Water Quality Monitoring in Jordan

EMWIS

Mediterranean Joint Process

Water monitoring working group meeting

Muhammad Saidam, PhD
Royal Scientific Society - Jordan
Environment Monitoring & Research Central Unit

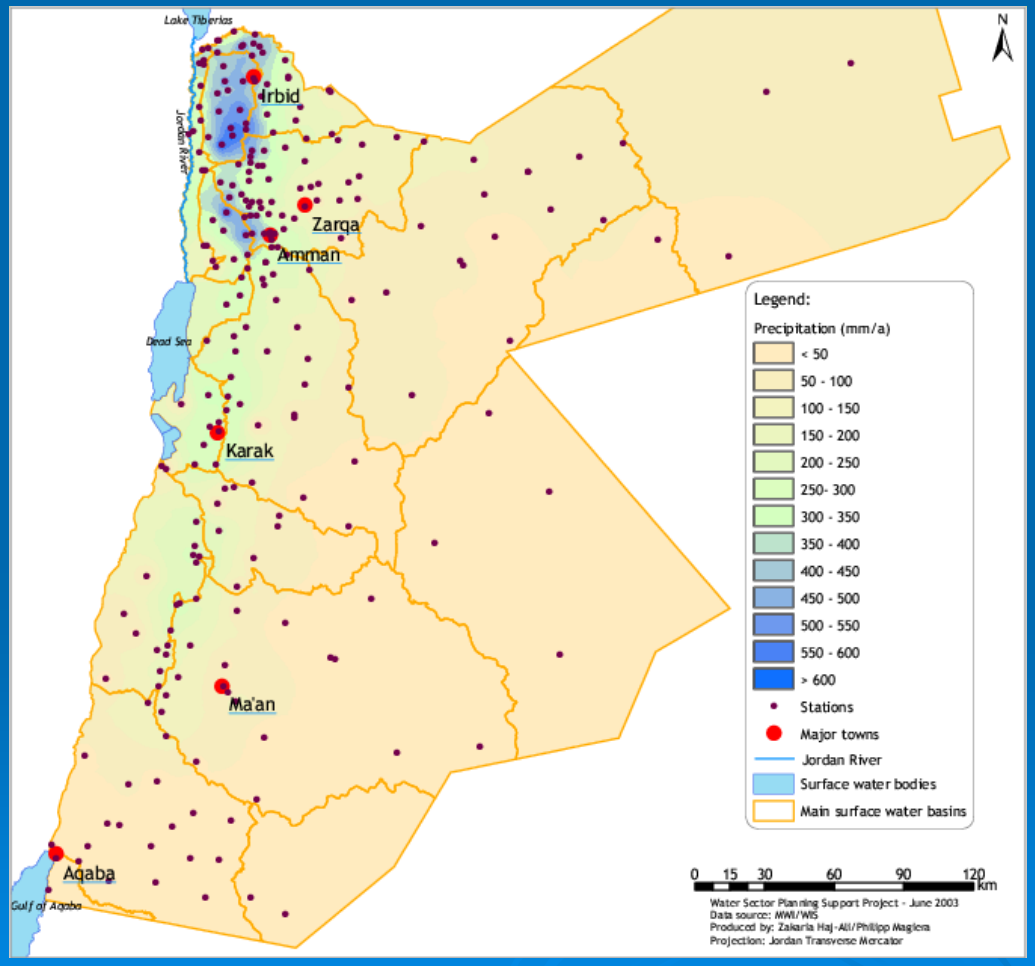
Beirut - Lebanon, 6 October 2009

Jordan

- Area ~ 92,300 km^2
- Climate: Mostly arid desert; rainy season in west (November to April)
- Terrain: Mostly desert plateau in east (80%)
- Population: ~ 5.723 million (2007), Growth ~ 2.2%

Rainfall

Annual mean (1963-2002)



