



تحديات وفرص إدارة المياه الجوفية في المنطقة العربية

Challenges and Opportunities of Groundwater Management in the Arab Region

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Overview

- General Constraints of Groundwater Management
- Groundwater in the Arab Region
- Available literature on GW Governance in the Arab Region
- Main Challenges for Effective GW Governance (based on Countries)
- GW Governance Priorities in the Arab Region (based on Countries)
- Diagnosis of the GW Management level
 - Case Study: Groundwater in the Kingdom of Bahrain
- Conclusion and Recommendations

General Constraints of Groundwater Management

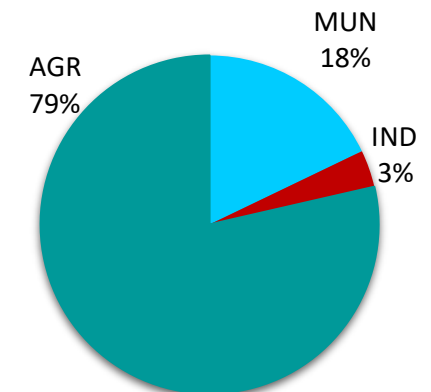
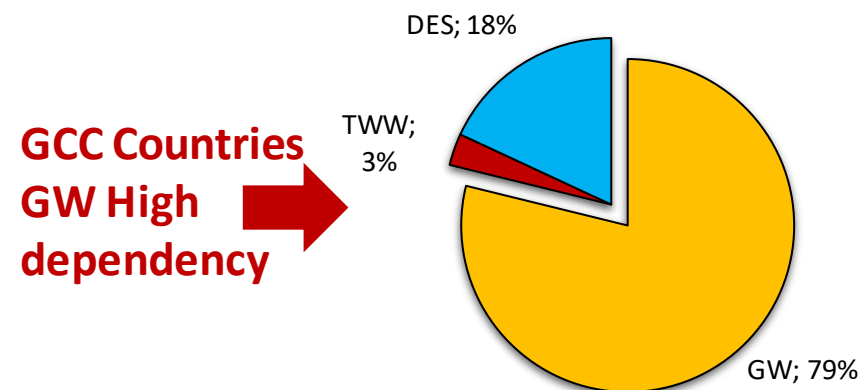
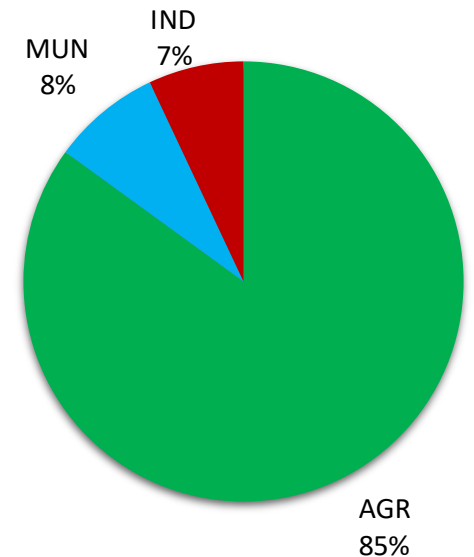
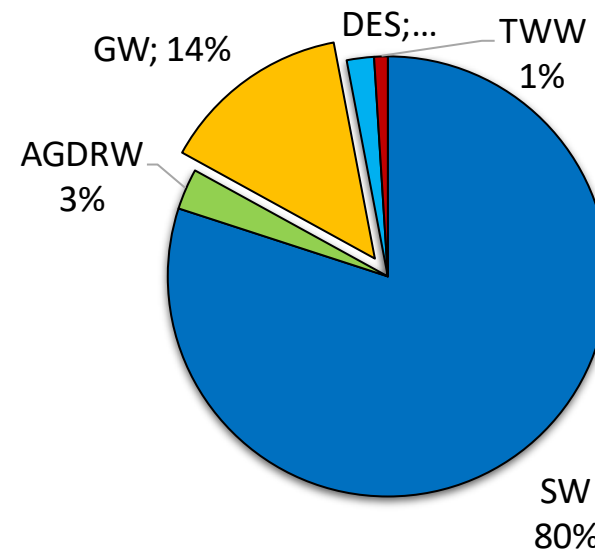
- **Invisible leading to wrong perceptions** (decision makers, users and the public at large)
- **Complex to assess** (heterogeneities, moving boundaries, crosses boundaries, hydraulic interactions)
- **Hard to manage** (spatially distributed users, socio-economic and political factors; slow processes)
- **Relatively costly to monitor and to enforce regulations** (water levels, water quality, and abstraction rates)
- **Difficult to rehabilitate when polluted or salinized** (takes long time and costly)



