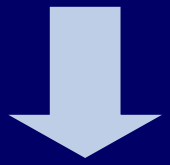





IWRM Framework
Problem/Introduced Solution

At MWRI Local (District) Level

- Water Quantity Problems (Shortage/Time)
- Water Quality Problems (Solid/Wastewater)
- Water Use Problems (Practices)



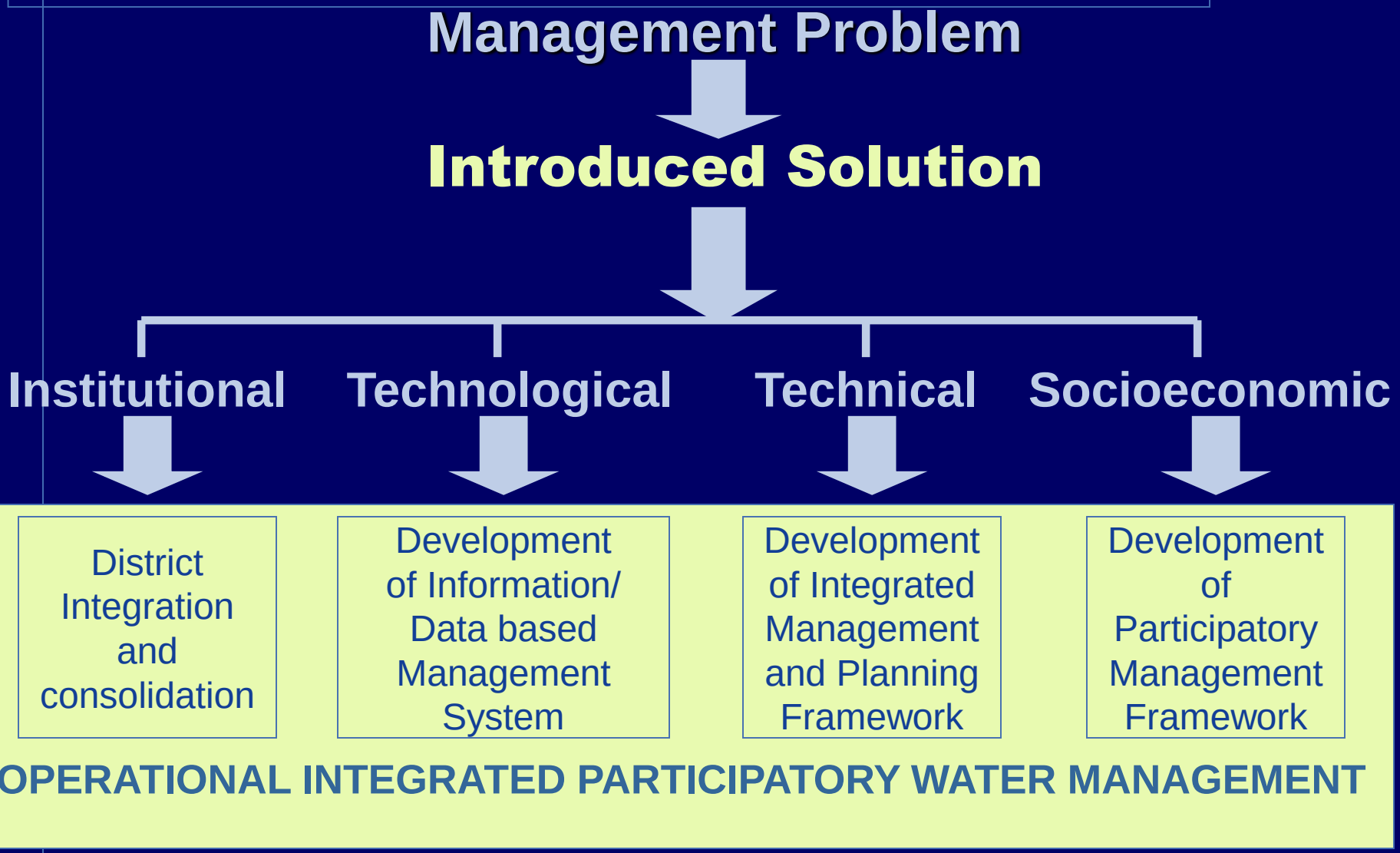
Management Problem

IWRM Framework
Problem/Introduced Solution

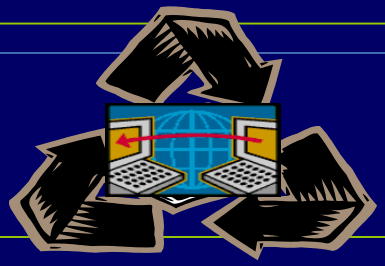
Management Problem

Introduced Solution

IWRM Implementation Components



Technological

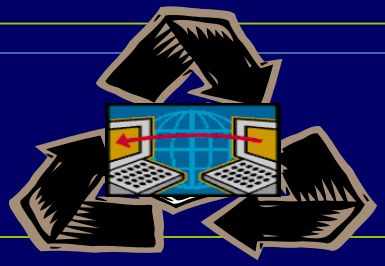


Development of Information/Data based Management System

In most of the developing countries, water information systems **at local administrative levels** are **generally absent** or **severely degraded**, and management decisions are mostly based on **unreliable data** and **information**.

A lack of data and **obsolete data capture** and/or **information management systems** are common issues, resulting in inadequate data/information to support management and decision making.

Technological



Development of Information/Data based Management System

An innovative, inclusive approach is required that will benefit of a number of powerful technologies to capture, manage, and disseminate water related data and information, in a **cost effective** and **sustainable** manner.

Technological

Development of Integrated Management and Planning Framework

The information system consists of three major technologies:

- Data Collection Procedures
- Database Development & management, and
- Digital mapping systems.

Technological

Development of Integrated Management and Planning Framework

- **Data Collection Procedures**

1. Establish water monitoring network
   - Monitored parameters;
   - Methods for collection, handling, analysis, and interpretation;
   - Type of data measured;
   - Location (latitude and longitude) of monitoring point;
   - Date and time of day measurement was collected;
   - Data collection and analyzing entities (who actually made the measurements);
   - Data source (whose monitoring program); and
   - Indication of data quality (including precision, bias, detection limits, and a defined QA/QC system).

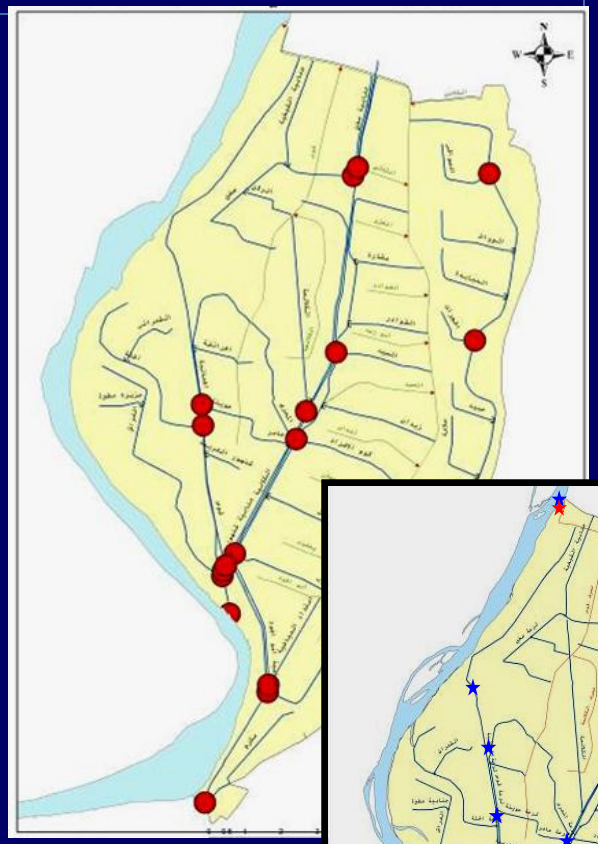
2. Initiate monitoring program

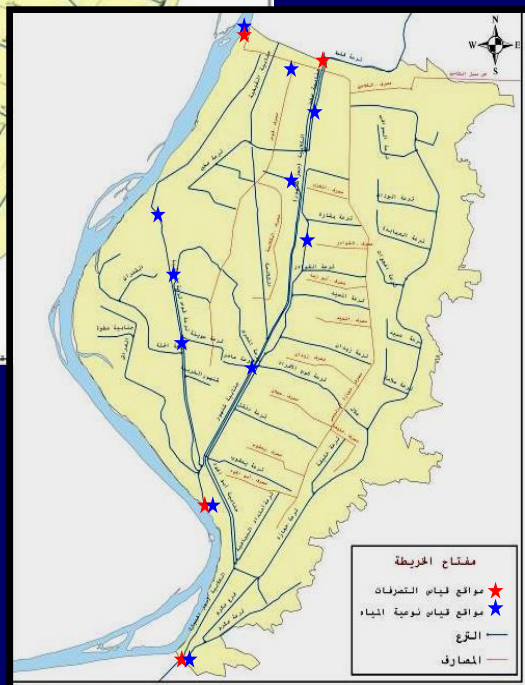
Technological

Development of Integrated Management and Planning Framework

- **Data Collection Procedures**

When data for surface water, ground water, and water quality, were collected and verified, these data should be archived to a database system to support decision-making process at the district level.

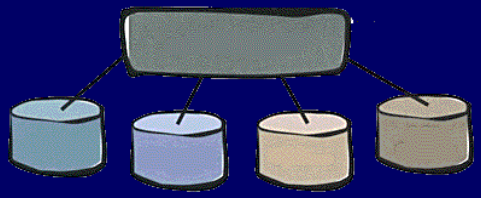


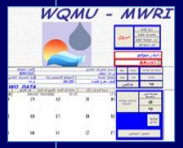


Technological

Development of Integrated Management and Planning Framework

- Database Development & management

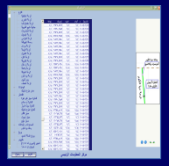




Water Quality

MISD

Ground Water



Water Levels

Complaints

Technological

Development of Integrated Management and Planning Framework

- **Database Development & management**

MISD

Matching Irrigation Supply & Demand

for_crop_rep

% من الزمام	المساحة المحصولة (١٩٥٥)	المحصول	الزمام(فدان)	الترعة	فترة	سنة
١٠٠ %	١٨٦٢	ق من المساحة الصحة				
			١٨٦٢	مليج الغربية	٦	٢٠٠٧
٤٨	٨٨٩	برسيم				
٢٨	٥١٩	قمح				
١٨	٣٢٨	أخرى				
١	١٣	قطن				
٤	٧٦	حدائق				
٢	٣٧	أرض لا تروى				
١٠٠ %	١٨٦٢	ق من المساحة الصحة				
			١٨٦٢	مليج الغربية	٧	٢٠٠٧
٤٦	٨٦٤	برسيم				
١٧	٣٢١	أخرى				
٤	٧٢	قطن				
٤	٧٦	حدائق				
٢٨	٥٢٨	أرض لا تروى				
١٠٠ %	١٨٦٢	ق من المساحة الصحة				
			١٨٦٢	مليج الغربية	٨	٢٠٠٧
٤٦	٨٥٧	برسيم				
١٧	٣١٢	أخرى				
٥	٩٥	قطن				
٤	٧٦	حدائق				
٠	٠	ذرة				
٢٨	٥٢١	أرض لا تروى				
١٠٠ %	١٨٦٢	ق من المساحة الصحة				

صفحة: ٢

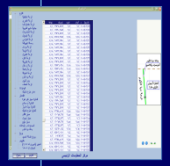
dist_forecast

الاحتياجات المائية لهندسة	بركة السيع		مليون متر مكعب
المتوقع	الحالي	الفترة	السنة
1.52	1.53	16	2006
1.53	1.18	17	2006
1.16	0.36	18	2006
0.90	0.51	19	2006
0.63	0.44	20	2006
0.56	0.49	21	2006
0.55	0.55	22	2006
0.57	0.55	23	2006
0.55	0.52	24	2006
0.52	0.55	1	2007
0.55	0.55	2	2007
0.55	0.67	3	2007
0.67	0.69	4	2007
0.69	0.86	5	2007
0.88	0.85	6	2007
0.87	0.57	7	2007
0.80	0.59	8	2007
0.76	0.71	9	2007

Technological

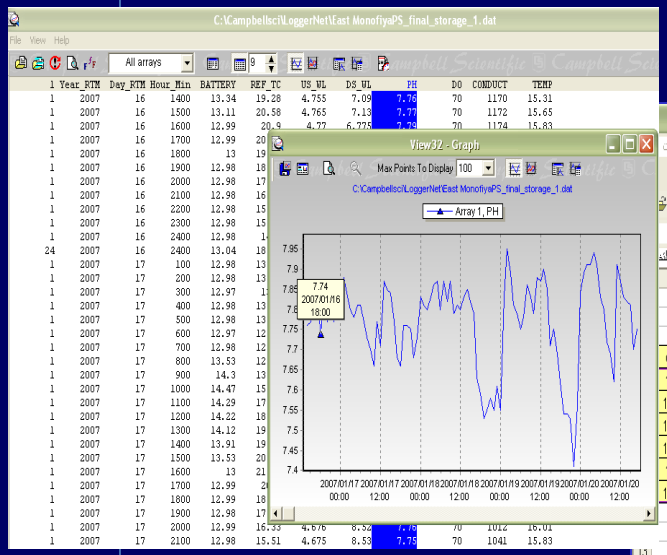
Development of Integrated Management and Planning Framework

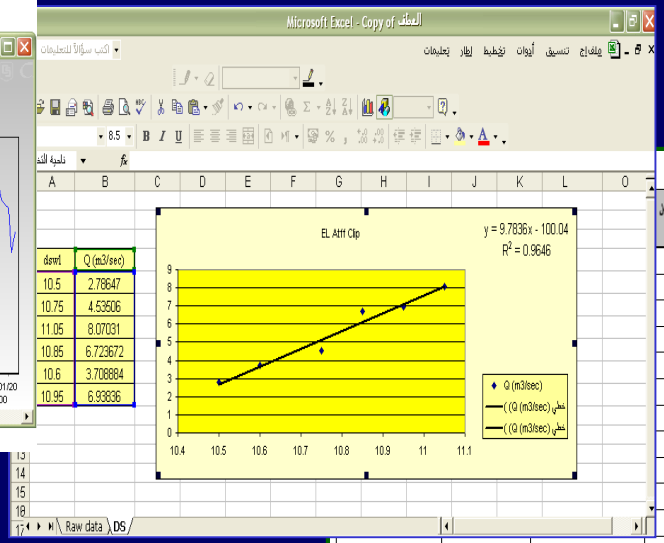
- **Database Development & management**



Water Levels

Water Levels and Discharge





حصة الهندسة (م.م٣/يوم)

التاريخ	تصرف مدخل جنابية مليج	تصرف مخرج قطارة حجز كفر غرة	تصرف مدخل المطف لك ه-15	تصرف مدخل ترعة دبا الكوم	تصرف المداخل
2007/05/01	0	0	635,502	120,659	756,162
2007/05/02	0	0	391,465	108,674	500,139
2007/05/03	0	0	342,658	132,645	475,303
2007/05/04	0	0	415,869	108,674	524,543
2007/05/05	0	0	415,869	132,645	548,514
2007/05/06	0	0	537,888	108,674	646,561
2007/05/07	0	0	367,062	108,674	475,736
2007/05/08	0	0	293,851	96,689	390,539
2007/05/09	0	0	489,080	96,689	585,769
2007/05/10	0	0	489,080	108,674	597,754
2007/05/11	0	0	489,080	84,703	573,783
2007/05/12	0	0	489,080	108,674	597,754
2007/05/13	241,652	0	562,291	96,689	900,632
2007/05/14	241,652	0	562,291	96,689	900,632
2007/05/15	241,652	0	415,869	84,703	742,224
المجموع	724,956	0	6,896,936	1,594,153	9,216,045

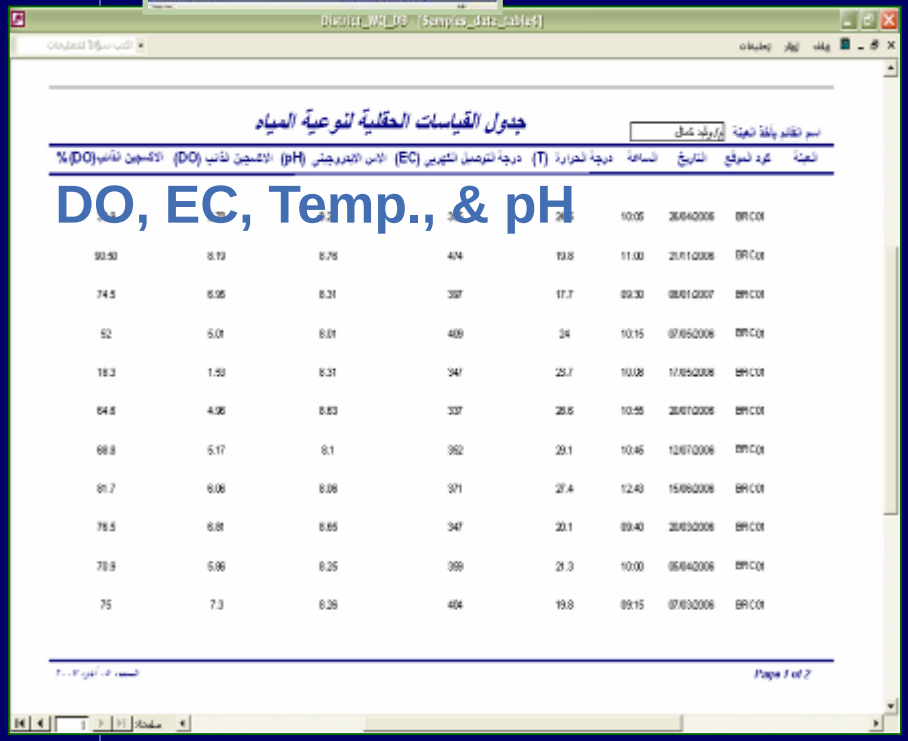
597,754	597,754	0
900,632	900,632	0
900,632	900,632	0
742,224	742,224	0
9,216,045	9,216,045	0