Range: 50 to > 600, average: ~104 mm/yr

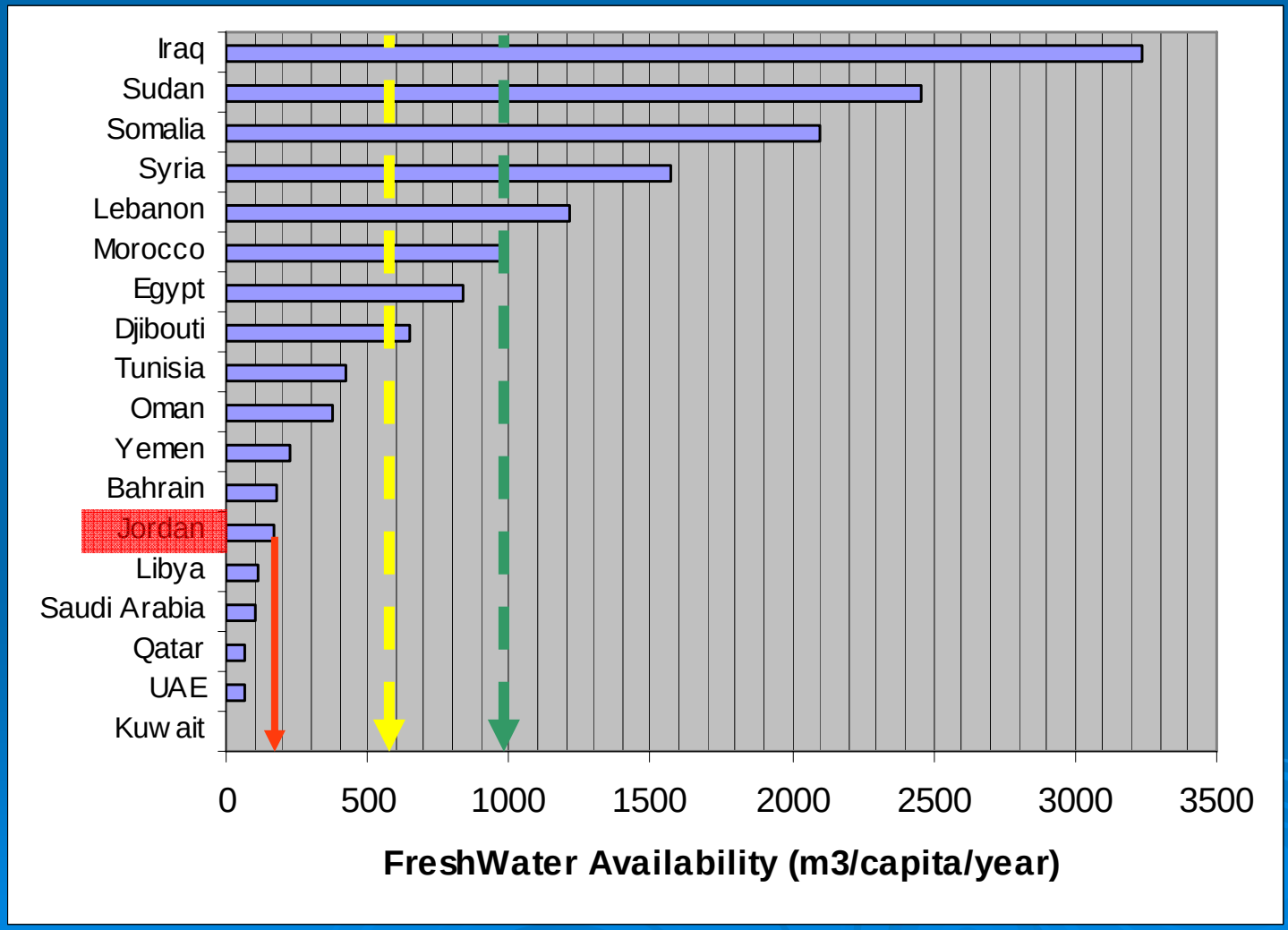
~ 75% receives < 100 mm/yr

~ 87% receives < 200 mm/yr

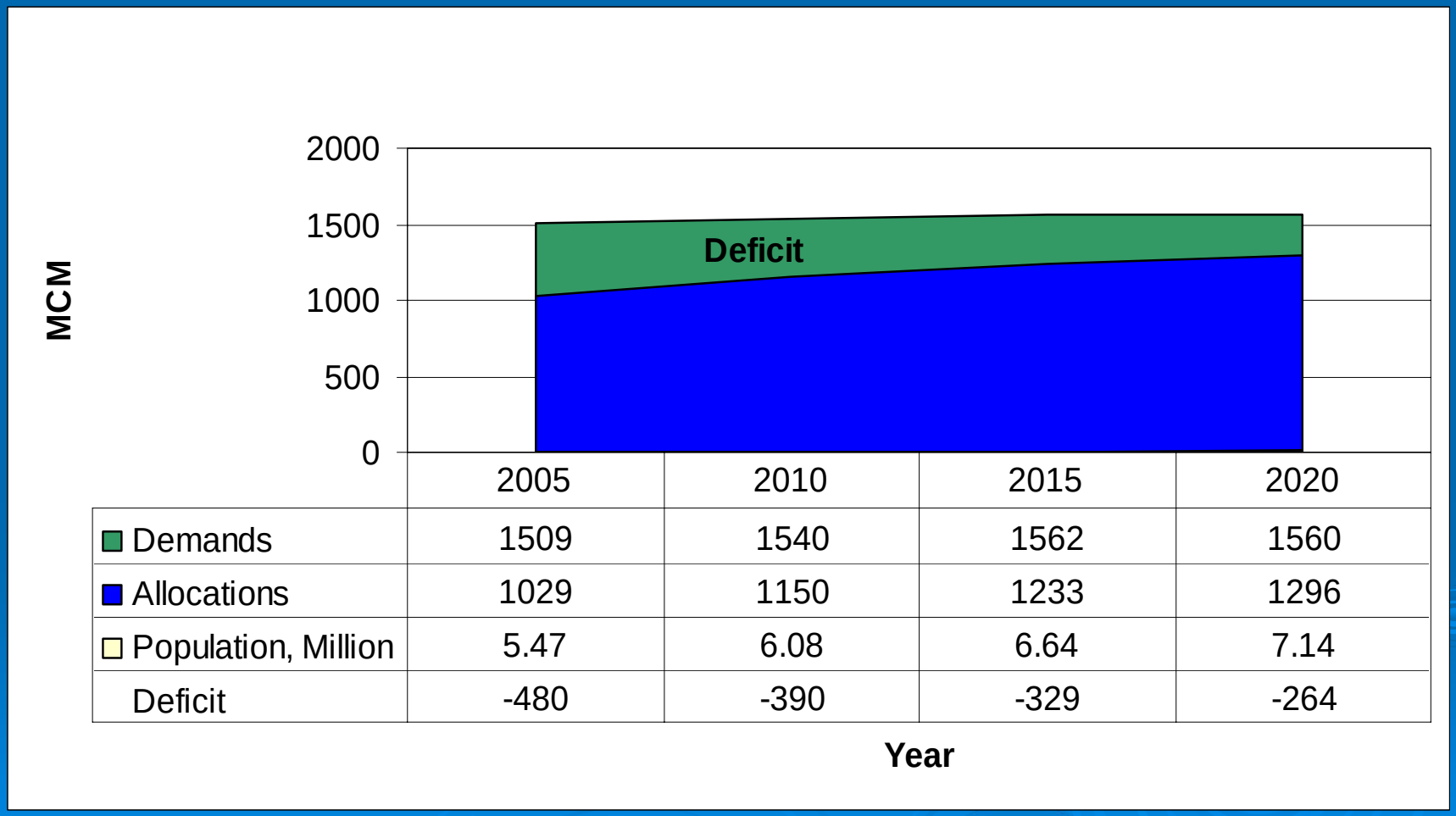
Source: NMP

Freshwater Availability

(Yr 1999, AQUASTAT, 2002)



