



Higher Education System

Department of Water Engineering

Damascus University

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Faculty of Civil Engineering

Development of a Modern Higher Education System for Water
Engineering In Syria
(EDUWAT TEMPUS Project)

Faculty of Civil Engineering
University of Damascus
9-13 January 2011

Postgraduate study: Master Degree Course

Basic Structure - curriculum

Two full academic years:

- [1] diploma, a taught year.
- [2] is a research year and the student should submit MSc dissertation

Postgraduate study: Master Degree Course

MSc:

Average number of students: 50

Water Engineering: about 10, 60% females

PhD:

Still at its starting point in the Water Engineering

Period: 3-4 years



Postgraduate study: Master Degree Course

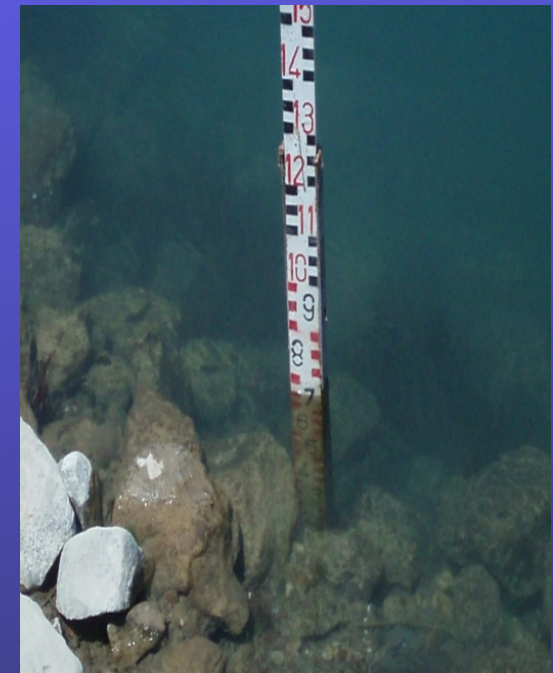
Facility and staff:

- Some 15 lecturers:
of which 3 professors and 7 assistant professors
- Newly equipped Hydraulic labora
- Computer cluster



Curriculum courses

1. **Water Rights and Conflict Resolution**
2. **Water Constructions (Advanced module)**
3. **Water Demand Management**
4. **Advanced Hydraulics**
5. **Water Resources Assessment**
6. **Research Methodology**
7. **Advanced Mathematics**



1- Water Rights and Conflict Resolution

Main objectives

- Introducing water law and legislation
- Giving background literature: sources of water legislations, present water law in Syrian
- Introducing islamic and international water laws.
- Discussion on regional/basin water challenges
- Skill development on best approach for conflict resolution under UN umbrella.

1- Water Rights and Conflict Resolution

Water law and legislation

- Introduction to water law
- Background, literature and present national water legislations
- Muslim water laws and legislations
- Syrian specifics

1- Water Rights and Conflict Resolution

International water laws

- The international legal and institutional structure
- International law for environment and water
- International water policy and commissions
- Inter and supranational treaties

1- Water Rights and Conflict Resolution

Shared Vision Planning

- What and why the shared vision planning in water supply
- Shared vision planning and models

1- Water Rights and Conflict Resolution

Case studies

- The Euphrates and Dejeleh Rivers
- The Yarmouk River

1- Water Rights and Conflict Resolution

Suggestion for improvement

- Using well approved software tools for water allocation system.

2- Water Constructions (Advanced module)

Main Subjects

- Dam water seepage
- Water tunnels
- Dam filling and insertion
- Earthquake dam safety
- Hydro-electrical power stations
- Waste water pumping stations
- Pump composition
- Russian specifications for pumping stations

2- Water Constructions (Advanced module)

Dam water seepage

- Water seepage through dams and its foundation (steady and unsteady flow, numerical models)
- Using Geo-Slope software:
 - Seep/w
 - Slope/w

3- Water Demand Management

Main Subjects

- Demand indicators and management
- Unaccounted for water and water losses
- Water demand calculation
- Water demand management (methodology)
- Operation and maintenance
- Water use efficiency