Groundwater in the Arab Region

- Heavily utilized to meet increasing demands; highest dependency in Arabian Peninsula and some Arab countries (e.g., Palestine, Jordan, Libya)
- **Renewable GW:** overexploited, water level decline, saltwater intrusion, and pollution by anthropogenic activities
- **Non-Renewable GW:** rapid mining (to fulfill agricultural water demands mainly)
- **Consequences of Loss of GW:** increasing water scarcity, increasing cost of water supply, loss of strategic reserves for emergency and CC buffer, loss of agriculture, ...

Water Resources and Water Utilization in the Arab Region & GCC Countries



Available Literature on GW Governance in the Arab Region

- **Governing Groundwater in the Middle East and North Africa Region, 2018**, Molle, F, Closas, A., and Al-Zubari, W. In: Advances in Groundwater Governance, Villholth, K. G, et al (eds.). CRC Press.
- **Groundwater Governance in Jordan, The case of Azraq Basin**, A Policy White Paper, **2017**, IWMI and USAID. Groundwater Governance in the Arab World project
- **Groundwater Governance in Lebanon, The case of Central Beqaa**, A Policy White Paper, **2017**. Groundwater Governance in the Arab World Project
- **Groundwater Governance in Tunisia**, A Policy White Paper, **2017**. Groundwater Governance in the Arab World Project.
- **Groundwater Governance in the Middle East and North Africa, 2016**, Closas, A. and Molle, F. IWMI project Report: Groundwater Governance in the Arab Region
- **Groundwater Governance: A Synthesis, 2016**, Molle, F. and Closas, A. IWMI project Report: Groundwater Governance in the Arab Region
- **Regional Diagnostic Report: Arab States Region, 2014**, Al-Zubari, W.K. GEF, WB, UNESCO/IHP, FAO, IAH.
- **MENA Regional Water Governance Benchmarking Project. 2010**. USAID
- **Innovations in Groundwater Governance in the MENA Region, Paper 14, 2008**, SIWI, SIDA, BGR, UNESCO/IHP.

Main Challenges for Effective GW Governance

- **Inadequate/Lack of clear GW policies and legislations**
- **Lack/inadequate political will** for the implementation of GW policies and legislation
- Overall **limited funding** for **GW sector** impacting management, monitoring and capacity development
- **Weak GW institutions, fragmented** or overlapping responsibilities, and **weak coordination** between involved sectors
- **Inadequate understanding of GW systems** and inadequate awareness
- **Limited community participation**
- **Inadequate human resources capacity** (and motivation due to low government salaries)
- **Weak monitoring systems** and **Lack of data, information, and** needed technology