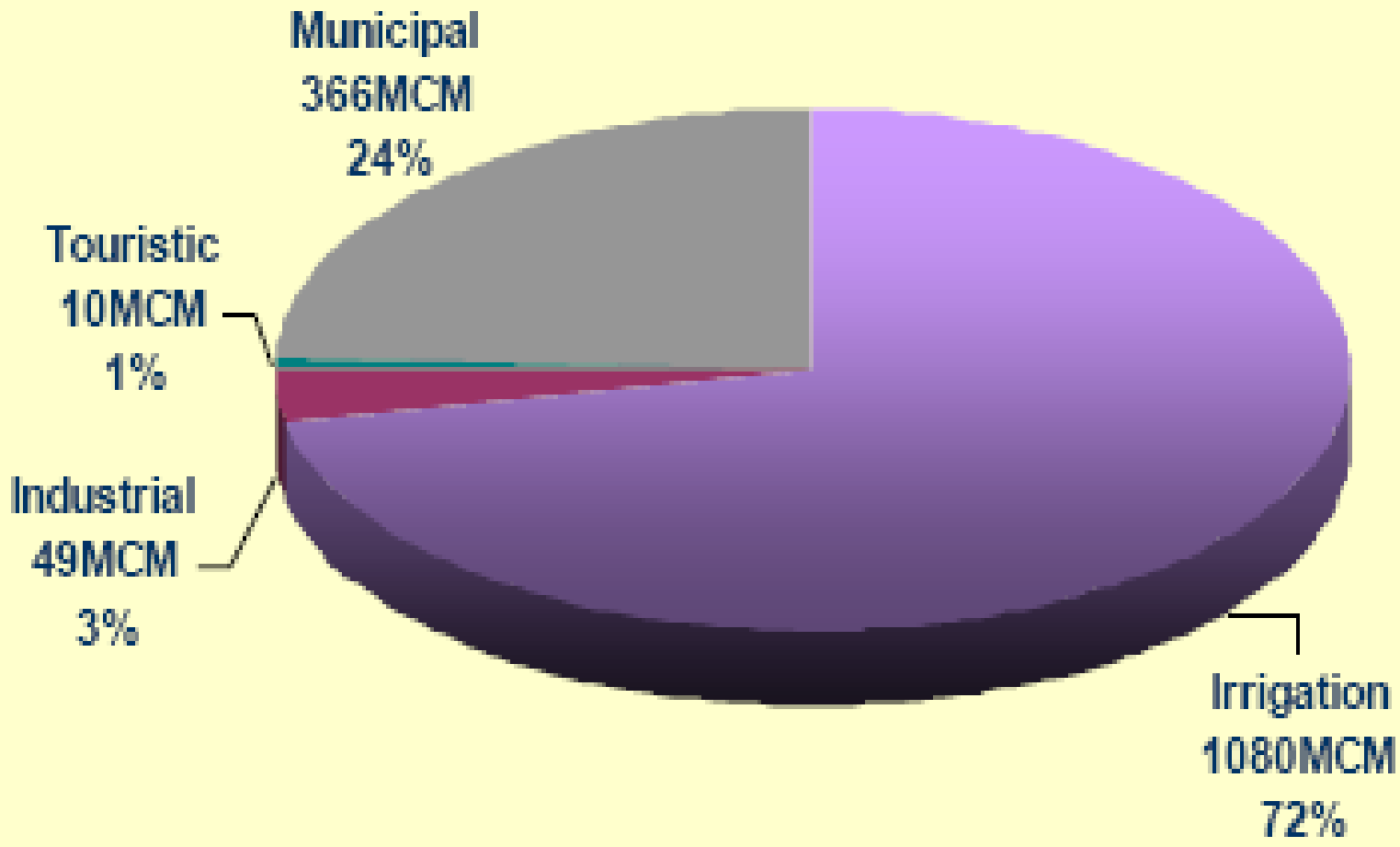
Projected Demands and Allocations



	2005	2010	2015	2020
Demands	1509	1540	1562	1560
Allocations	1029	1150	1233	1296
Population, Million	5.47	6.08	6.64	7.14
Deficit	-480	-390	-329	-264