Technological

Development of Integrated Management and Planning Framework

- **Database Development & management**

Water Quality

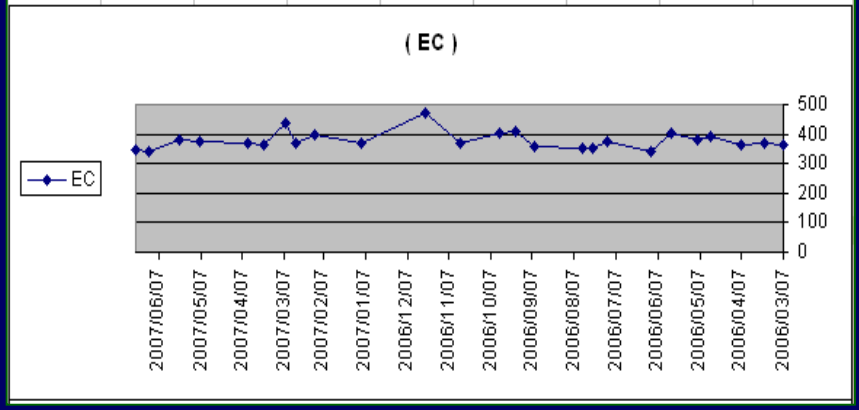


BRC04

Statistics:

Avg of T	Max of T	Min of T	Avg of Ec	Max of Ec	Min of Ec	Avg of pH	Max of pH	Min of pH
24.324	29.8	18.2	377.76	471	339	7.964	8.72	7.29
Avg of Do	Max of Do	Min of Do						
3.546	6.78	0.81						

Charts:

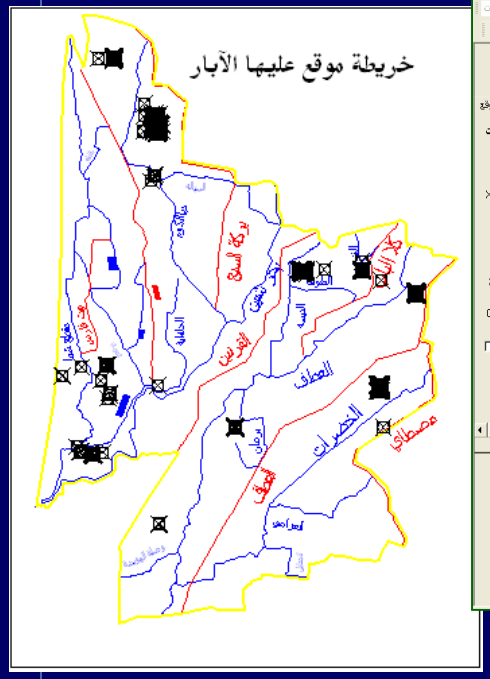


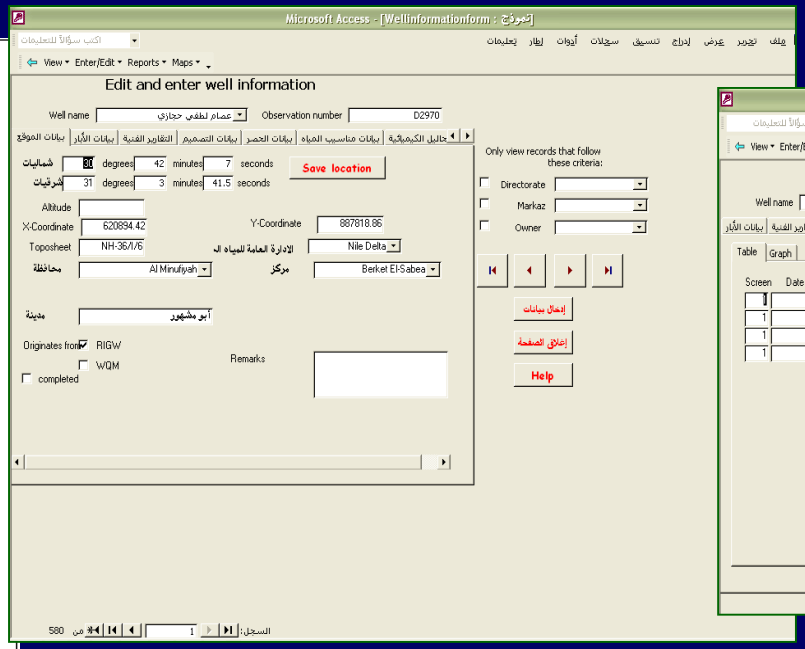
Technological

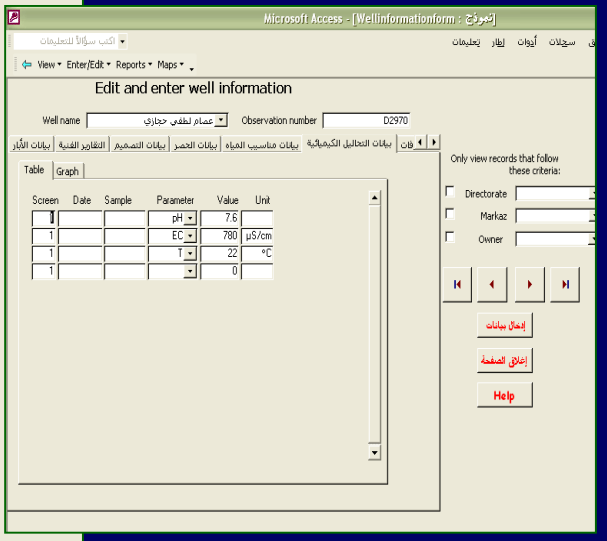
Development of Integrated Management and Planning Framework

- **Database Development & management**

Ground Water



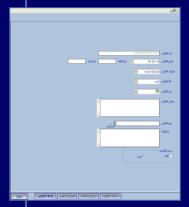


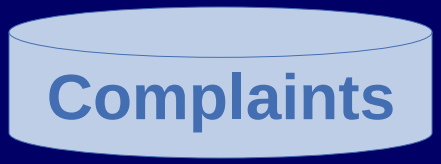


Technological

Development of Integrated Management and Planning Framework

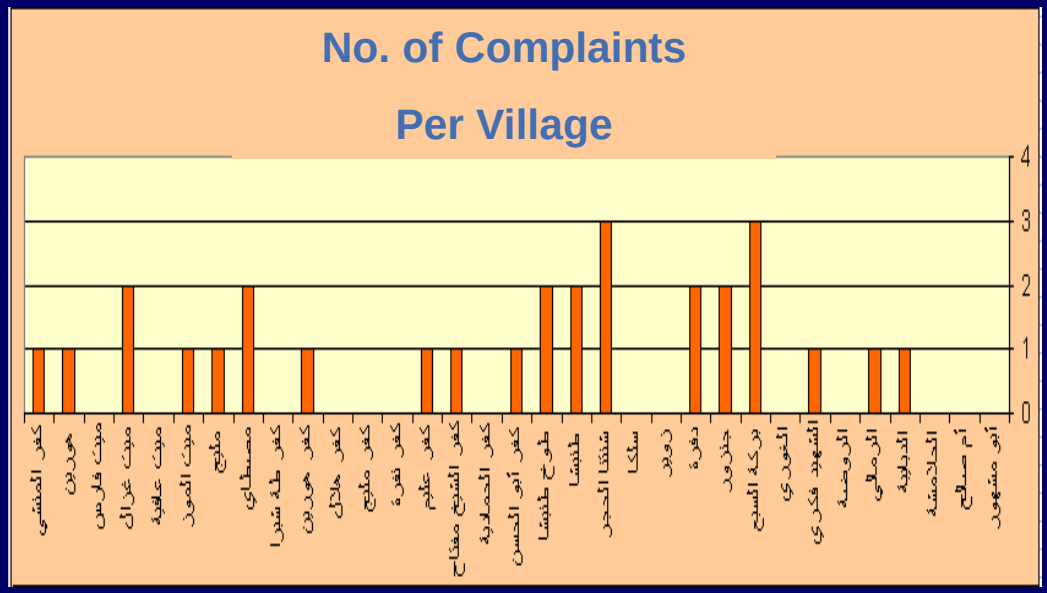
- **Database Development & management**





05/05/2007

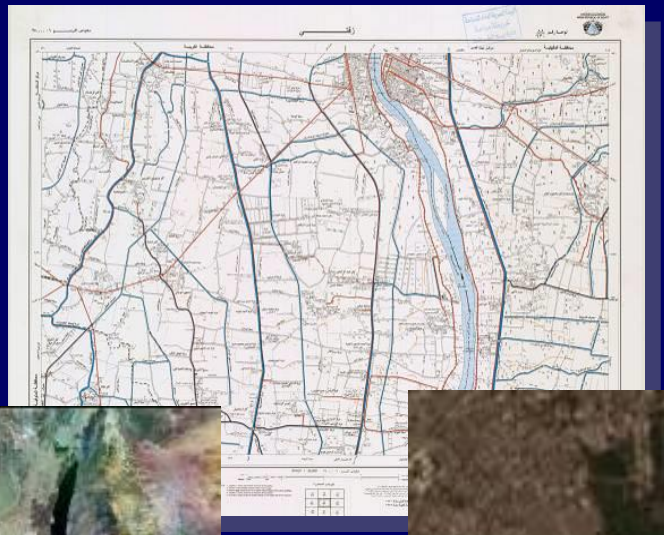
مسلسل	اسم مقدم الشكوى	تاريخ الشكوى	محتوى الشكوى	الإجراء المتخذ	تاريخ المتابعة
1	سيد فتوح مجاهد درويش	2005/08/29	أهالي المصرف المغطي لمطمية أرض ملكي مزروعة ذرة مما تسبب لطمور المياه	تم حصمة	2005/08/30
2	محمد محمد عامر و صبحي عبد	2005/09/28	قام الأهالي بالتعدي على الطريق المؤدي الي عدد ٢ مسجد و صنعوا الطريق الي املاكهم	معاينة	2006/06/26
3	حنان عبد العزيز متولي	2006/02/26	تعديات على كوبري ترعة جنابية مليج	تم حصمة	2006/02/27
4	جمال مخلوفي الشافعي	2006/02/25	التصرف من الجرار الذي يقوم بالقاء الكسح في الترعة	تم حصمة	2006/02/27
5	الوحدة المحلية بتلمجية مليج	2006/03/11	وضع تاتج التطهير للترعة على الطريق رقم ٢٤ بقرية مليج أمام كوبري الشوائي	تم حصمة	2006/03/16
6	سعد يونس عريان	2006/03/22	قيام المواطن شوقي محمد عريان بردم مسقة مقطع شما الخصوصية الأخذه من ترعة جنابية مليج الغربية	تم حصمة	2006/03/29
7	القس اسطفانوس سمير عازر	2006/04/20	عن تعطية ترعة جنابية مليج الغربية	جار التنفيذ	2006/04/27
8	سامح ابراهيم عفيفي	2006/08/21	طلب نقل محبس مياه خارج أرضة	تم حصمة	2006/08/21
9	ما نصر بجريدة الأهرام الفسائي	2006/08/21	تضرر أهالي سكان منطقة الهيشة بمليج من استكمال تعطية مسقة الجمال الخصوصية الأخذم من ترعة مليج الغربية	تم حصمة	2006/09/09



Technological

Development of Integrated Management and Planning Framework

- Digital mapping systems



Technological

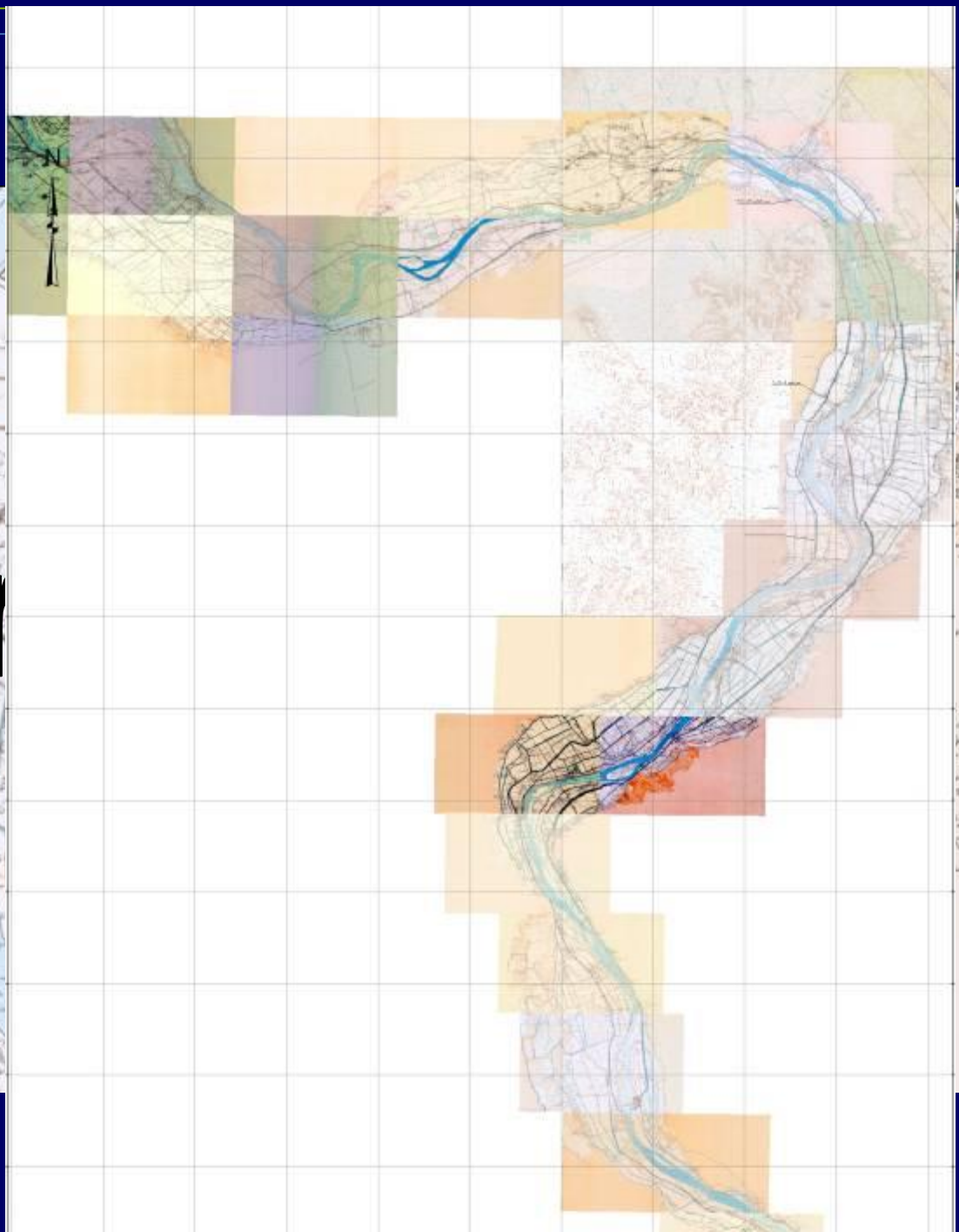
Development of Integrated Management and Planning Framework

- **Digital mapping systems**

1. **Base map development**
   - Paper Maps (1:25000, 1:50000)
   - Scanning
   - Clipping
   - Geo-referencing