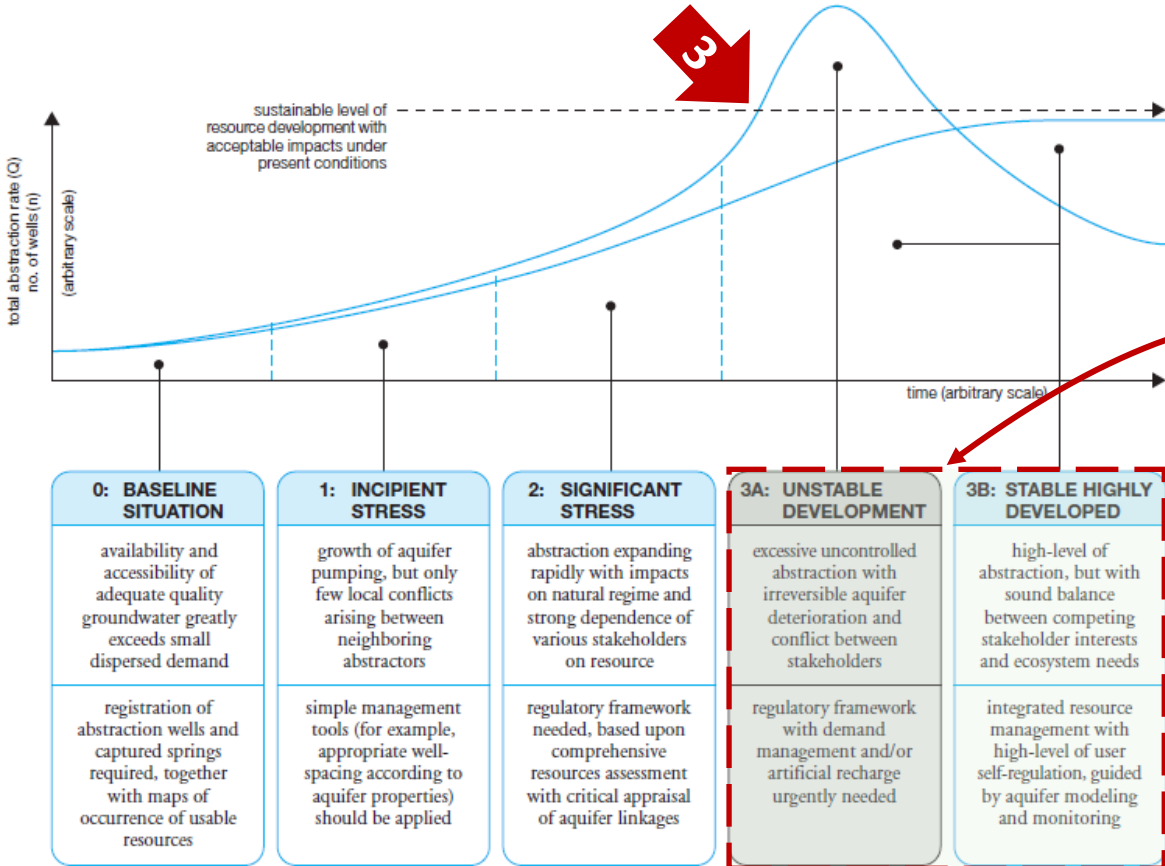
GW Governance Priorities in the Arab Region

- **Technical Level**
 - Improving GW monitoring; Developing reliable data systems and/or modules for quality and quantity; Protecting GW quality from surface contamination; Promoting GW conservation techniques especially in agriculture; Capacity building and training of staff in GW management including simulation modeling
- **Legislative Level**
 - Formulating clear GW policies, strategies and plans; Enforcing groundwater legislations; Regulating and limiting abstraction to sustainable levels; Controlling licensing for drilling and pumping and transparent licensing; state ownership to GW; clear GW allocation plans
- **Infrastructure Level**
 - Implementing water supply projects to provide (potable) water to the population; GW recharge techniques (MAR) or dams
- **Socio-political Level**
 - Promoting GW conservation and increasing public awareness and increasing public engagement and stakeholder involvement