Source: NMP

Water Demand 2007



Effect of Climate Change

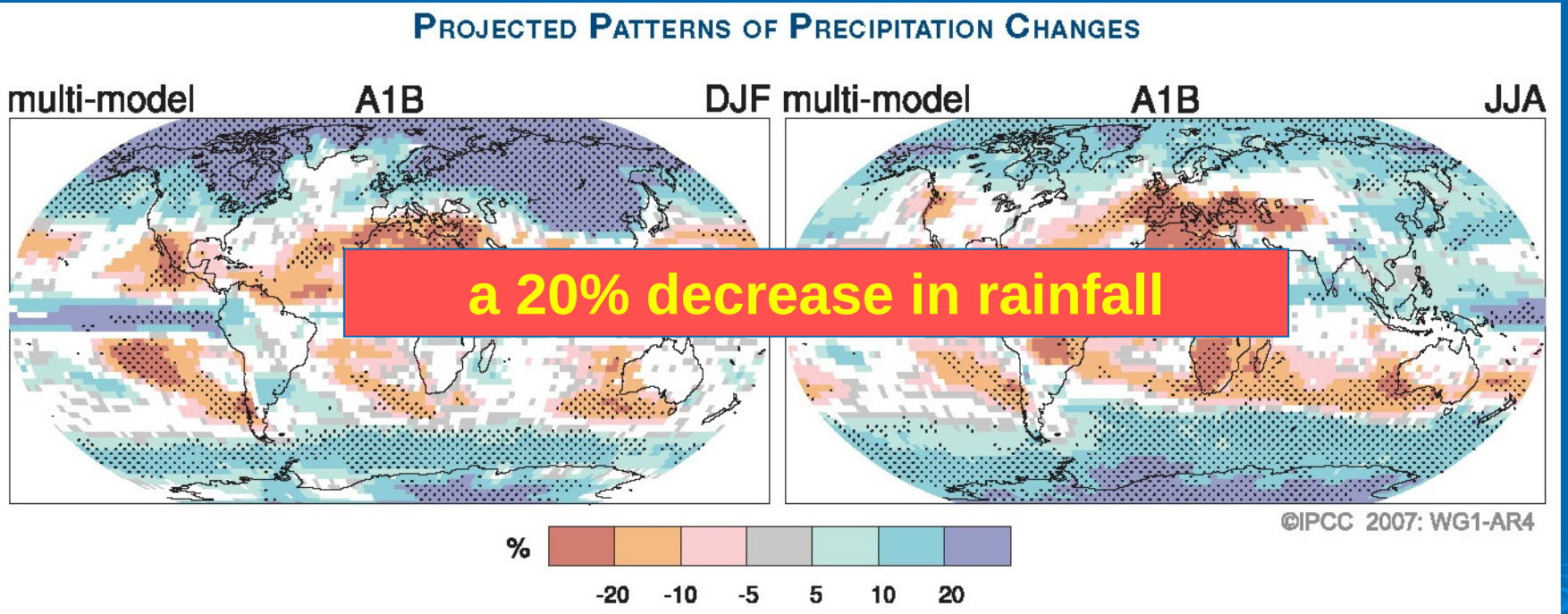


Figure SPM.7. *Relative changes in precipitation (in percent) for the period 2090–2099, relative to 1980–1999. Values are multi-model averages based on the SRES A1B scenario for December to February (left) and June to August (right). White areas are where less than 66% of the models agree in the sign of the change and stippled areas are where more than 90% of the models agree in the sign of the change. {Figure 10.9}*

Jordan Water Issues …

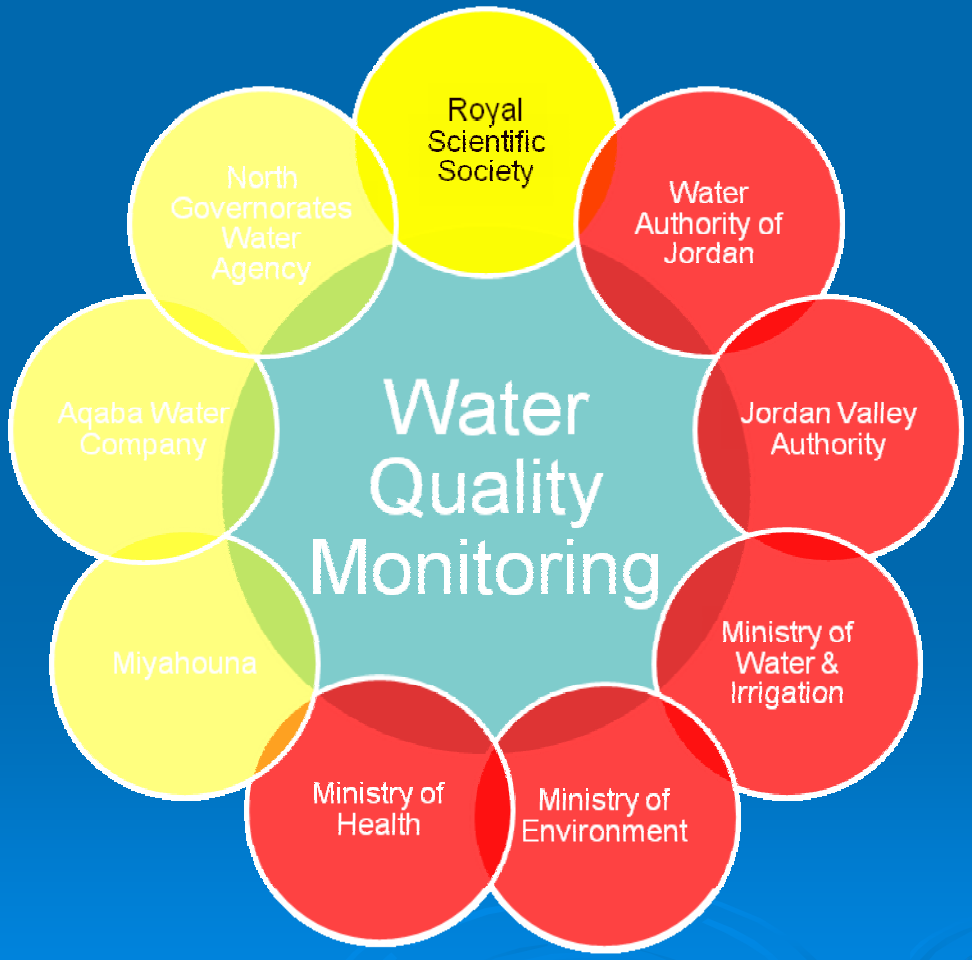
- **Water Availability:**
  - sufficiency and continuous supply
    - 97% linked to public water supply systems
    - average of two days supply per week
- **Water Quality:**
  - Groundwater of high salinity
  - Surface water is not adequate for drinking