4- Advanced Hydraulics

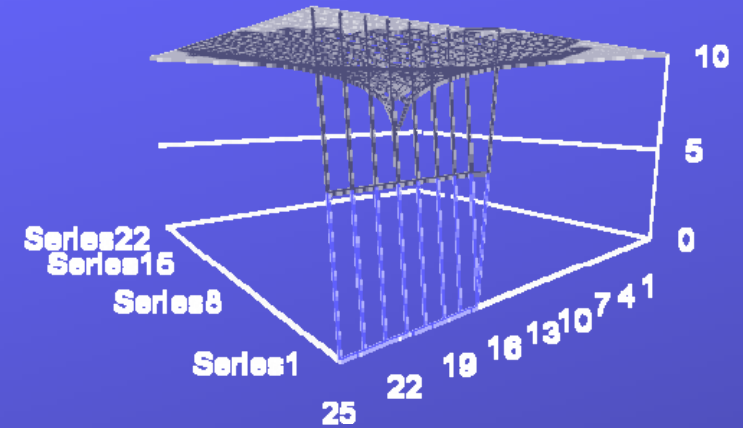
Main Subjects

- Principle of mathematical models
- Models for drinking water supply networks
- Water hammer phenomenon
- Waste water - modeling
- Pumping stations – modeling

5- Water Resources Assessment

Main Subjects

- Principle of WRA
- Water data and information exchange cycle
- Introduction to Ground water Assessment
- Introduction to Surface water Assessment
- Advanced topics in hydrology (flood/wave flow)
- Advanced topics in Hydrogeology (quality issues)
- Modeling as a tool for WRA



6- Scientific Research Methodology

Main Subjects

- Basic information on how to write scientific paper, dissertation and thesis
- Main elements
- Literature review: how and why

7- Advanced Mathematics

Main Subjects

- Advanced Statistics
- Numerical Modelling
- Linear mathematics
- Series
- Differential equation
- Applications on water problems

Suggestions

In order to develop the present course, we should schedule the main criteria:

- Related to the national strategy, challenges and local policies
- Effective supportive to the water local policies
- Efficient: well organized and meets the international standards
- Sustainable: through international network

Suggestions

- Building on existing course and EDUWAT
- Knowledge Sharing Strategy
- Project work involvement

key part of ensuring the value and enduring relevance of the courses will be the creation of a knowledge sharing strategy.

The key components of the strategy are increasing research relevance through the creation of participatory research plans, improving collaboration during the research project, enhancing learning in the project and extending research delivery through the use of a broad range of methods and media to disseminate messages.



Suggestions

● **Post Graduate Degrees and Short Courses**

- The post graduate element should offer the creation of long-term institutional capacity with tailored research to solve specific prioritized problems linking research with implementation.
- Sandwich programs offered the optimum model for the MS and PhD training, with a history of success, access to prestigious international teaching and research opportunities, but with relevant focus of study at the national problems.

Suggestions

● **Post Graduate Degrees and Short Courses**

- Creating effective links between the national universities and EU universities should be further explored.
- The direct link between post-graduate research and the national sites/problems/stakeholders offers research opportunities that could be tackled by MS or PhD students or post-docs and would be of direct benefit to the country and research.

Suggestions

● **Post Graduate Degrees and Short Courses**

- Short training courses for the Syrian academic staff and knowledge exchange with the EU universities (project partner) with differently improve capacity of the national faculties and regional capacity building
- The short courses also present the key area in which both existing materials may be utilized and new tailor-made material can be optimized.

Suggestions

● Development of a policy cycle

- In order to develop consistent policies, true integration between the water-dependent sectors is necessary. Key in developing policies is executing this development in a “*plan – do – check – act*” cycle and repeating this cycle based on the results achieved:



- Plan: Identifying and analysing the situation on the water resources problem;
- Do: Developing and testing a potential solution;
- Check: Measuring how effective the test solution was, and analysing whether it could be improved in any way; and

Suggestions

● Development of a policy cycle

- Plan: Identifying and analysing the situation on the water resources problem;
- Do: Developing and testing a potential solution;
- Check: Measuring how effective the test solution was, and analysing whether it could be improved in any way; and
- Act: Implementing the improved solution fully.