Technological

Geo-Referncir

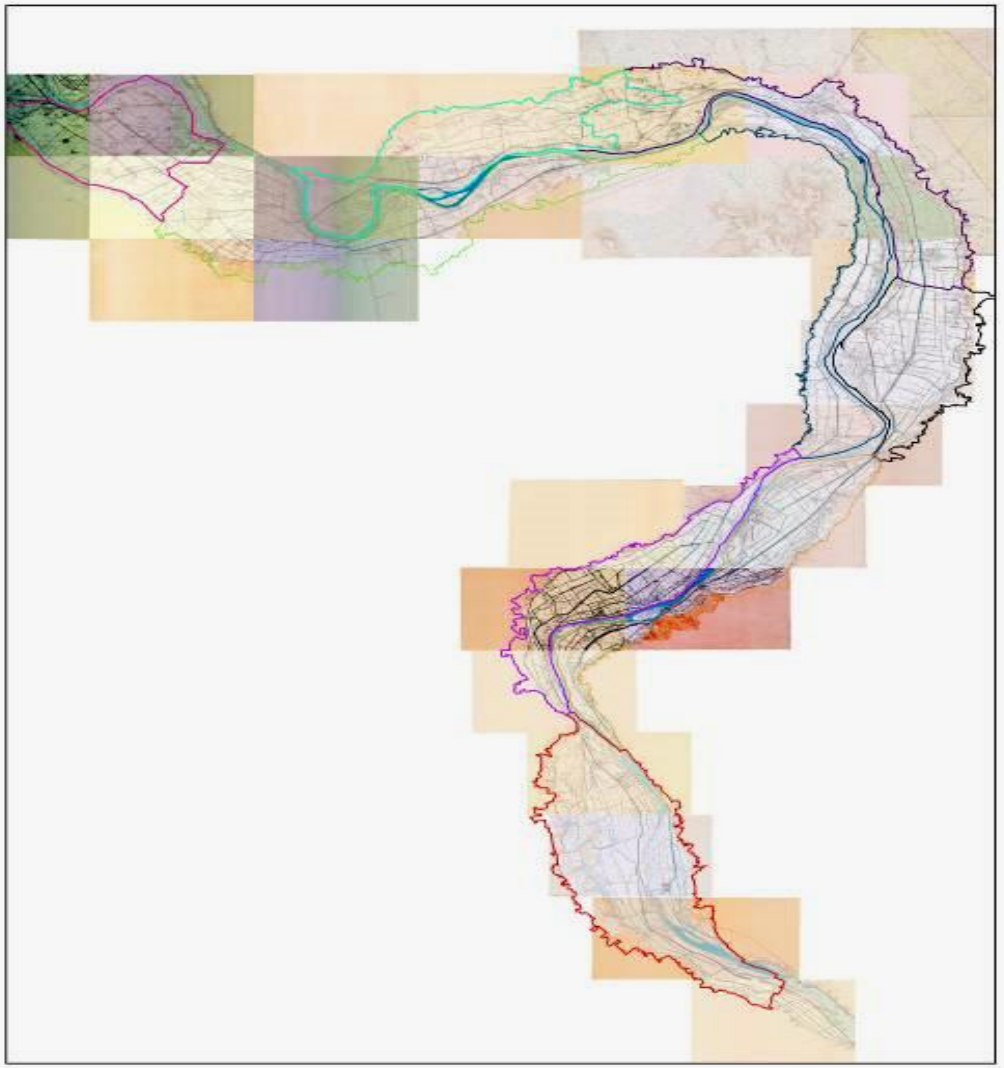


Technological

Development of Integrated Management and Planning Framework

- **Digital mapping systems**

  2. Official Boundary delineation

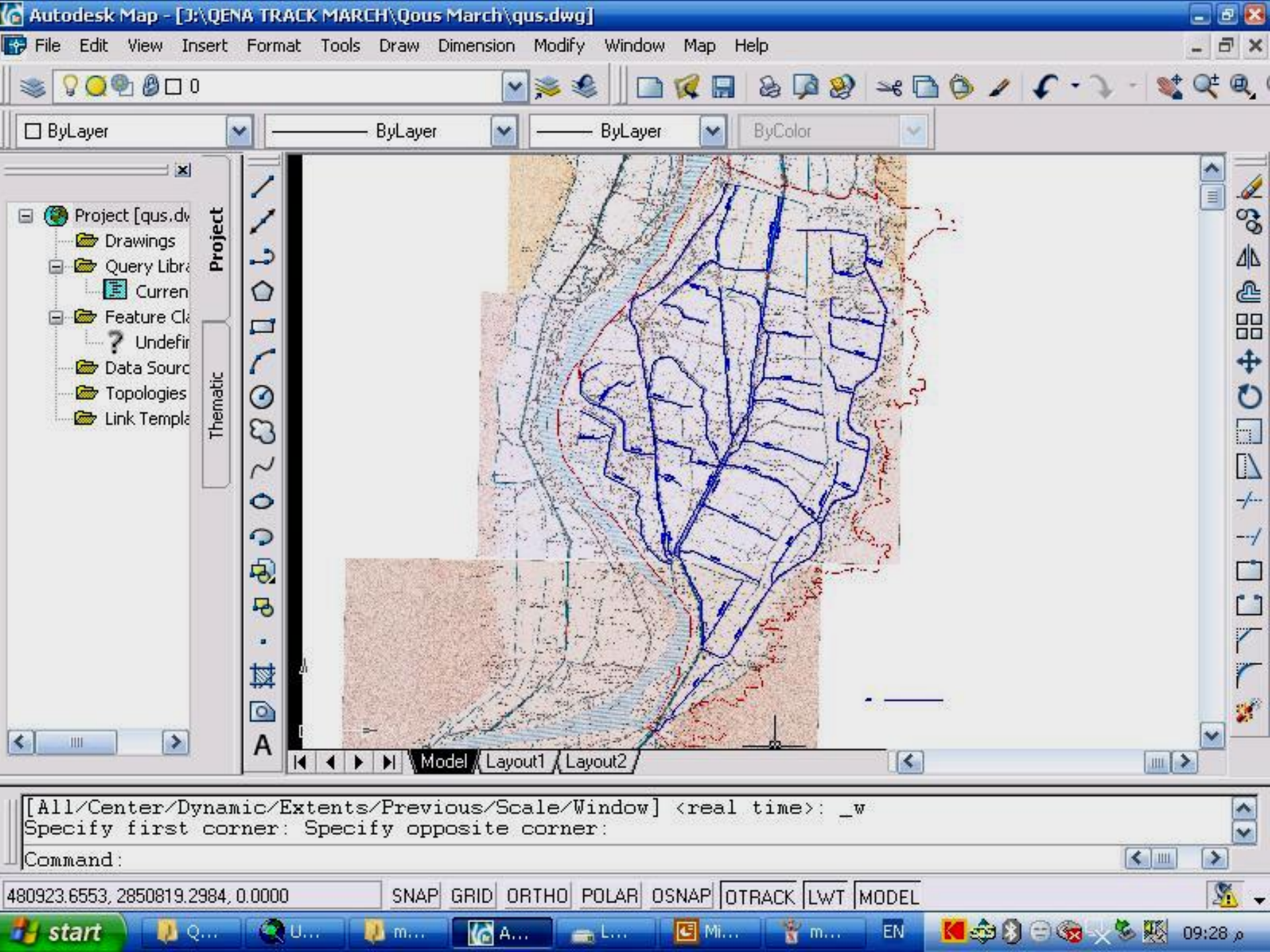


Technological

Development of Integrated Management and Planning Framework

- Digital mapping systems

3. Physical System delineation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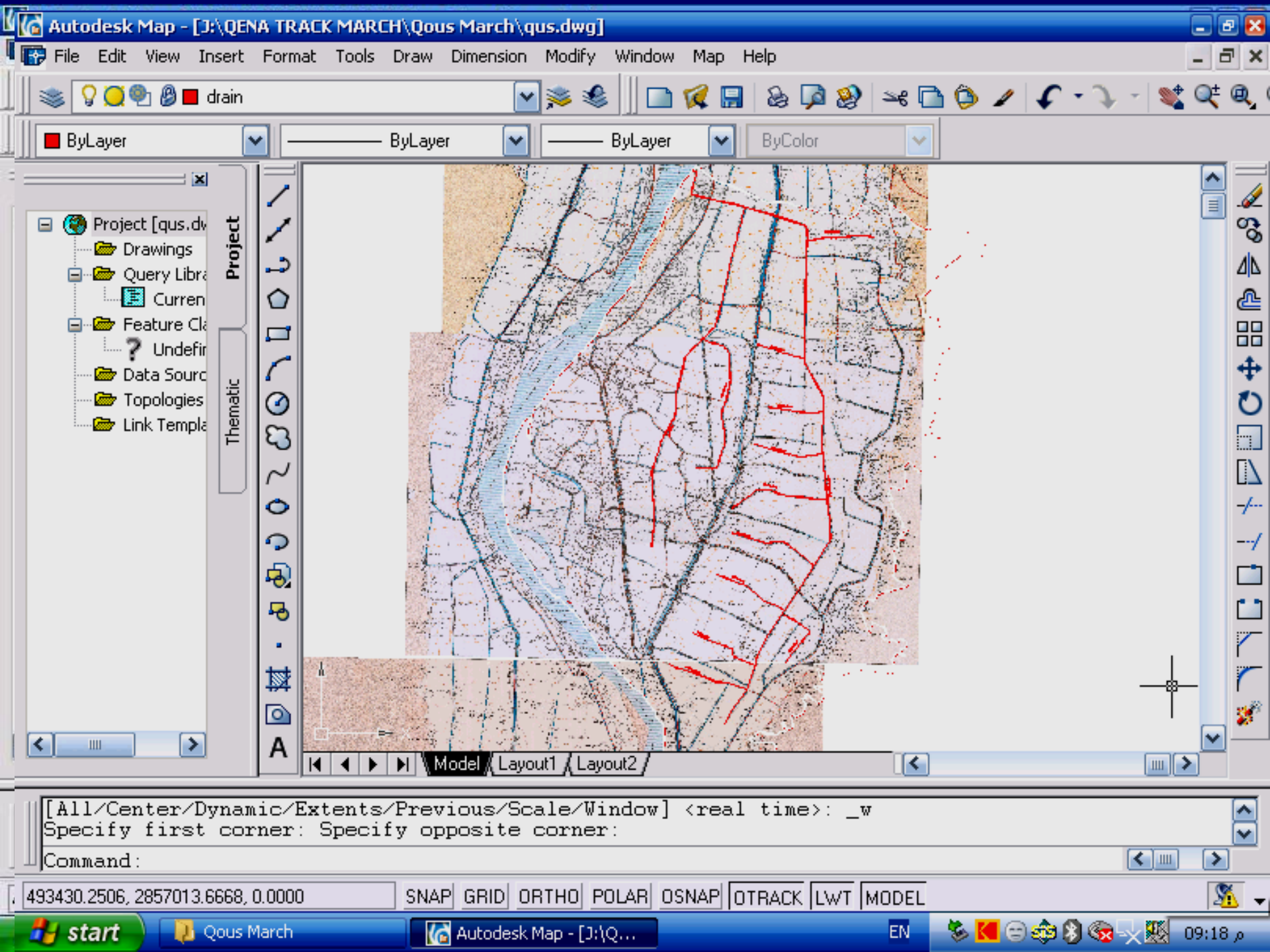
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Pump Stations
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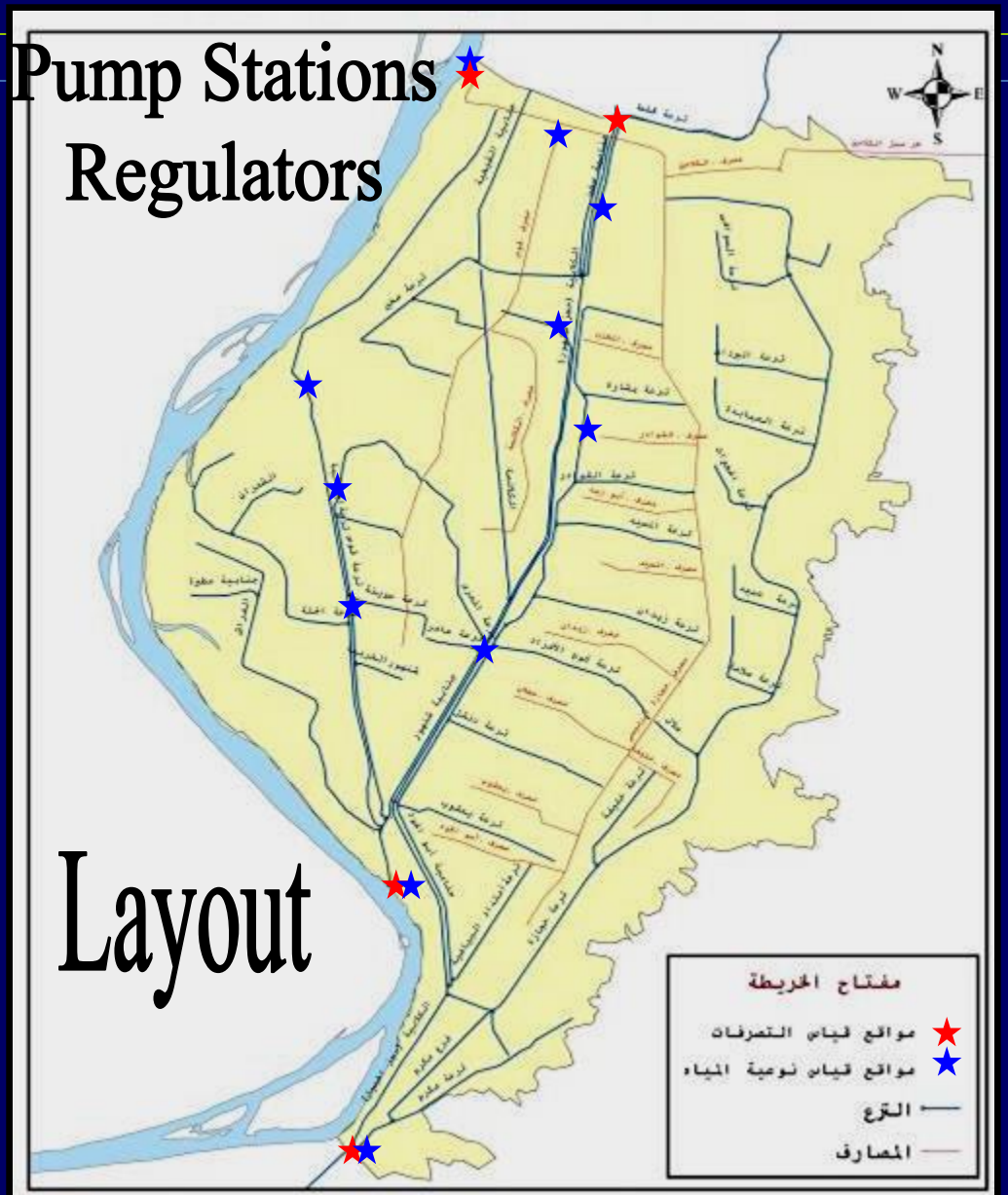