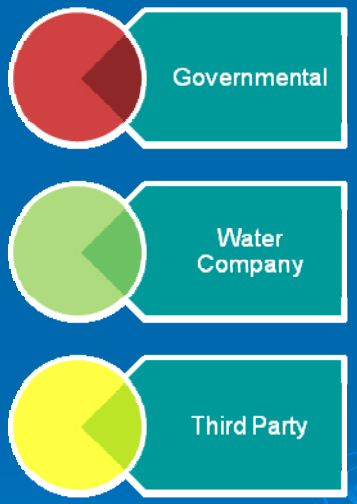
… Jordan Water Issues

- **Physical accessibility**
  - most reliable water resources are far from residential centres
  - 100% of urban and 87% of rural population have access to piped water
- **Economic accessibility / affordability**
  - Water supply is still subsidized by the government
  - water prices still affordable by the poor
  - water prices for bottled water and tanked water is 8-10 times more than piped water

Water Quality Monitoring Networks in Jordan

Legal Framework for WQ Monitoring





Water Resources (Envir. Purposes)

- **WAJ : Surface Water** {KAC(6), Wadis (6), Reservoirs (2)
- **Groundwater**
- **JVA : Surface water {rivers} (30), & {rivers} (30), / RSS labs (15), Dams (25)**
- **RSS** (EMARCU Network) – (13).
- **MoEnv.** (rivers (22) & dams (10) / RSS
- **MOH** – wells for DW
- **MWI**(quantity, quality)

Pollution Sources (Envir. Purposes)

- **WAJ :** Treated industrial WW to public sewerage (55)
- **MoEnv.** Treated industrial WW to environment or reused (20). Effluent of domestic WWTP (33)

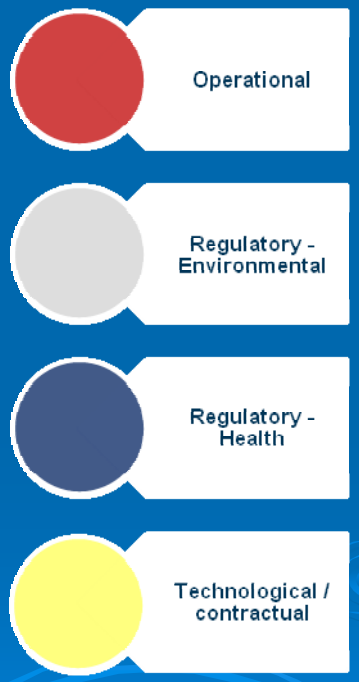
Drinking Water Supply (Operational & Eh)

- **WAJ:** DW in pumping stations, reservoirs, networks & tap
- **NGWA:** DW network & tap
- **Miyahouna:** DW network & tap
- **AWC:** DW in wells, network & tap
- **MOH:** DW & water tankers for environmental health purposes
- **MoEnv:** DW (20) / RSS contract

Wastewater Treatment Plants (operational & Eh)

- **WAJ:** influent & efflent of WWTP (20 public, 20 private
- **NGWA:** influent & efflent of WWTP (1)
- **AWC:** influent & efflent of WWTP (2)
- **MOH:** effluent of WWTP (22) - for environmental health purposes

Reason for WQ Monitoring



MWI Monitoring Networks
(flow, rainfall & meteorological)

Network	Total Number	Remarks
Rainfall stations	258	Data extends since 1936
Meteorological stations	29	Temp., humidity, windrun, sunshine Other stations: by Meter. Dept. & JVA
Wadi flow gauges	38 (floodflow) , 31 baseflow	
Springs	859 springs, not directly measured but obtained from observed water levels and a stage-discharge relation. Only irregularly observed	
Groundwater monitoring	5,912	Levels (253), salinity (1,476), production (3,203), WQM: cations and anions
WWTP Outflow	17 (till 1999)	Monitoring started 1985, (probably 26 now?).