Current status of water resources

- Syria is an arid to semi-arid country
- Average rainfall > 500 mm/yr in the coastal areas to < 200 mm/yr in the south east.
- Seven surface water basins with heterogeneous distribution of water availability
- Average per capita 800 m³/yr, including Syria's water share from Euphrates.



Current status of water resources

- Internal renewable WR are around 9 billion m³/yr, of which **5 billions** cubic meters are **groundwater**.
- Total renewable water resources 14 billion m³/yr including Euphrates River
- Over extraction of groundwater for irrigation resulted in falling groundwater levels in various regions.



Current status of water resources

- In many seasons, groundwater used for agriculture **exceeds** renewable water resources
- The fact is that water is not used efficiently in agriculture production



Water Use

- Irrigated agriculture accounts for more than 90 % of the water use.
- About 8 % is used for domestic purposes and some 2 % for industrial, commercial and tourist purposes.
- Drinking water consumption per capita varies between rural areas and urban areas.



Water Use

● Pressure on water resources is expected to increase further due to:

1. High population growth
2. Economic , social, tourism and industrial development
3. National policy of **food security**
4. Climate change



Water Quality

- In many water basins, water shortage is accompanied by **poor water quality**, particularly in the areas of heavy economic activities.



Water Quality

- Contaminated river water is used for irrigation purposes, which poses a major health hazard to consumers of irrigated vegetables



Water Quality

- Sewage treatment is very limited and the treatment processes are not always meeting international standards.
- Surface and groundwater pollution is obvious due to the lack of appropriate wastewater collection, treatment plants and leaching of agricultural chemicals.
- Discharged wastewater in rural areas is rarely treated.



In Summary

- National deficit is 3 billion m³, 20% of actual renewable water resources
- Irrigated agriculture uses 90% of water
- Contribution to GDP: Agriculture 20%, industry 36%, services 45%
- Efficiency of water use is very low
- Over-irrigation of low water productivity crops
- Treatment of wastewater severely lagging behind

Drivers for unsustainable water outcomes

External factors such as:

- The food security policy
- Price and input support
- Overall water productivity in agriculture **remains low**
- Subsidies
- Over-pumping of groundwater
- Shifting to crops with higher water productivity **is limited**
- Poor irrigation practices
- Groundwater has “**NO**” value

Policy, legal and institutional framework

- Limited integration of water related sectors
- The enforcement of the Water Law lags behind.
- Weak law enforcement and regulation of groundwater pumping
- Lack of evaluation and assessment
- Water Use Associations should be activated.
- Basin approach is needed together with a clear allocation system, integrating surface water and groundwater

Information management and data collection

- Water resources and water services
- Water monitoring
- Future water demand will substantially increase the deficit
- Domestic waste water treatment is low