Layout

Technological

Development of Integrated Management and Planning Framework

- Digital mapping systems

4. Branch Canal Boundary delineation and Area Served Identification


N
Branch Canal
Boundary
Delineation
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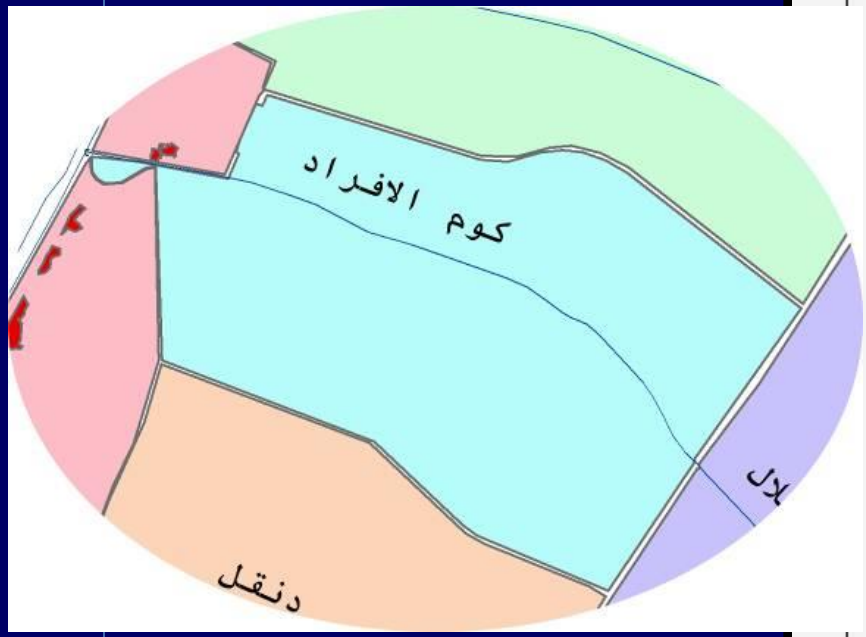
©2006 Google
Pointer 25°55'15.70" N 32°50'13.92" E
Streaming 100%
Eye alt 2.89 km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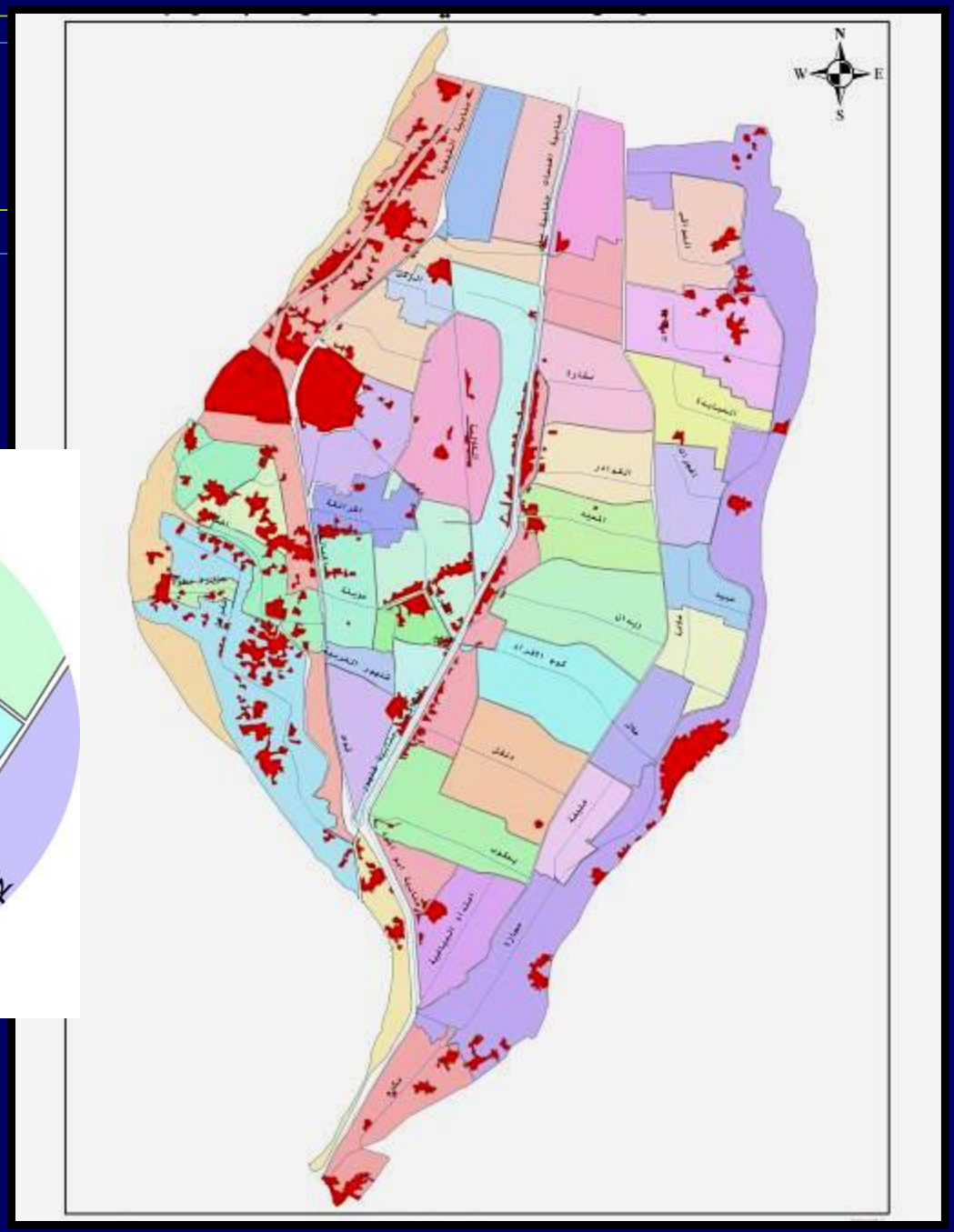
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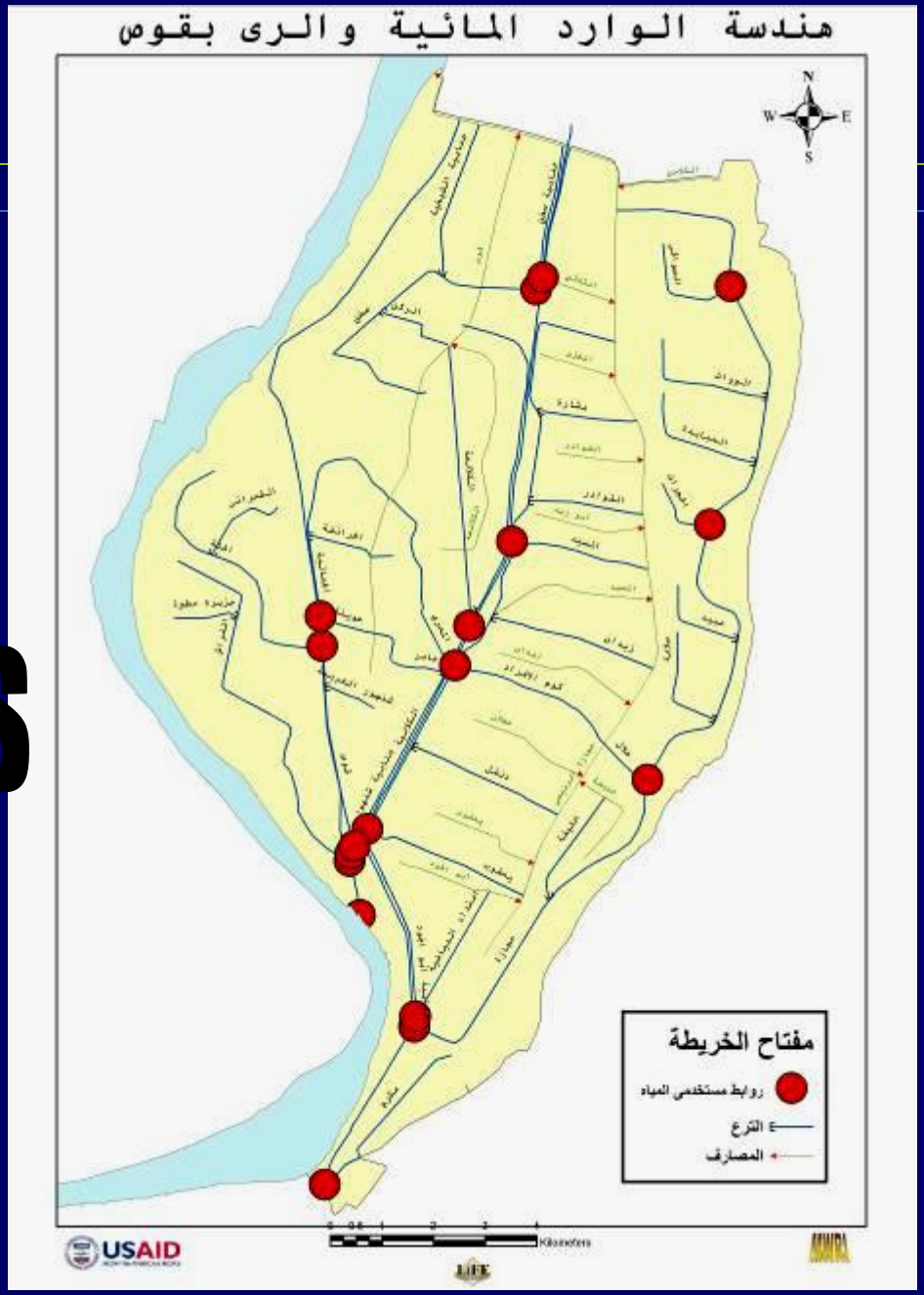
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District	Qous
BCWUA_Name	Sekheen & Al Moukhamasat
A_Name	رابطة ترعة ج.سخين + ج.المخمسات
Chairperso	Abou Amer Ahmed Osman
Male_users	300
Female_use	15
Tot_member	315
Estab_Decr	OK
MOU	OK
Internal_R	OK
Priority_L	OK
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Maintenance

BCWUA participated in cleaning upstream covered area to allow better water flow (El-Koam canal in Santa)

BCWUA participated in removing 20 out of 30 violations on the canal (IbrahimAfandi canal in Quesna)

BCWUA participated in maintenance tile drainage network on the canal (El Kanan canal in Awald Sakr)

Before After

45 Meters

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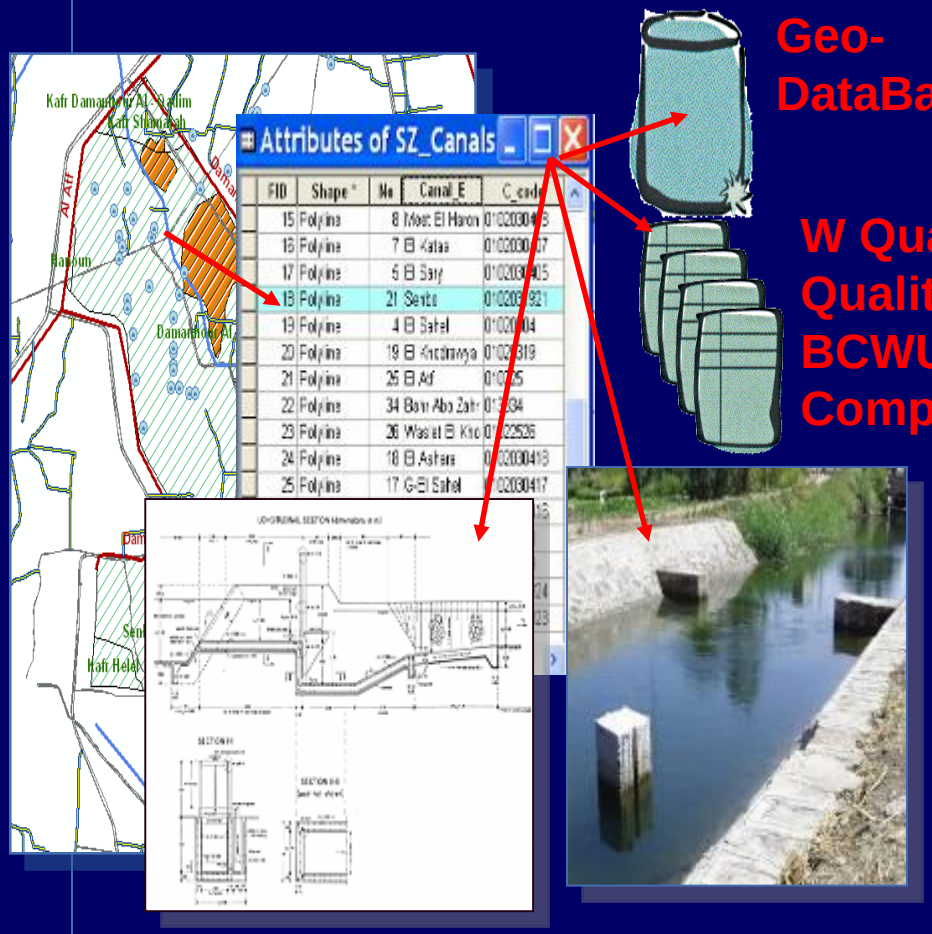
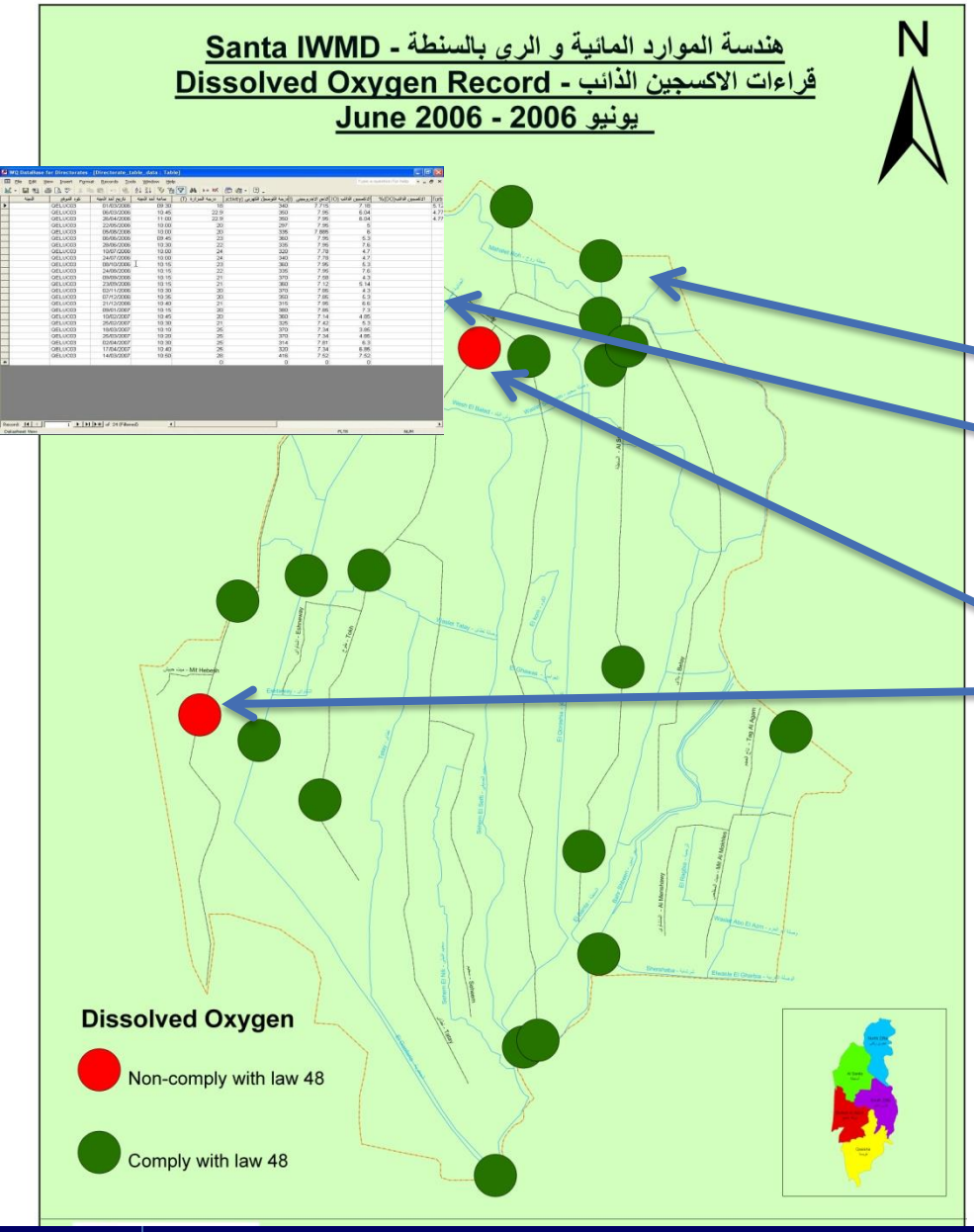


Geo-DataBase

W Quant. W Quality BCWUAs Complaints

INTEGRATED INFO. SYS.



Integrated IS

- WQ Monitoring Sites,
- WQ Measurements & Data,
- Law 48 Limits,
- Identify Hot Spots,
- Call for Action.

Example:

DO data for a District during June 2006.

Technical

Development of Integrated Management and Planning Framework

- Decision Support Tool

1) the integrated operational plan that target water allocation and distribution,

2) the integrated maintenance plan.

A parallel plan is also introduced to IWMDs to address and manage water quality considerations.

Water Quantity Mgmt.

Infrastructure Mgmt.

Water Quality Mgmt.

Technical

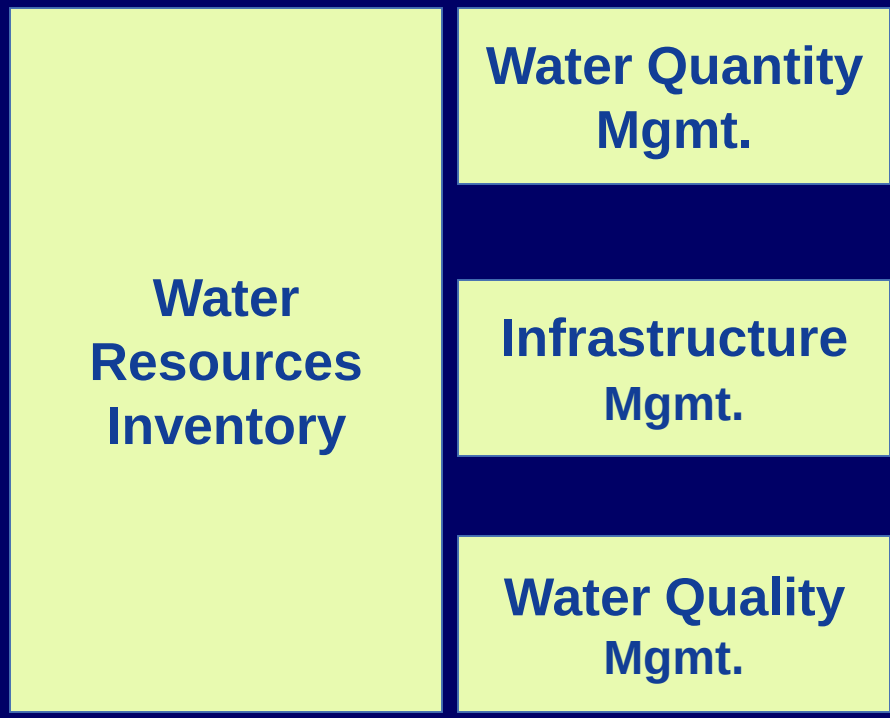
Development of Integrated Management and Planning Framework

- **Decision Support Tool**

1) the integrated operational plan that target water allocation and distribution, and

2) the integrated maintenance plan.