(source: WIS of MWI)

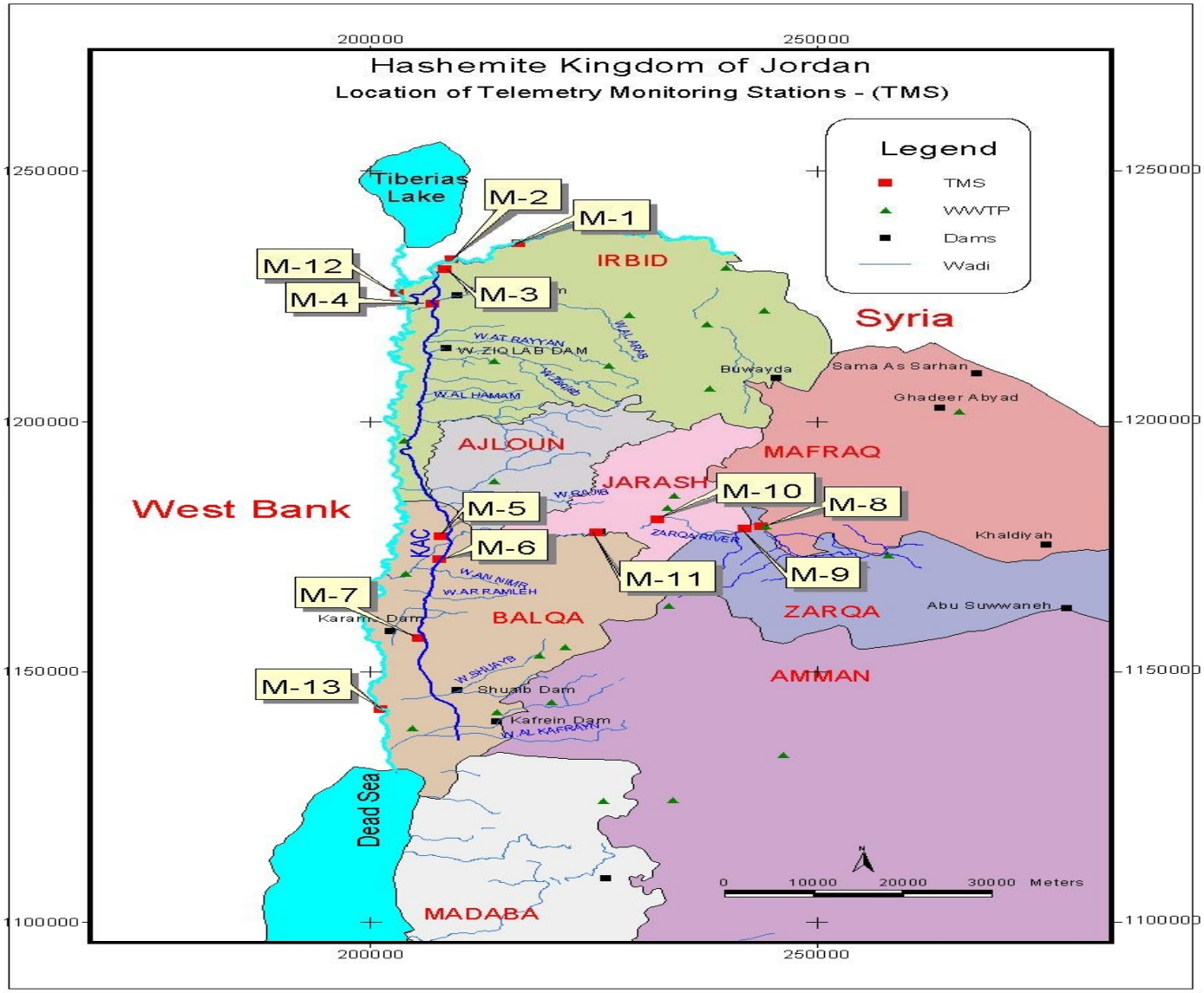
RSS Real-time Water Quality Monitoring Systems