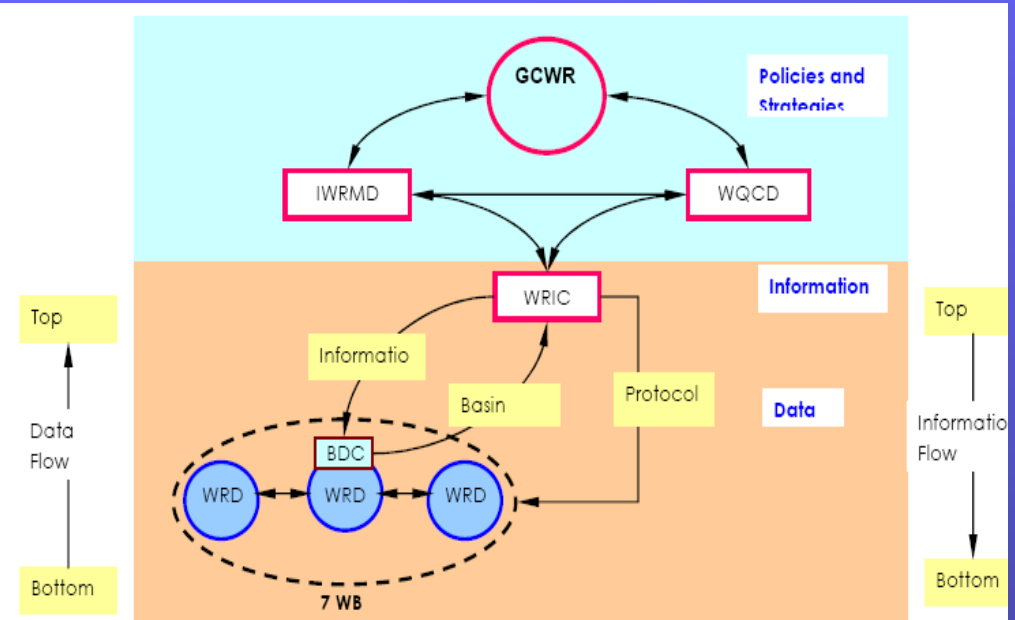


Figure 4: Proposed institutional setting

WB : Water basin
WRD : Water resources directorate
BDC : Basin Data Centre
WRIC : Water Resources Information Centre
GCWR : General Commission for Water resources
WQCD : Water Quality Control Directorate
IWRMD: Integrated Water Resources Directorate

Public financing is driving unsustainably

- Low levels of cost recovery
- Water services (water supply and sanitation)
- No recovery of capital investment
- There is still supply-led water development (instead of management-led)
- Over-extraction of groundwater and depletion of groundwater resources
- Lack of understanding the water value

Economic aspects

- Cost recovery in irrigation and value generated in irrigated agriculture
- Energy price is partly subsidized
- Water resources fee on surface water is fixed at 3500 SYP/ha/yr
- No water fee in groundwater areas
- Economic return is low

Recommendations

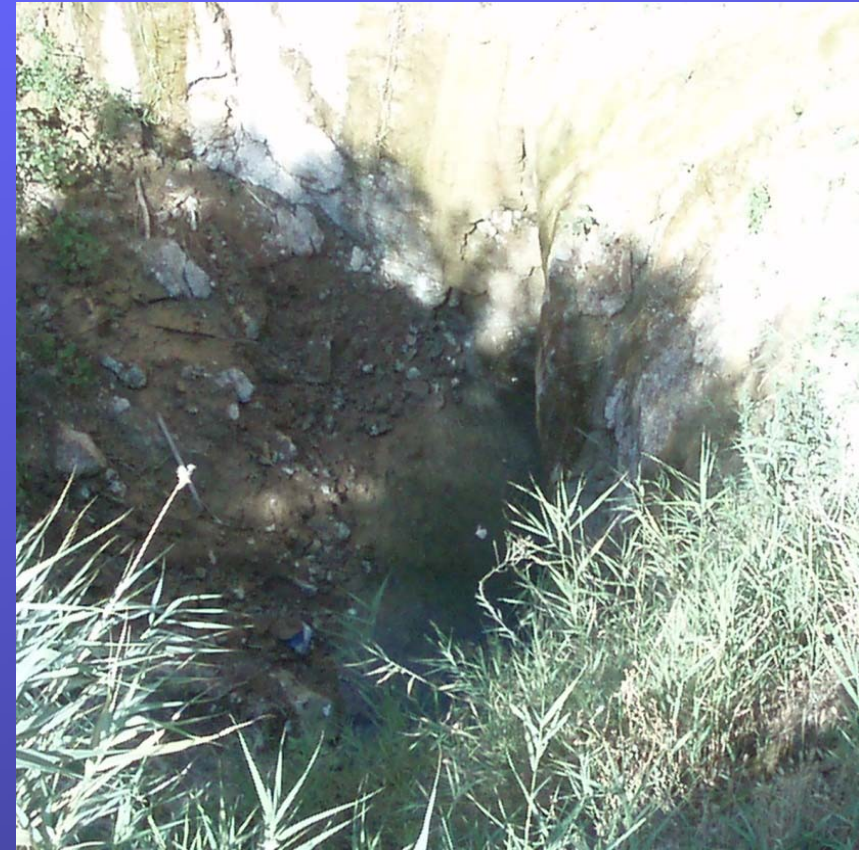
- Syria is facing real challenges regarding the safe and sustainable management of the nation's water resources.
- Under present conditions the national water deficit may increase to about 5 billion m³/yr in 2025, if nothing is changed.
- Supporting the water sector in Syria is essential especially education system to involve implementation, **association and real cooperation** with companies and project work.