A parallel plan will be also introduced to IWMDs to address and manage water quality considerations.



Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

A. Water Resources Supply Assessment:

1. Actual canal allocations to the District by daily,15-day period for each season
2. Groundwater pumped during the season (official and non-official)
3. Drainage water pumped season (official and non-official)
4. Average monthly and seasonal rainfall

B. Water Resources Demand Assessment

1. Agricultural water demand
2. Municipal water demand
3. Industrial water demand
4. Environmental water demand
5. Navigation water demand
6. Fishing and ecological system water demand
7. Hydropower generation water demand
8. Recreation water demand

Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

Actual allocations from different sources to the District

GW Well	Type (gov/priv)	Use (Irrig/M/I)	Location		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
			GPS	BC													
1																	
2																	
3																	
4																	
Total																	

Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

Actual requirements from different demands at the District

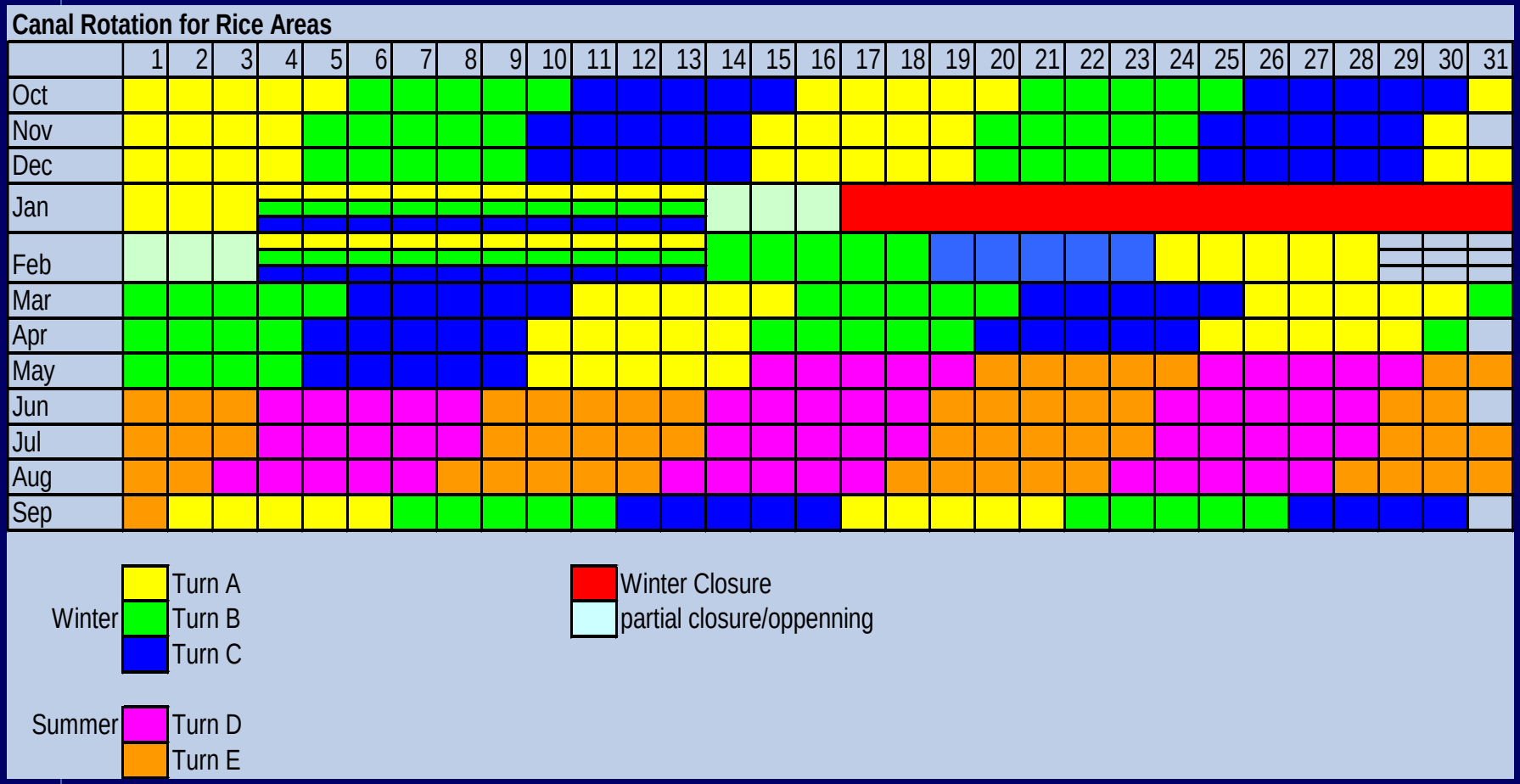
Canal	Demand	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
canal 1	Agriculture													
	Municipal													
	Industry													
	Others													
	Total													
Canal 2														
Total														

Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

C. Water Distribution and Scheduling Plan at the District



Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

D. Conducting Water Balance and water budget analysis

Water Demand (m.m3)			Water Supply (m.m3)	
1. Agriculture			1- Canal	230
1-1 Area Served (f)	40,000		2- Rainfall	
1-2 Rice Area (f)	10,000		3. Drainage Reuse	
1-3 Sugar Cane Area (f)	0		3-1 Official	2
1-3 Water Req (MISD data)	240		3-2 unofficial	10
2. Municipal	1.8		4. Groundwater	
3. Industry	1.8		4-1 Governmental	1.5
4. Other			4-2 Individual	0.5
			Total Non-conventional Water (3+4)	14
Total Water Demand	243.6		Total Water Supply	244

Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

E. Decision for Water Resources Supply/Demand Management

The local water resources system is a very complex system where careful reconciliation of physical, economical, environmental and other aspects is requisite.

The aim of the local DSS is to model the relevant phenomena based on all interdependencies, using the data acquired from the local system which is considered on Egypt a very difficult task.

The complexity of the physical system is so large that most of the combined effort of everyone involved in creating support systems failed to interpret the system in a way that help improving the decision making process in a professional manner.

Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

E. Decision for Water Resources Supply/Demand Management

E.1. Water Allocation and Demand Demonstration and Forecasting

As bi-weekly, monthly, seasonally, and annual figures are obtained for water demands and allocations, the following figures can be demonstrated to understand and develop the relation between demand and allocation for different districts in one directorate.

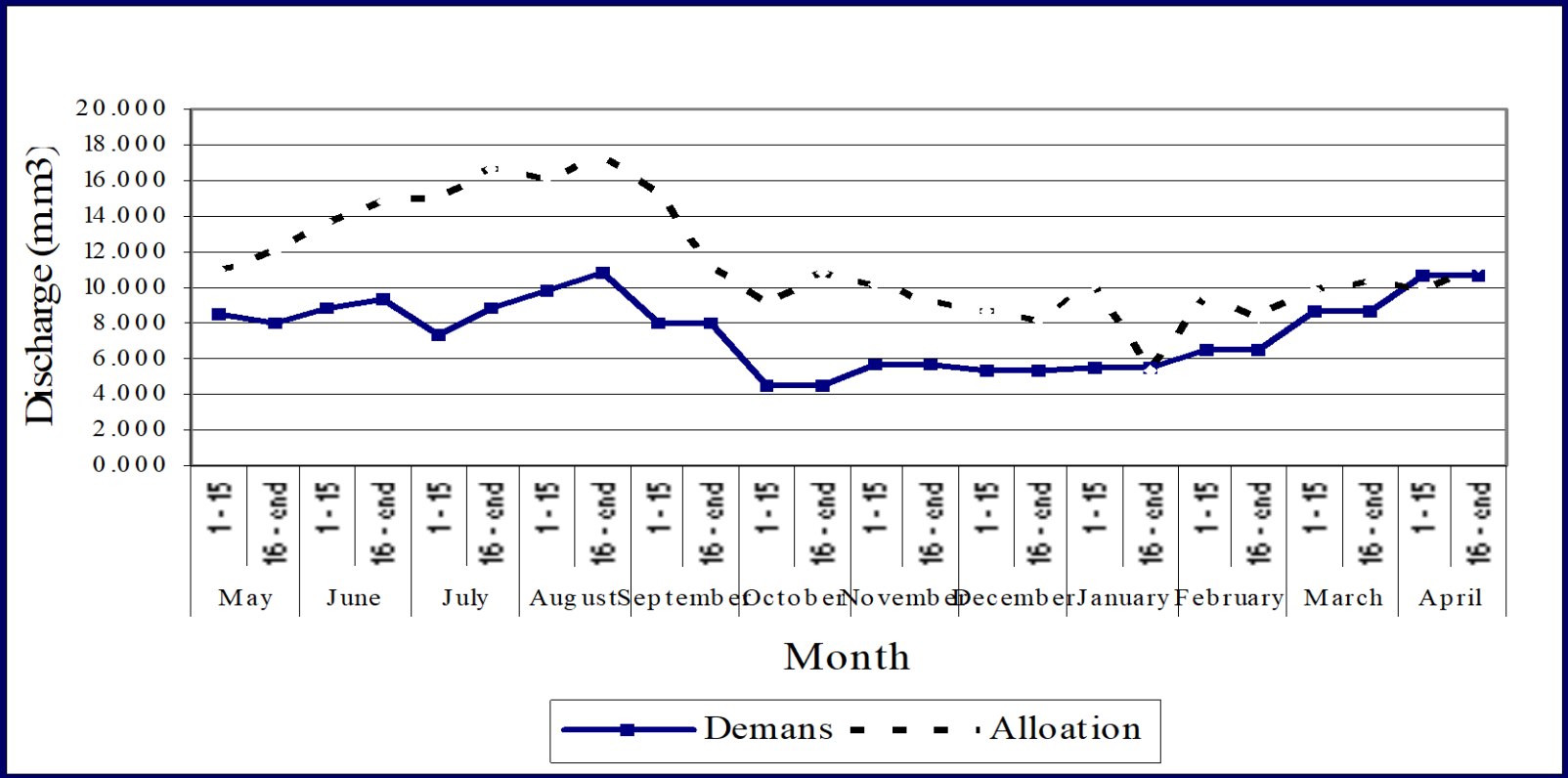
Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

E. Decision for Water Resources Supply/Demand Management

E.1. Water Allocation and Demand Demonstration and Forecasting



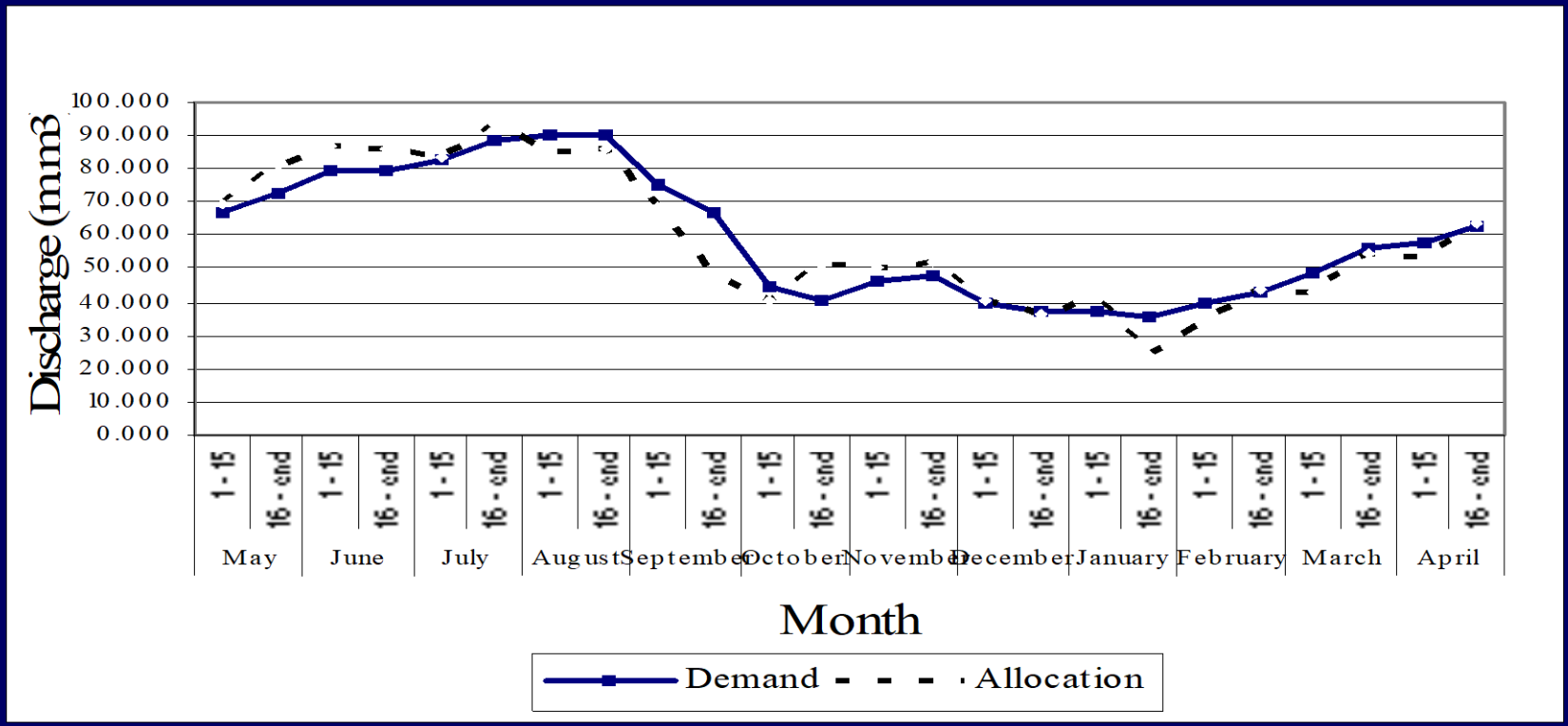
Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

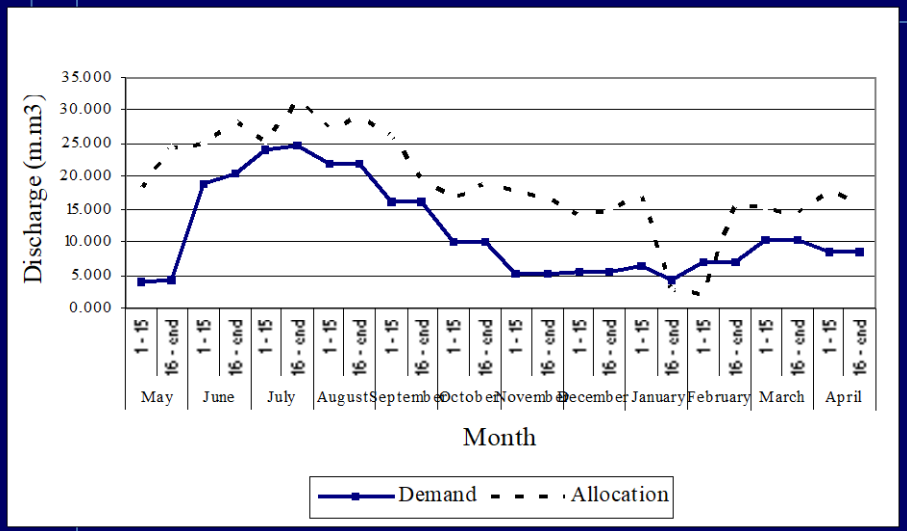
E. Decision for Water Resources Supply/Demand Management

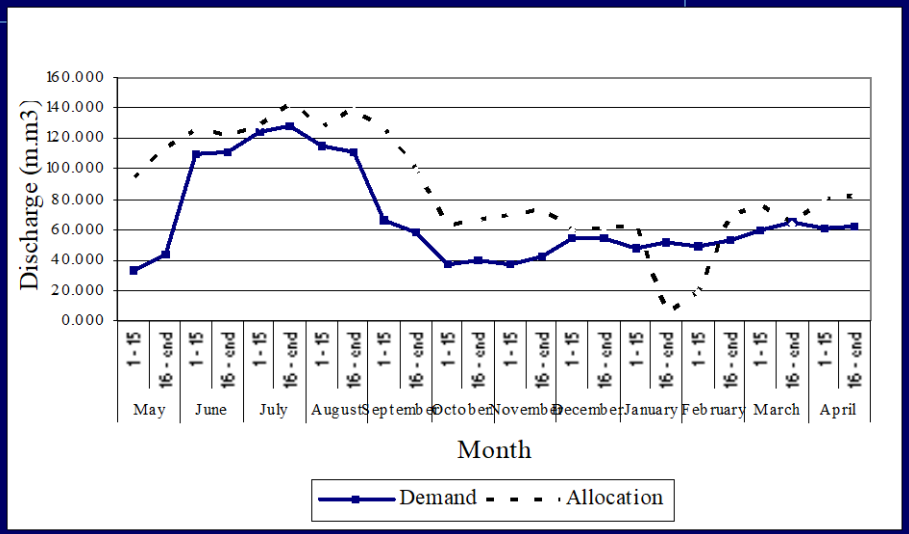
E.1. Water Allocation and Demand Demonstration and Forecasting