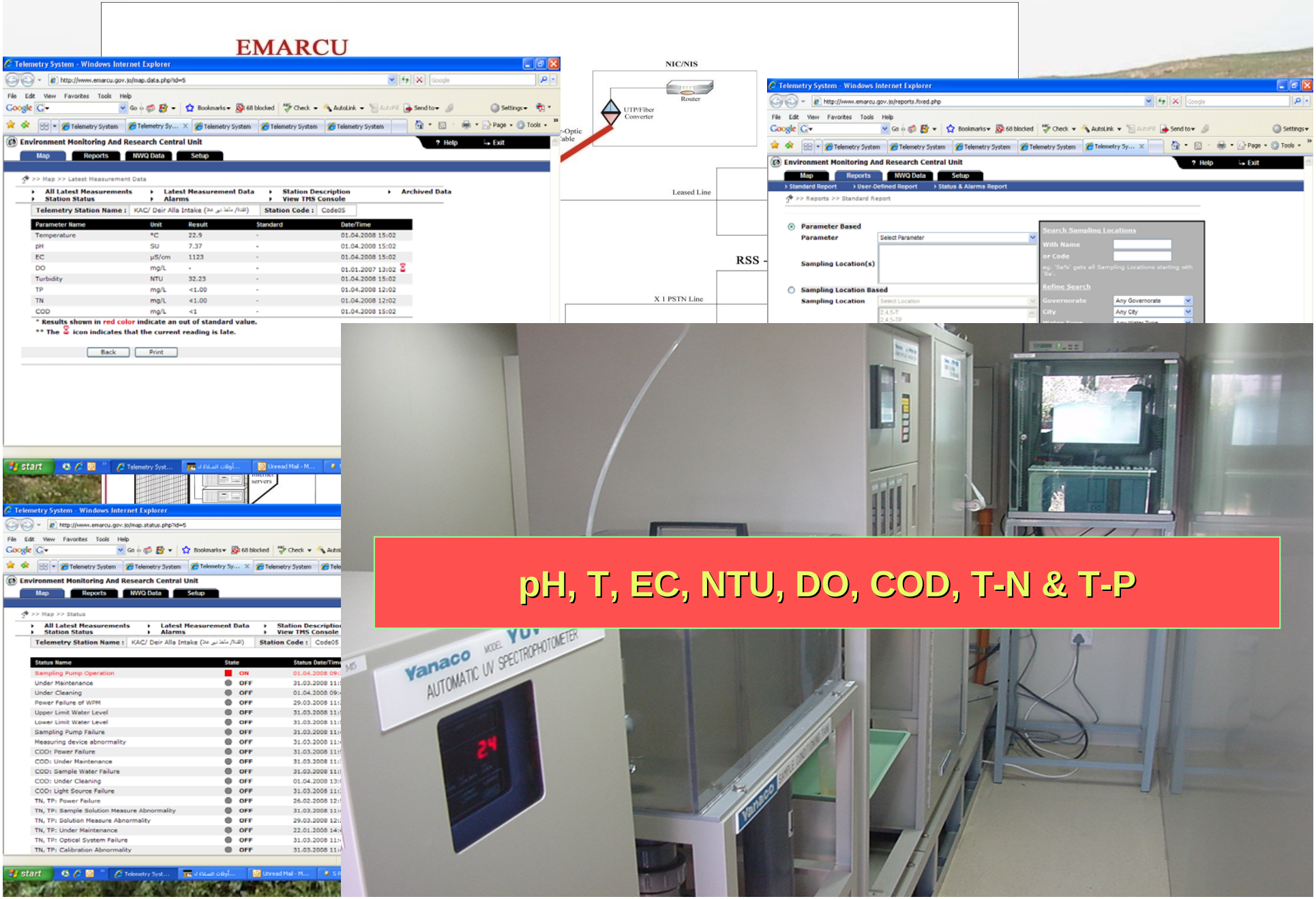
- Water quality monitoring and assessment is an essential component of IWRM
- The availability of sufficient water quality data is essential to:
  - trace trends over time and space
- Provide decision-makers with timely data
- Share data with stakeholders;
  - on local, regional and international levels

RTMS
Concept & Goal

- System Concept:
  - Continuous, automated, on-site sampling & analysis, data acquisition, storage and dissemination in one system in *real-time*.
- Major goal:
  - Facilitating decision making in the water and environment sectors