Recommendations

- Real practical experience is urgently needed in Syria regarding **the application of IWRM and especially water demand management**.
- Syria is at this moment losing its **real** national wealth, the groundwater resources, seriously endangering the prospect of profitable use by future generations.
- **Water demand management and the difficulty in implementation should have first priority.**

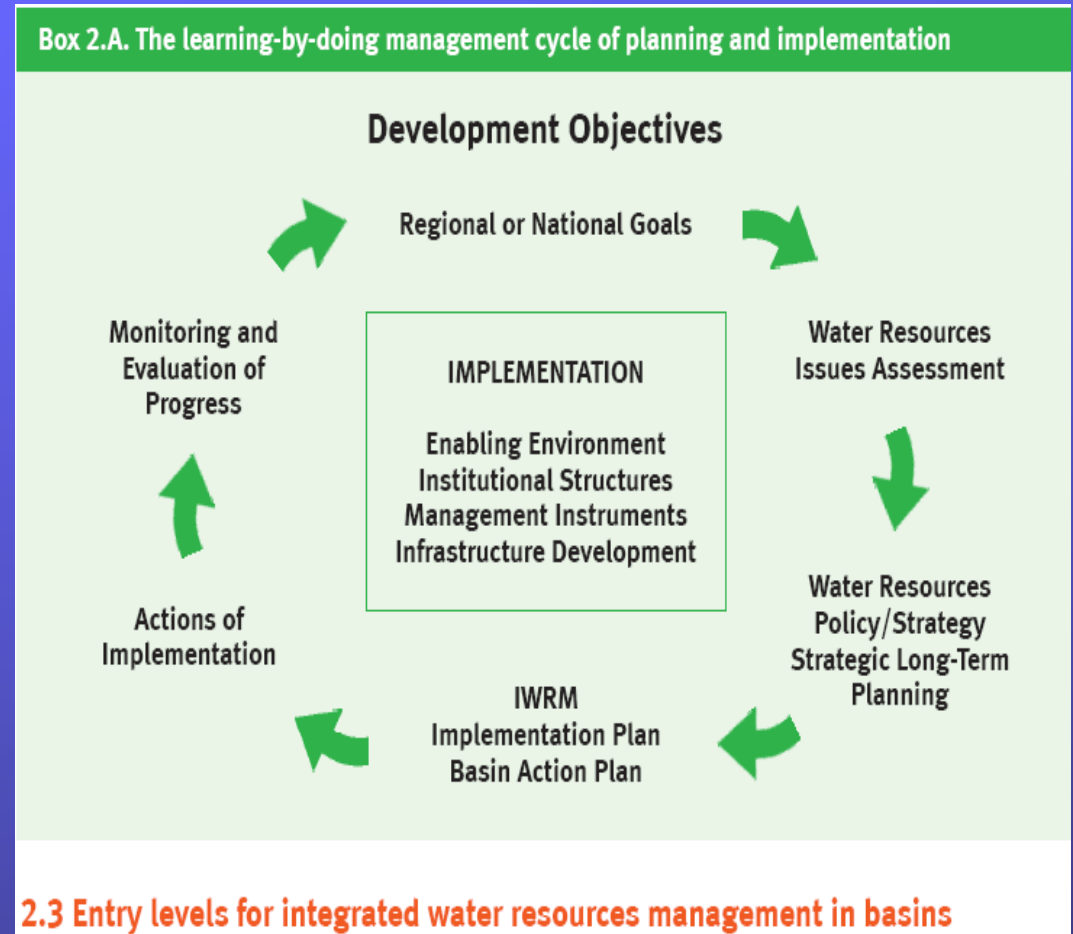
Recommendations

- The current attention to **climate change** in the world and the effects on Syria's water situation are minor compared to the effect of human-induced water practices that seriously affect the socio- economic development.
- **Effective capacity building programmes**



Recommendations

- There is a **critical** need for a clear direction in **strategy, policies and implementation of WRM** both at national and local level, to:



- Reduce the water deficit
- Re-allocate water to higher value uses
- IWRM, especially concerning water demand management and water use rationalisation is urgently needed, **but the institutional and operational framework to support also needs to be considerably strengthened.**