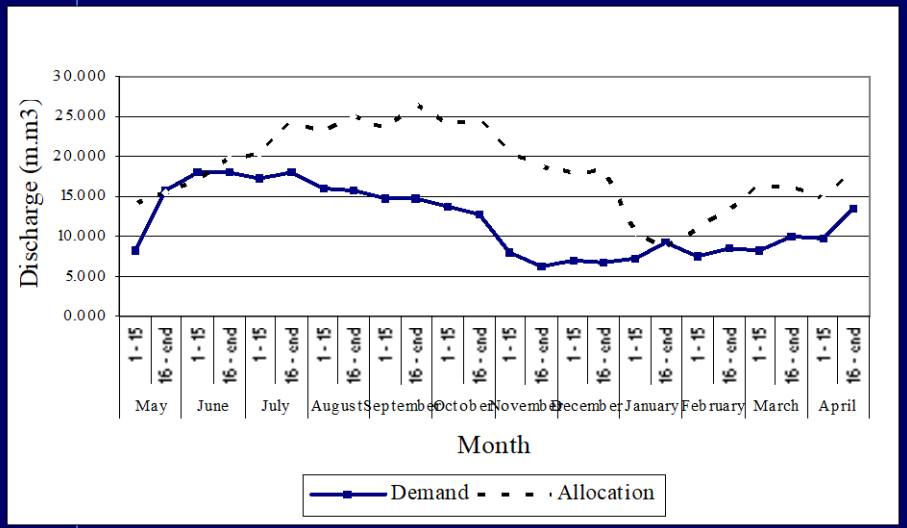


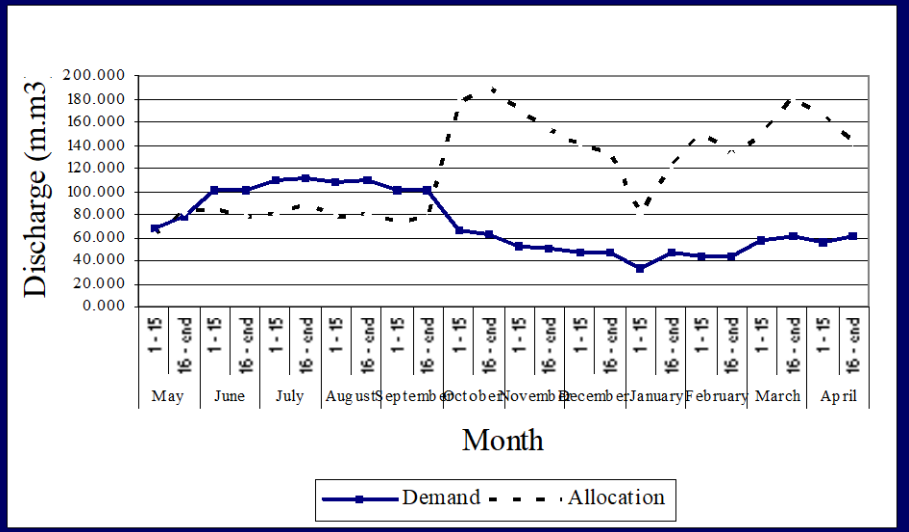
Technical

Development of Integrated Management and Planning Framework









1) The Integrated Operational Plan

E. Decision for Water Resources Supply/Demand Management

E.1. Water Allocation and Demand Demonstration and Forecasting

Studying the above figures, several questions and explanations can be concluded

? effect of physical system condition on water allocations,
? effect of over allocation on drainage system performance,
? effect of current allocations on equity standards,
? effect of current allocations on water users satisfactions and complaints,
? winter closure period planning …etc.

Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

E. Decision for Water Resources Supply/Demand Management

E.2. Water Management Alternatives

Evaluation Criteria and BC Categorization

BC Demand indexing:

area served,
demand pattern for area served (crops, drinking, industry, environment, others),
No. and distribution of users,
Economic & Social Returns
soil properties,
climate.

RANK (PD%)
High
Medium
Low

Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

E. Decision for Water Resources Supply/Demand Management

E.2. Water Management Alternatives

Evaluation Criteria and BC Categorization

	RANK (PS%)		
BC Supply and Distribution Criteria:	**Difficult**	**Medium**	**Easy**
Network maximum and minimum capacity (for BCs, drains, and total)			
BC maintenance categories			
BC water distribution indexing (category for area served, length, layout, rotation schedule, No. and distribution of users, complaints frequency, violation status, control structures status, soil properties, water quality, climate, dependency of other water ways, dependency of different water resources.			

Technical

Development of Integrated Management and Planning Framework

1) The Integrated Operational Plan

E. Decision for Water Resources Supply/Demand Management

E.2. Water Management Alternatives

Canal	Demand	Total m.m3 (table4.14)	Alternative 1			Alternative 2			Alternative 3		
			PD%	PS%	Total	PD%	PS%	Total	PD%	PS%	Total
canal 1	Agriculture										
	Municipal										
	Industry										
	Others										
	Total										
Canal 2											

1) The Integrated Operational Plan

E. Decision for Water Resources Supply/Demand Management

E.2. Water Management Alternatives

Financial and Social (F/S) Comparison of Water Allocation Alternatives

	Alternative 1	Alternative 2	Alternative 3
Associated Cost Percentage			
Users Preferences (%)			
F/S Preference %			

2) The Integrated Maintenance Plan

There are several reasons for poor maintenance:

- insufficient funds made available to the management;
- lack of interest by the farmers in participating or collaborating in the maintenance work;
- poor organization of the work.

The most widespread causes for poor maintenance in public irrigation schemes are the lack of sufficient funds or inefficient allocation of funds for servicing and repair. As these not only affect the maintenance but the whole water management organization, it should be dealt with efficient planning and

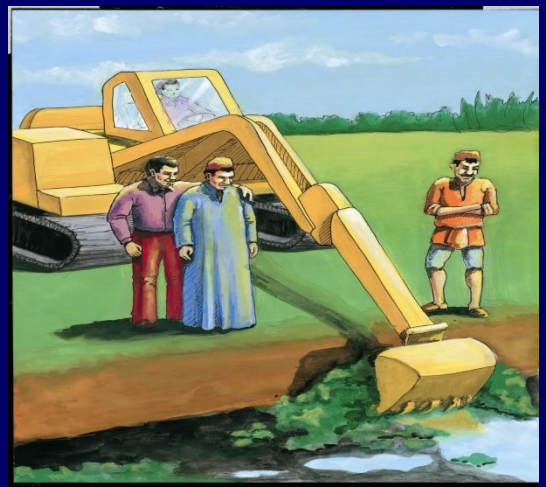
2) The Integrated Maintenance Plan

Objectives

The objectives of the maintenance plan are to:

a. locate, identify, assess and prioritize maintenance needs for both canals and drains.

b. present the priority needs in an integrated budget request to the General Director and the MWRI Irrigation Sector.



2) The Integrated Maintenance Plan

2.1. Integrated Infrastructure Management System

A. Infrastructure Replacement Cost

Capacity of Works (cms)	Unit Replacement Costs by Type of Conveyance Works				
	Earth Canal (L.E./m)	Pitched Canal (L.E./m)	Lined Canal (L.E./m)	Pitched and Lined Canal (L.E./m)	Concrete Canal (L.E./m)

Technical

Development of Integrated Management and Planning Framework

2) The Integrated Maintenance Plan

2.1. Integrated Infrastructure Management System

B. Physical State of the Infrastructure. Rating System Based on:

- **Condition,** — **Open Channels**

bank condition;	6 Points
control structures;	6 Points
seepage;	6 Points
potential for failure;	6 Points

- **functional Adequacy,** — **Yes** / **No**

- **Utilization** — **District Qualifier**: ratio of annual actual irrigated area to assessed irrigation area

2) The Integrated Maintenance Plan

2.1. Integrated Infrastructure Management System

B. Physical State of the Infrastructure. Rating System Based on:

- Condition,
- functional Adequacy,
- Utilization

Poor	4 – 10 Points
Fair	11 -17 Points
Good	18 -24 Points

Category of works	Replacement Cost (Million L.E.) By Condition Rating			Total Value (Million L.E.)
	GOOD	FAIR	POOR	
Conveyance				
Drainage				
Major Structures				
Total				

2) The Integrated Maintenance Plan

2.1. Integrated Infrastructure Management System

- The IIMS provides an effective mean of supporting water infrastructure capital asset management and planning.

- The IIMS at a district or a directorate can predict exactly;

Capital investment	next 5 to 10 years	Poor
	next 10 to 30 years	Fair
	next 30 to 50 years	Good

- This when applied in all districts and directorates, will be an essential tool for management and planning of national water infrastructure capital assets.

2) The Integrated Maintenance Plan

2.2. Annual Maintenance Management and Planning

A. Set Ranking Criteria

CRITERION		CATEGORY	RANGE	SCORE
1-	Area Served	Small	< 2000 feddans	0.5
		Medium	≥ 2000 - 5000 feddans ≤	1.0
		Large	≥ 5000 - 10000 feddans ≤	1.5
		Very Large	> 10000 feddans	2.0
2-	% of length passing through housing area(s)	None	0	0.0
		Small	< 20%	0.5
		Medium	≥ 20% - 50% ≤	1.0
		Large	> 50%	1.5
3-	Number of housing units (Villages)	None	0	0.0
		Few	1	0.5
		Medium	≥ 2 - 5≤	1.0
		Many	> 5	1.5
4-	Does not serve water treatment plant(s)			0.0
	Serves water treatment plant(s)			2.0
5-	Does not serve important factory(ies)			0.0
	Serves important factory(ies)			1.0
6-	Users do not complain			0.0
	Users complain			2.0

Technical

Development of Integrated Management and Planning Framework

2) The Integrated Maintenance Plan

2.2. Annual Maintenance Management and Planning

B. Ranking Canals/Drains

			Scores					Total score (max 10)	Rank
Feeder canal	Canal name	Area served	Area (1-3)	Houses (0-1.5)	Villages (0-1.5)	Water supply (0-3)	Factories (0-1)		

2) The Integrated Maintenance Plan

2.2. Annual Maintenance Management and Planning

C. Assessment of Maintenance Needs

- Weed control works (manual, mechanical and biological)
- Silt and garbage removal works (by hydraulic excavator, dragline machine and floating suction line machine)
- Embankment and bank repair (bank leveling and stability, stone pitching, removal of obstacles and small trees)
- Structural repair (welding, lubrication, painting, replacement, removal of obstacles)

2) The Integrated Maintenance Plan

2.2. Annual Maintenance Management and Planning

D. Prepare Prioritized Form of Maintenance Needs

D.1. The importance of the channel (as prioritized earlier);
D.2. The criticality of the need, based on:

- When was the relevant channel or reach maintained;
- What would be the consequences if this work is not carried out (rapid degradation or not, significant impact on the water supply or not);
- If there is a strong demand from the BCWUA;
- The cost of maintenance work needed (would it absorb great part of the available maintenance budget; in this case it is better to include this work in a special request to the Irrigation sector).

2) The Integrated Maintenance Plan

2.2. Annual Maintenance Management and Planning

E. Assessment of Volumes and Costs

F. Submit Integrated Maintenance Plan

General Integrated Directorate of .....
Integrated Water Management District of .....

CATEGORY OF MAINTENANCE WORK	MAINTENANCE METHOD	UNIT	QUANTITY	UNIT COST (LE)	COST (LE)
Weed Control	Manual Mechanical Biological	Kilometer Kilometer Kilometer			
Sub-total					
Silt and Garbage Removal	De-silting Garbage Removal Obstacles Removal	Cubic Meter Cubic Meter/ Lump Sum Number/ Lump Sum			
Sub-total					
Embankment and Bank Repair	Stone Pitching Plain Concrete Lining Retaining Walls Sheet Piles	Cubic Meter Cubic Meter Cubic Meter Cubic Meter/ Kilometer			
Sub-total					
Gates and Metal Parts Repair	Welding Painting Cleaning of Garbage	Number Square Meter/ Lump Sum Cubic Meter/ Lump Sum			
Sub-total					
Bridges Repair	Welding Painting Concrete Repair Cleaning of Garbage	Number Square Meter/ Lump Sum Cubic Meter/ Lump Sum Cubic Meter/ Lump Sum			
Sub-total					
Pumps Repair	Repair/ Maintenance	Number			
Sub-total					
Repair of Aqueducts, Siphons and Coverings	Cleaning Repair Concrete Repair Flushing	Number/ Lump Sum Square Meter/ Lump Sum Cubic Meter/ Lump Sum Number/ Hours			
Sub-total					
Cleaning of Sub-surface Drainage	Operation and Maintenance of Flushing Machines				
Sub-total					
GRAND TOTAL					

Technical

Development of Integrated Management and Planning Framework

3) Water Quality Improvement Plan

Objectives

Decentralization of water management decision-making is expected to encourage 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 s wastes.

This overall objective will lead to :

- **Improve water resources quality**
- **Reduce water health hazards**
- **Increase water productivity**

Technical

Development of Integrated Management and Planning Framework

3) Water Quality Improvement Plan

Activities

3.1. Address water quality problem and inventory of pollution.

3.2. Encouraging all stakeholders, including water users, general public, local government, and non-government organizations to participate.

3.3. Introducing alternative methods for the treatment and disposal/use of solid/liquid wastes generated at local level.

3.4. Presenting practical methods for solid waste disposal and management at local level.

3) Water Quality Improvement Plan

Activities

3.5. Developing cooperative linkages with local councils, governorate offices, the private sector, IWMDs, water user organizations, and other groups as identified to assess options for improving disposal of liquid and solid wastes in project areas.

3.6. Providing technical assistance and training to local organizations and the private sector entities initiating these activities.

3.7. Provide public awareness and outreach on healthy water resources management concepts and actions.

3) Water Quality Improvement Plan

Waste Management Scenarios/Alternatives

A. Evaluation of Waste Management Alternatives

The criteria were used in selecting the most appropriate solution:

- Estimated revenues from the suggested collection fee able to support the project and generate a reasonable profit to ensure the project's sustainability

- Cost of investment and running expenses

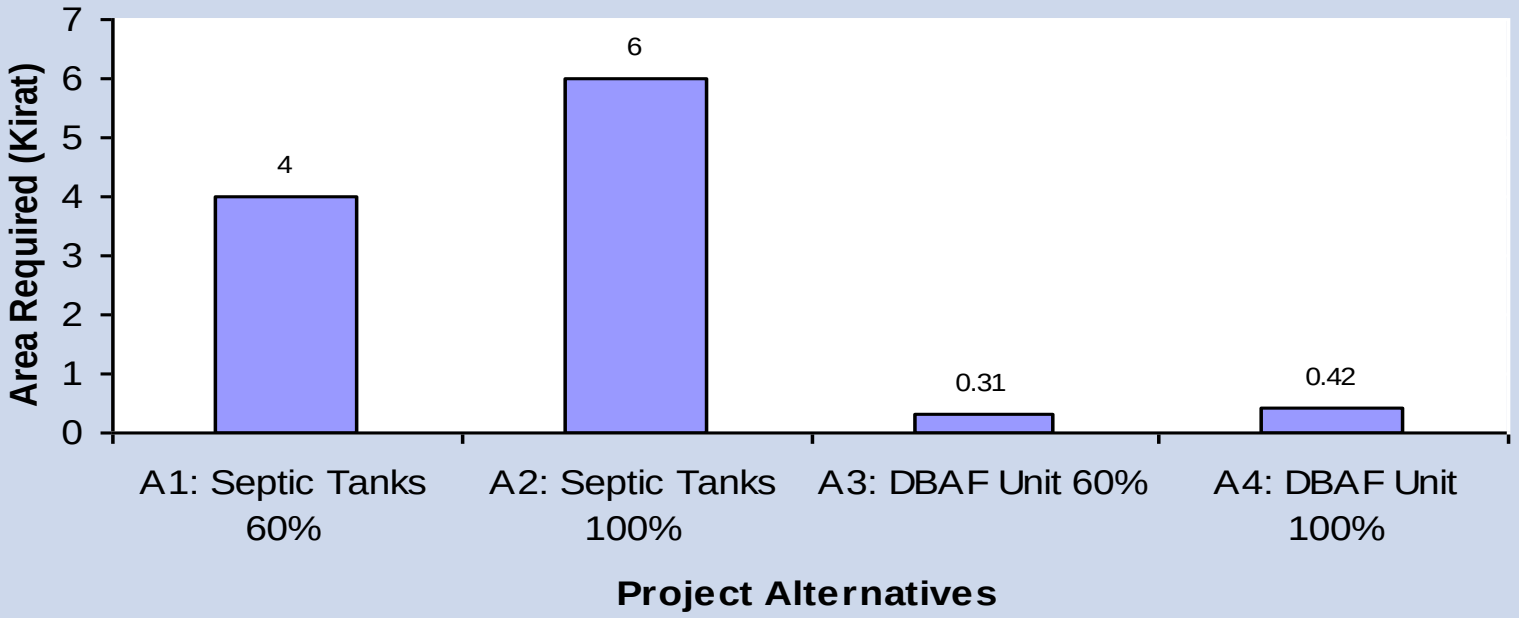
- Effectiveness of service delivery/Associated Risks.