The *Real-time* Monitoring System in Jordan

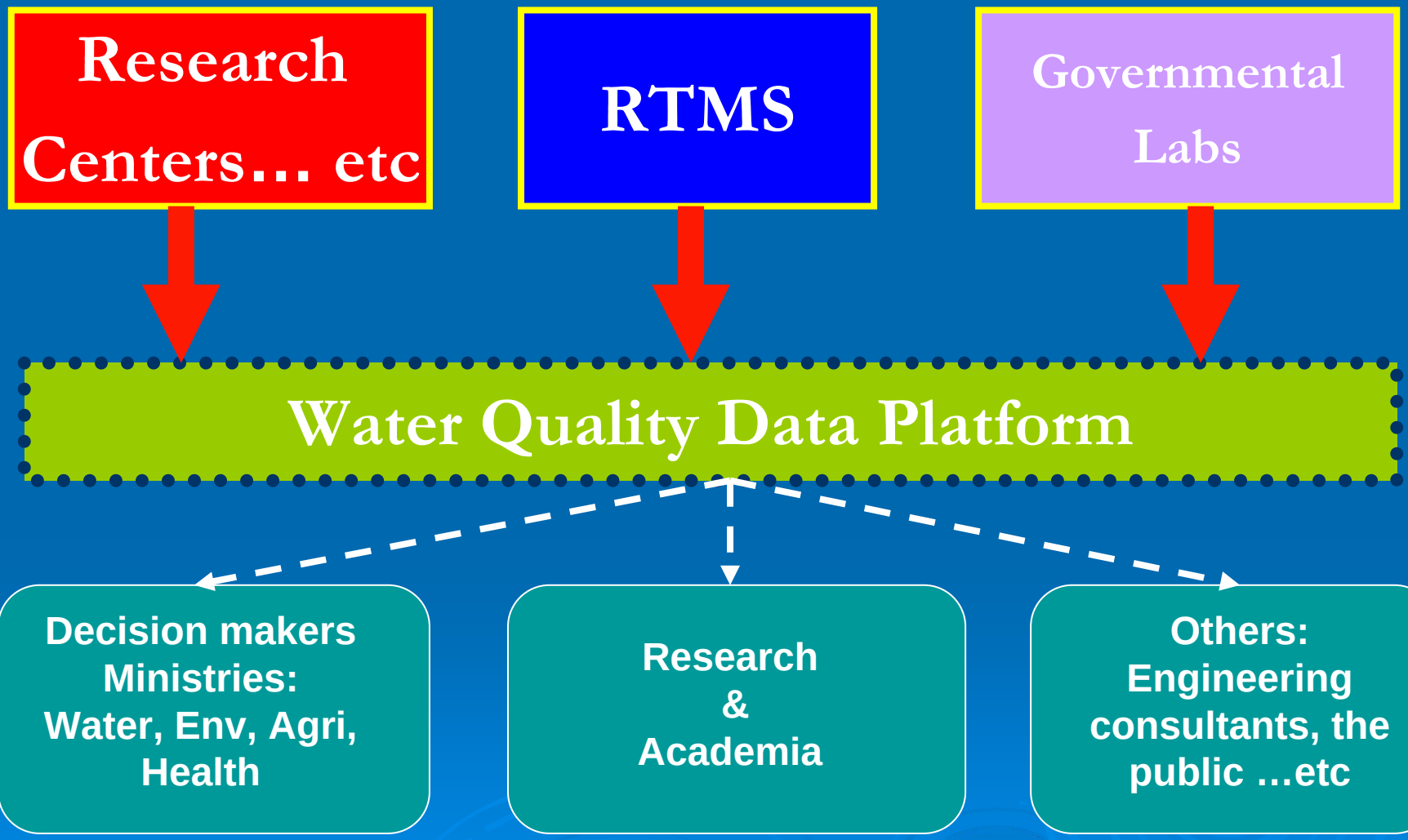



EMARCU
Telemetry System - Windows Internet Explorer
Environment Monitoring And Research Central Unit
Map
Reports
NWQ Data
Setup
Help
Exit
Telemetry Station Name : KAC/ Deir Alla Intake
Station Code : Code05
Parameter Name | Unit | Result | Standard | Date/Time
Temperature | °C | 22.9 | - | 01.04.2008 15:02
pH | SU | 7.37 | - | 01.04.2008 15:02
EC | µS/cm | 1123 | - | 01.04.2008 15:02
DO | mg/L | - | - | 01.01.2007 13:02
Turbidity | NTU | 32.23 | - | 01.04.2008 15:02
TP | mg/L | <1.00 | - | 01.04.2008 12:02
TN | mg/L | <1.00 | - | 01.04.2008 12:02
COD | mg/L | <1 | - | 01.04.2008 15:02
* Results shown in red color indicate an out of standard value.
** The icon indicates that the current reading is late.
Back
Print
NIC/NIS
Router
UTP/Fiber Converter
Leased Line
RSS
X 1 PSTN Line
Telemetry System - Windows Internet Explorer
Environment Monitoring And Research Central Unit
Standard Report
User-Defined Report
Status & Alarms Report
Parameter Based
Parameter
Select Parameter
Sampling Location(s)
Sampling Location Based
Sampling Location
Search Sampling Locations
With Name
or Code
Refine Search
Governorate
Any Governorate
City
Any City
Telemetry System - Windows Internet Explorer
Environment Monitoring And Research Central Unit
Telemetry Station Name : KAC/ Deir Alla Intake
Station Code : Code05
Status Name | State
Sampling Pump Operation | ON
Under Maintenance | OFF
Under Cleaning | OFF
Power Failure of WPM | OFF
Upper Limit Water Level | OFF
Lower Limit Water Level | OFF
Sampling Pump Failure | OFF
Measuring device abnormality | OFF
COD: Power Failure | OFF
COD: Under Maintenance | OFF
COD: Sample Water Failure | OFF
COD: Under Cleaning | OFF
COD: Light Source Failure | OFF
TN, TP: Power Failure | OFF
TN, TP: Sample Solution Measure Abnormality | OFF
TN, TP: Solution Measure Abnormality | OFF
TN, TP: Under Maintenance | OFF
TN, TP: Optical System Failure | OFF
TN, TP: Calibration Abnormality | OFF
pH, T, EC, NTU, DO, COD, T-N & T-P
Yanaco
AUTOMATIC UV SPECTROPHOTOMETER

Characteristics of the RTMS System

- State-of-the-art technology
- Real-time: *enabling timely decisions*
  - **http://www.emarcu.gov.jo**
- Accurate: *as human errors are minimized*
- Impartial: *records can't be changed*
- Long-term: *data stored in EMARCU database*
- Forms a basis for other environmental applications: *e.g. air & soil pollution monitoring*

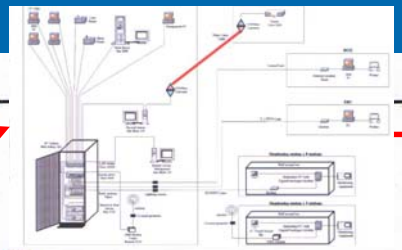
Real-time On-line Dataflow

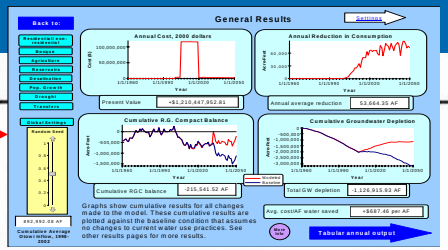


Potential Users *of* RSS RTMS

- **Decision makers:**
  - ***MOE: Enforcing environmental regulations***
  - ***MWI: in employing integrated water management***
  - ***MOA: managing agricultural water quality***
  - ***MOH: public health protection***
- **Planners:**
  - **Long-term planning**
  - **Emergency**
  - **For an Early warning System**
  - **Security**
- **Water utility managers:** ***e.g. Zai WTP***
- **Engineering consultants:** ***feasibility and design studies***
- **Farmers:** ***management of salinity & use of fertilizers***
- **Academics & Researchers:** ***through coordinated data provision***
- **The public:** ***transparency and confidence building***

Integrated System for WAter Quality Management (ISWAQ)





Real Time
Data Collection

Concluding Thoughts

- Harmonize the monitoring process through a unified identification system to Facilitate data sharing and process optimization.
- Promulgate a national water information policy
- Adoption of emerging water quality (& quantity) monitoring technologies
- Encourage cooperation between scientific institutes, water providers and operators and regulatory agencies

THANK YOU

for your attention