The Way Forward

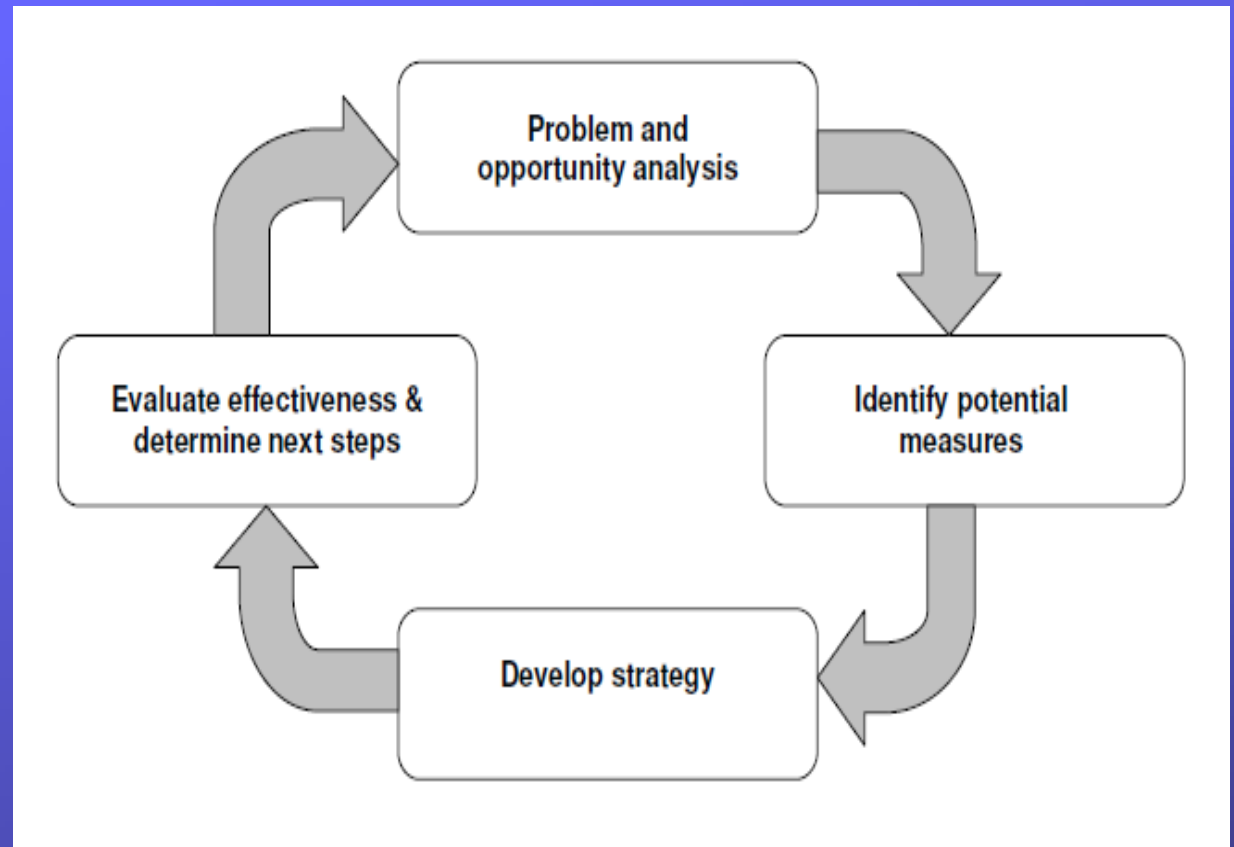
Water Management is priority for Syria which should contain at least the following topics:

- Strengthening surface water and groundwater monitoring networks on quantity and quality
- Strengthening surface water and groundwater resources assessment
- Capacity building to strengthen a participatory approach between the national and local water-related institutions for IWRM

The Way Forward

● IWRM, among which:

- Water and spatial planning, policy- and decision making processes



IWRM-process

The Way Forward

- Integrated management of water supply and sanitation
- Water resources and water demand management **in practice**: cooperation is **essential**
- Water scarcity management, protection of water resources and reuse
- Irrigation water management

Thank you for
your Attention