B. Cost/Benefit Analysis

3) Water Quality Improvement Plan

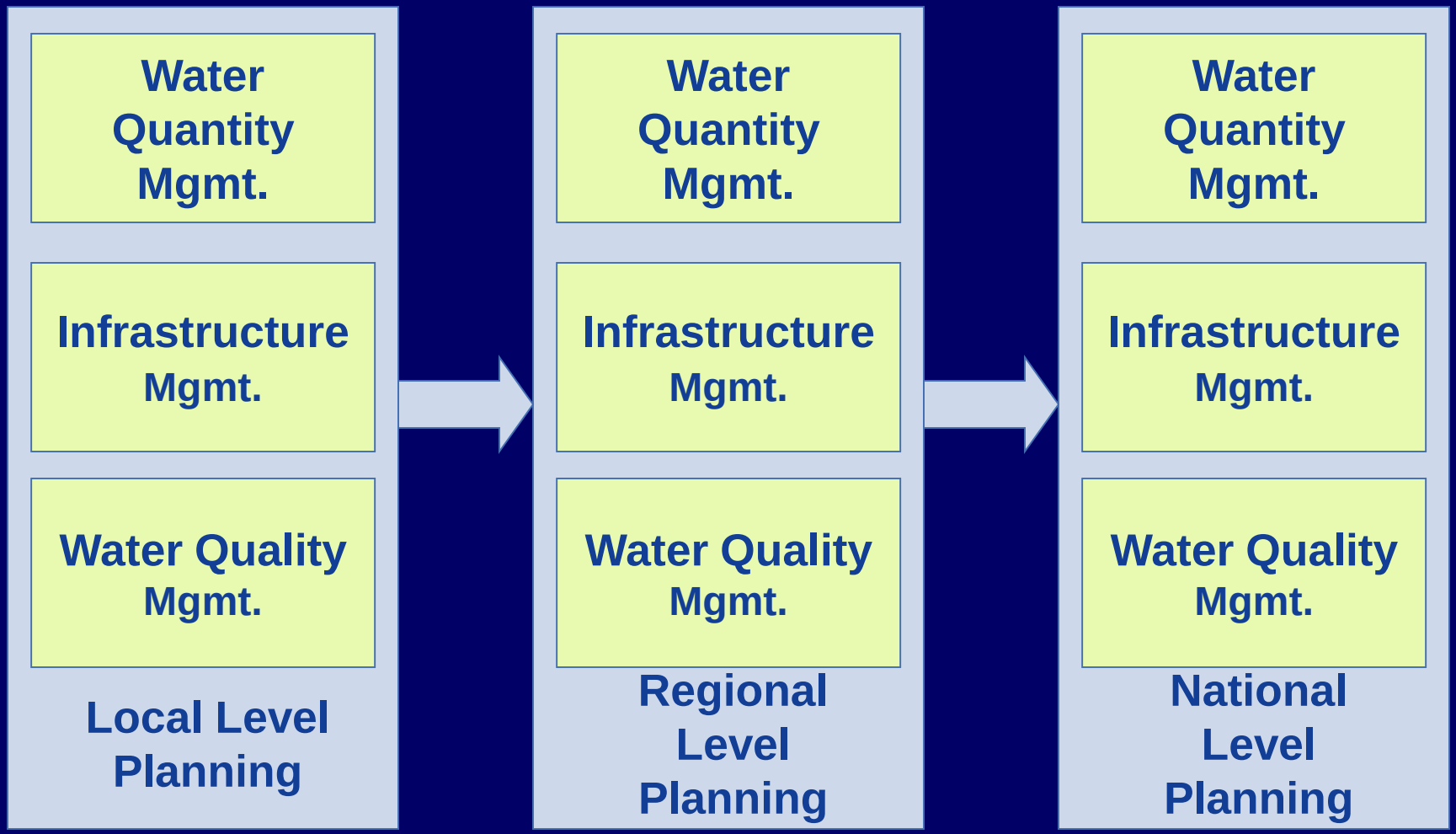
Waste Management Scenarios/Alternatives

C. Selection of Best Alternative Solution



Technical

Development of Integrated Management and Planning Framework



Institutional & Socioeconomic

Institutional and Organizational Reform

Institutional and Organizational Reform

District integration and consolidation

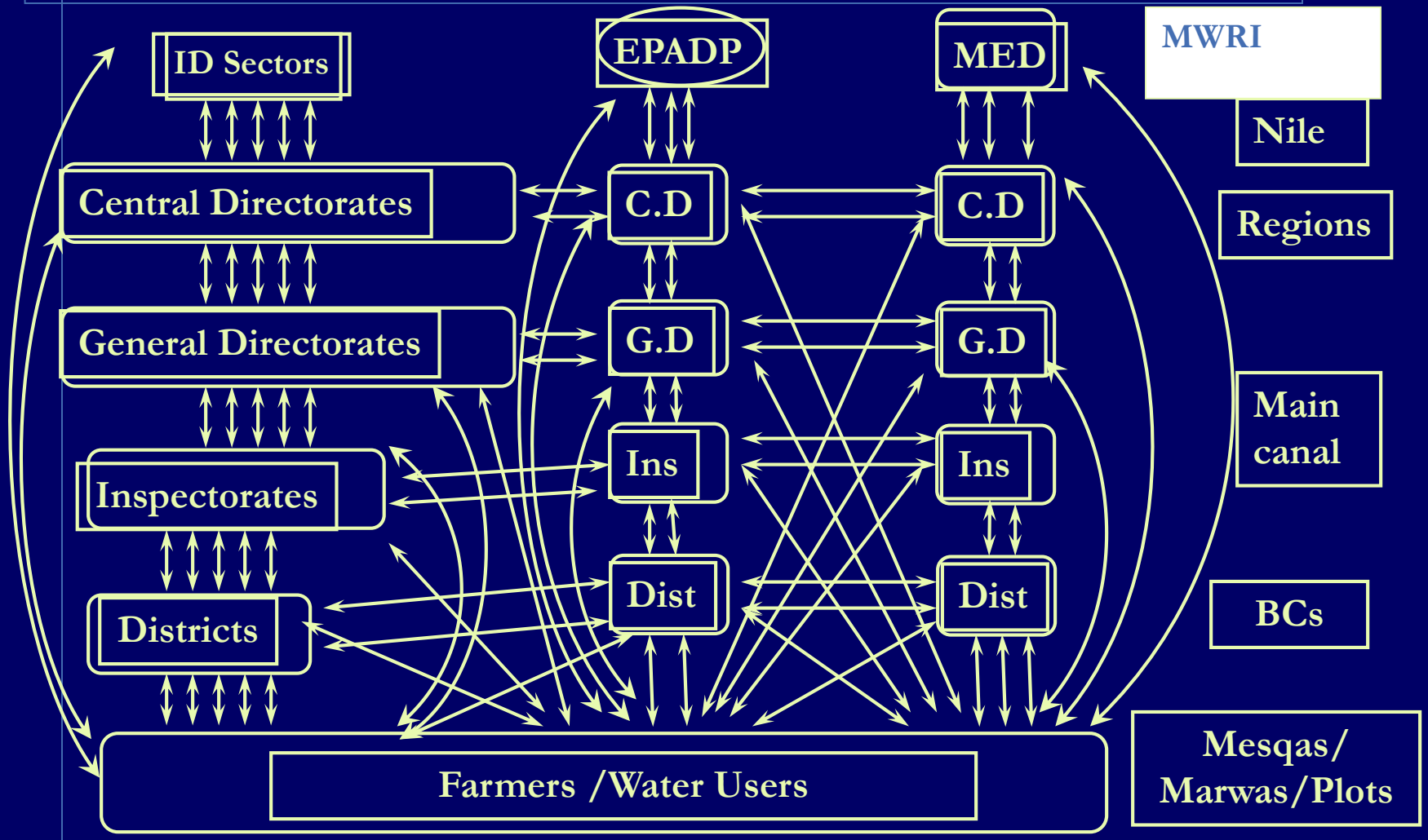
Water users participation

Framework

Procedures

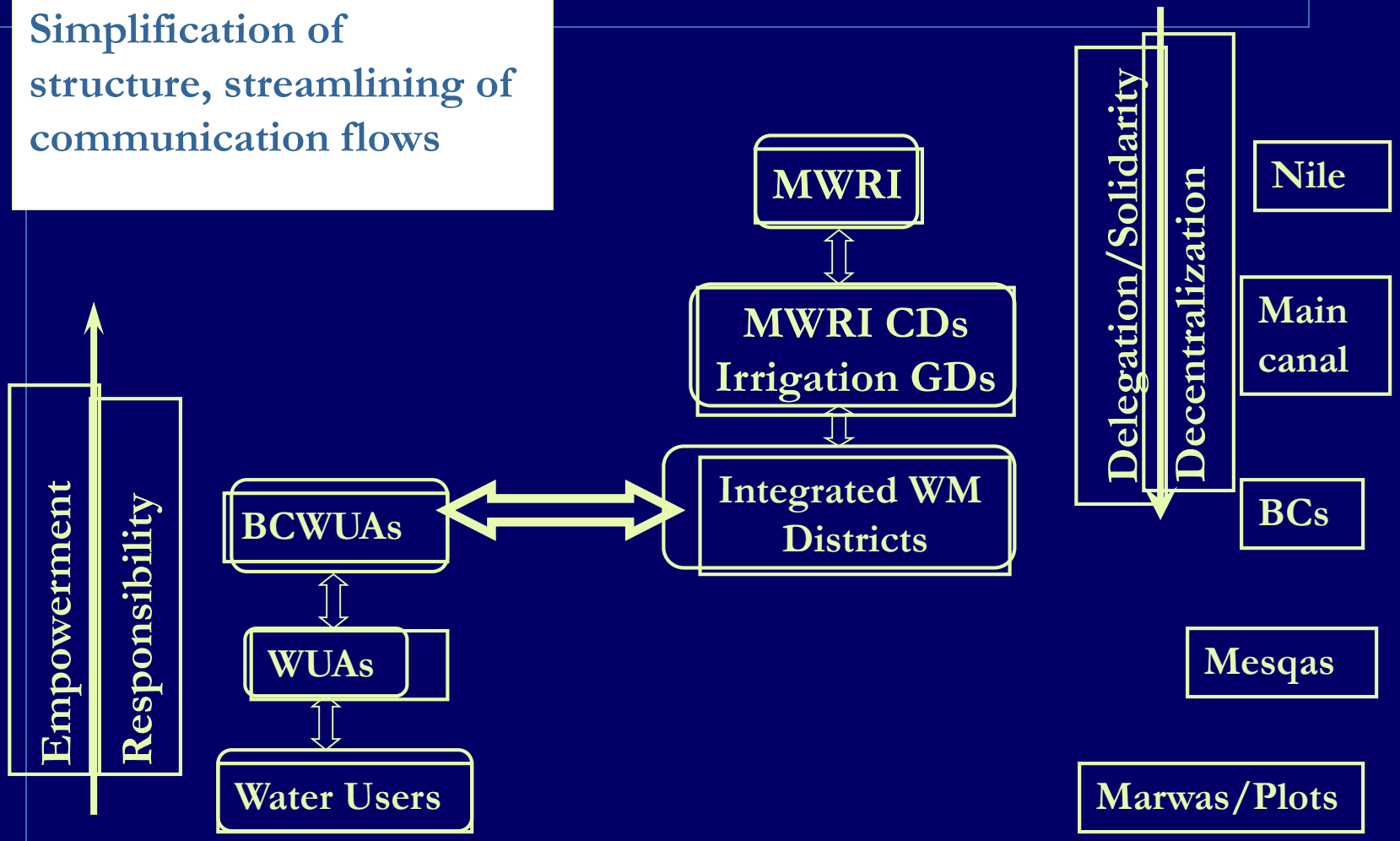
Institutional & Socioeconomic

Development of Integrated Participatory Management and Planning Framework



Institutional & Socioeconomic

Simplification of structure, streamlining of communication flows



Institutional & Socioeconomic

Development of Integrated Participatory Management and Planning Framework

Integrated Participatory Management Structure

- Better Institution/Capacity
- Efficient coordinated planning
- User participation
- Improved communications
- Conflict resolution
- Less complaints and less violations
- Better handling of users needs and concerns
- Opportunities for physical/financial participation of users
- Increased awareness of users & staff
- Partnership btw users & IWMD for O&M

Institutional & Socioeconomic

Development of Integrated Participatory Management and Planning Framework

Integrated Participatory Management Framework



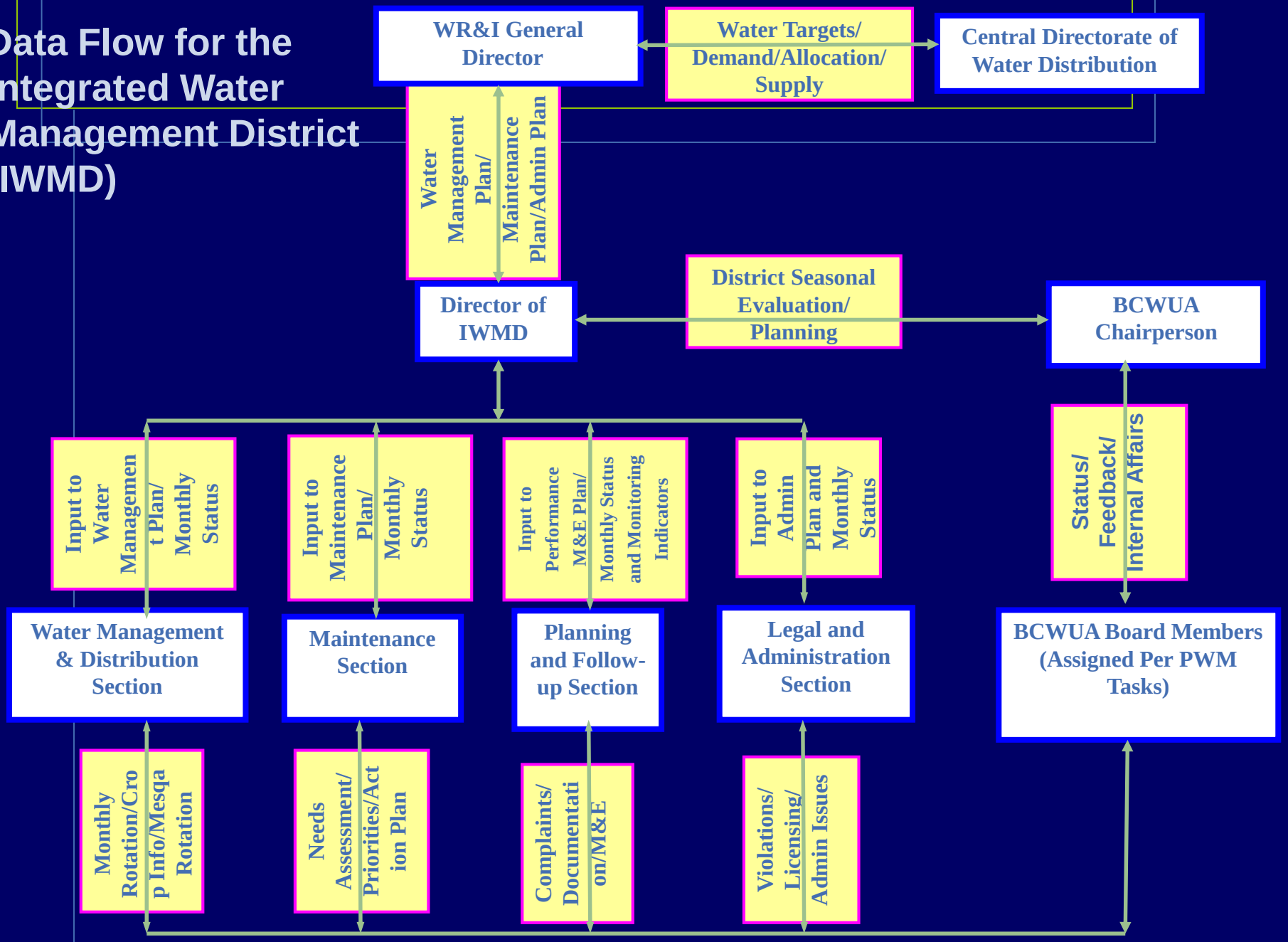


- Resolution of violations and complaints
- Small-scale canal maintenance
- Co-supervision of canal maintenance
- Water allocation among mesqas
- Monitoring water supply
- Environmental services (e.g. garbage collection)
- Collection of crop data (MISD)



Water Allocation Among BC Off-Takes (Meskas) (Form)									
District name:									
BCWUA Name:									
BC(s) name:									
Rotation (5/10, 7/7, etc.):	days on:		days off:						
Planned water supply during a water turn (4, 5 or 7 days)									
Meskas	Location on BC (Head/Middle/Tail)	Total Area	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7

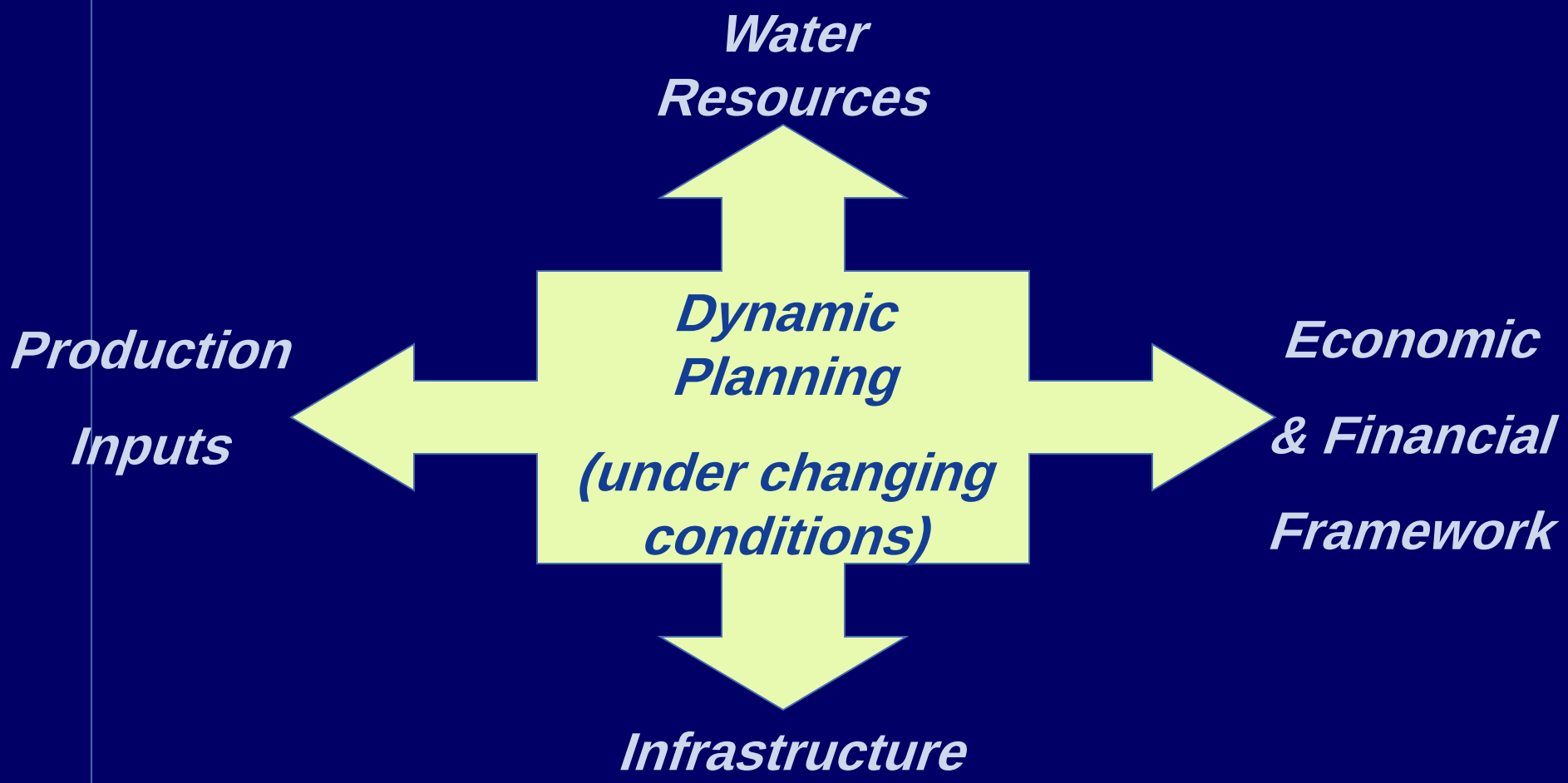
Data Flow for the Integrated Water Management District (IWMD)



Institutional & Socioeconomic

Development of Integrated Participatory Management and Planning Framework

Integrated Participatory Management Framework



Monitoring & Evaluation

Development of Integrated Participatory Management M&E System

Goals & Objectives

Evaluations must be driven by goals and objectives.

The following are taken as illustrative goals for the IWMD program.

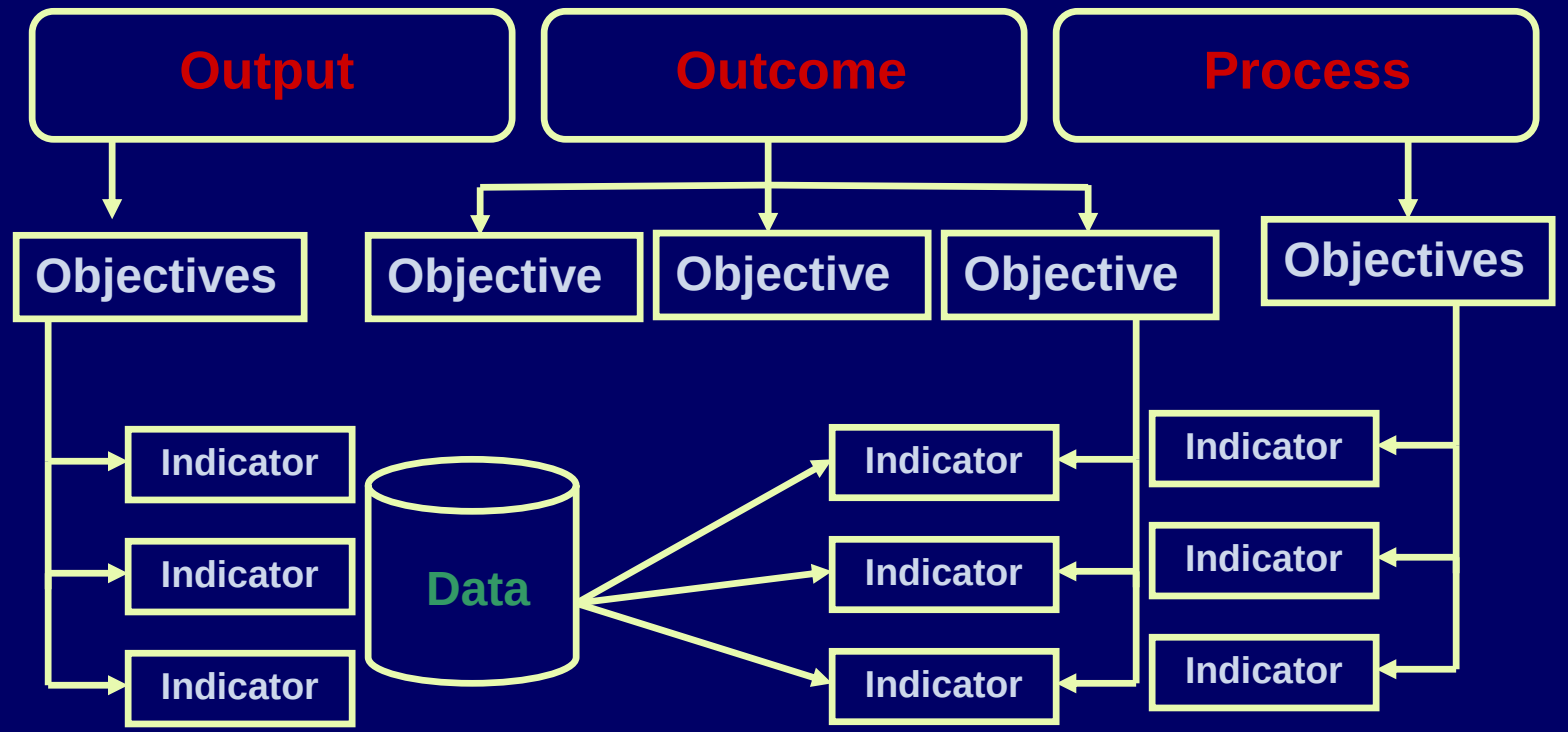
- Improved irrigation service to farmers
- Improved water use efficiency
- Higher crop income to farmers
- Reduced IWMD operating costs

Monitoring & Evaluation

Development of Integrated Participatory Management M&E System

Objectives & Indicators

Objectives and indicators in the M&E system are divided into three basic categories

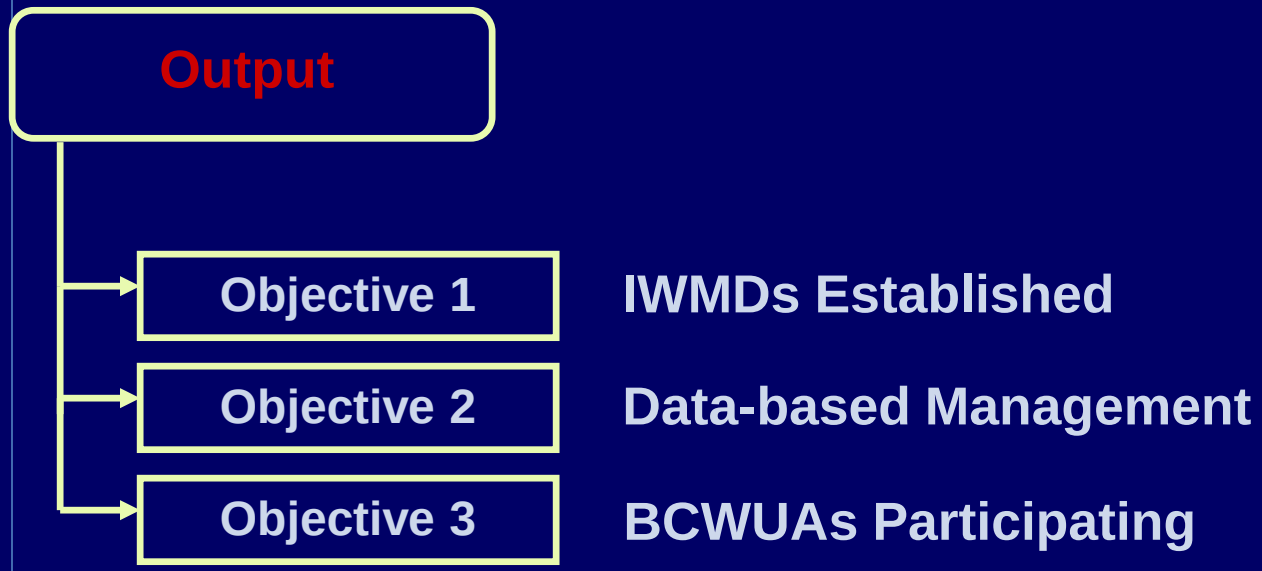


Monitoring & Evaluation

Development of Integrated Participatory Management M&E System

Objectives & Indicators

Objectives and indicators in the M&E system



Monitoring & Evaluation

Development of Integrated Participatory Management M&E System

Objectives & Indicators

Objectives and indicators in the M&E system

Monitoring & Evaluation

Development of Integrated Participatory Management M&E System

Objectives & Indicators

Objectives and indicators in the M&E system

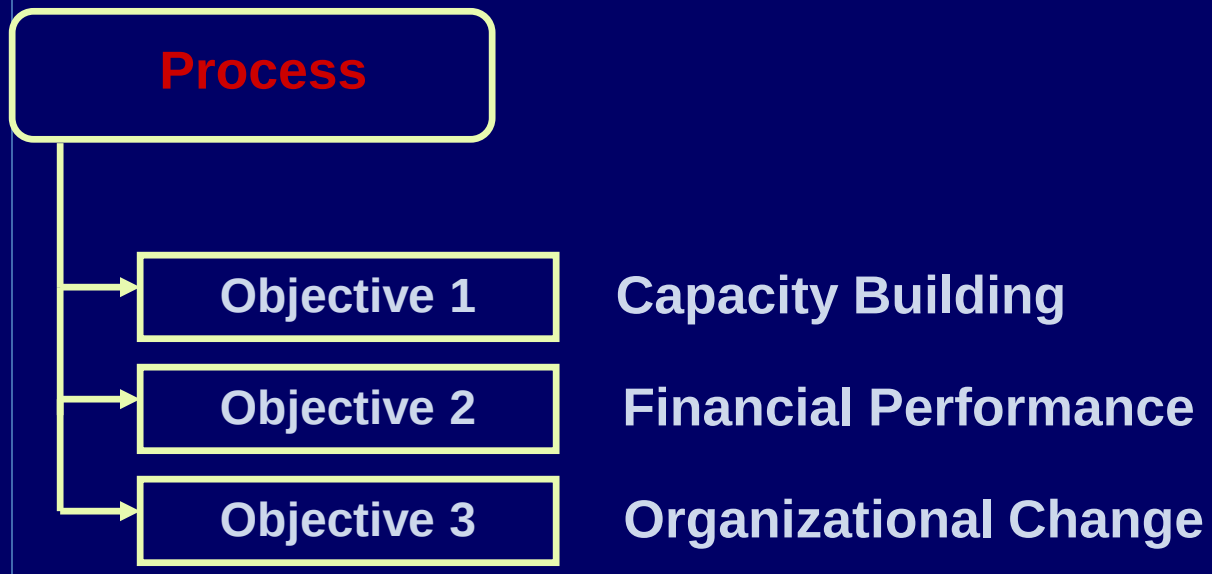
Objective 1 — **Improve Service Delivery**

Indicator	Units	Data Needed	Target	Source for Data
Availability of supply	Percent	Farmer assessments	100%	Sample survey/ BCWUA
Reliability of supply	Percent	Farmer assessments	100%	Sample survey/ BCWUA
Equity of supply distribution	Percent	Farmer assessments	100%	Sample survey /BCWUA

Development of Integrated Participatory Management M&E System

Objectives & Indicators

Objectives and indicators in the M&E system



Monitoring & Evaluation

Development of Integrated Participatory Management M&E System

Objectives and indicators in the M&E system

Objective 2 — **Financial Performance**

Indicator	Units	Data Needed	Target	Source for Data
IWMD maintenance expenditure/total O&M expenditures	Percent	Actual expenditures	Decrease	IWMD
IWMD maintenance expenditure/unit service area	LE/feddan	Actual expenditures, area	Decrease	IWMD
IWMD maintenance expenditure/unit water supplied	LE/m3	Actual expenditures, inflows	Decrease	IWMD
BCWUA fee collections/total collectibles	Percent	Collections, assessments	Increase	BCWUA
BCWUA expenditures/fee collections	Percent	Expenditures, collections	Increase	BCWUA

Analysis and Interpretation

Baseline data should be collected for indicators,

Data collected from both primary and secondary sources must be processed in order to create values for the indicators.

The focus of the analysis will be the assessment of outcome, output and process indicators compared to baseline values.

Monitoring & Evaluation

Development of Integrated Participatory Management M&E System

Analysis and Interpretation

Season	Water	Irrigation Methods	Drainage	Total	Area	Complaints per 1,000 Feddans
Summer 2001	3	15	0	18	39,650	0.45
Winter/Nili 2002	9	31	0	40		1.01
Summer 2002	9	25	0	34		0.86
Winter/Nili 2003	12	22	2	36		0.91
Summer 2003	11	9	11	31		0.78
Winter/Nili 2004	6	10	1	17		0.43
Summer 2004						

Monitoring & Evaluation

Development of Integrated Participatory Management M&E System

Analysis and Interpretation

Month	Total Supply (M m^3)	Seasonal Supply (M m^3)	Total Demand (M m^3)	Seasonal Demand (M m^3)	RWS (Monthly)	RWS (Seasonal)
May	29.681		28.155		1.05	**Summer**
June	29.425		41.457		0.71	
July	38.973	179.606	44.539	185.840	0.88	0.97
August	43.499		41.856		1.04	
September	38.028		29.834		1.27	
October	28.979		22.542		1.29	**Winter**
November	29.603		17.193		1.72	
December	25.744		11.664		2.21	
January	27.141	195.45	11.305	118.445	2.40	1.65
February	27.123		12.165		2.23	
March	28.592		21.418		1.33	
April	28.268		22.158		1.28	

Monitoring & Evaluation

Development of Integrated Participatory Management M&E System

	Area (feddans)	Yield (tons/feddan)	Price (LE/ton)	Return (LE/feddan)	Total Return (M LE)	Weighted Average Return (LE/feddan)
Winter						
Wheat	22,056	2,869	747	2,143	53.420	
Berseem	24,926	32.302		3,840	95.716	
Beans	7,649	1.393	1,465	2,041	2.322	
Other	1,138			3,500	3.983	
Total	**55,769**				**155.441**	**2,787**
Summer						
Corn	9,000	2.400	614	1,474	13.262	
Rice	30,000	3.750	670	2,513	75.375	
Cotton	6,000	1.120	2,508	2,809	16.854	
Other	14,214			5,000	71.070	
Total	**59,214**				**176.561**	**2,982**
Year					**332.002**	**2,887**

Conclusion

- Integrated water resources management is not a product, but a process that can be applied and evolve.
- Sustainable management of this finite resource must take into account a broad spectrum of social, economic, and ecological factors.
- Integrated Water Management is one of the essential processes through which these factors are linked.
- It allows decision making within the framework of overall planning and coordination among all sectors of society.

Conclusion

District Integration and consolidation	Development of Information/ Data based Management System	Development of Integrated Management and Planning Framework	Development of Participatory Management Framework

Development of Monitoring and Evaluation System


THANK YOU
HONORABLE COMMITTEE