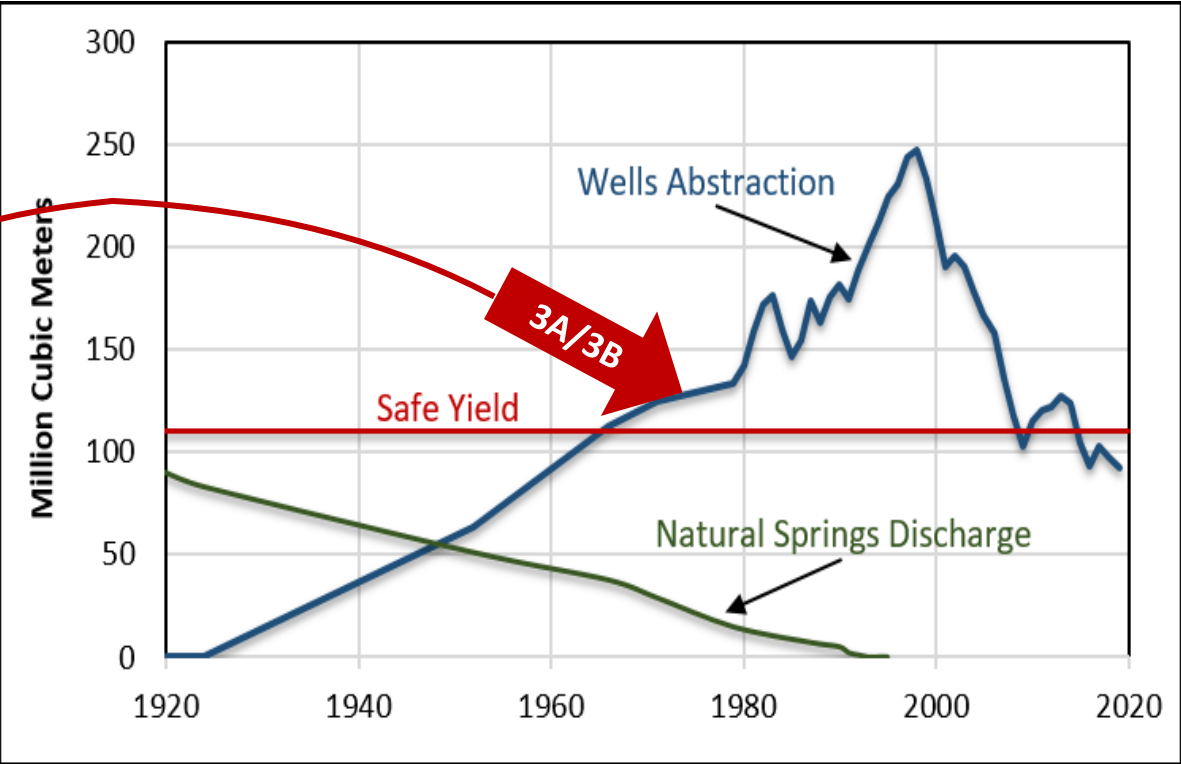
Diagnosis of the GW Management level

Case Study: Groundwater in the Kingdom of Bahrain

Groundwater Development and their corresponding management needs



Groundwater Exploitation in the Kingdom of Bahrain, 1925-2020



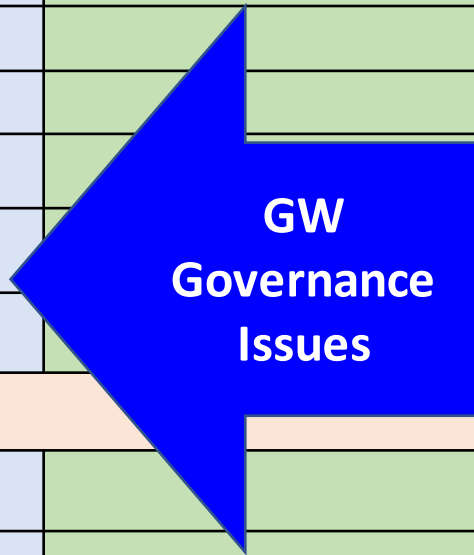
World Bank Framework for Diagnosing GW Management level

GROUNDWATER MANAGEMENT TOOLS & INSTRUMENTS	LEVEL OF DEVELOPMENT OF CORRESPONDING TOOL OR INSTRUMENT			
	0: BASELINE SITUATION	1: INCIPIENT STRESS	2: SIGNIFICANT STRESS	3: UNSTABLE DEVELOPMENT
TECHNICAL TOOLS				
Resource Assessment	basic knowledge of aquifer	conceptual model based on field data	numerical models operational with simulation of different abstraction.	models linked to decision-support and used for planning and management
Quality Evaluation	no quality constraints experienced	quality variability is issue in allocation	water quality processes understood	quality integrated in allocation plans
Aquifer Monitoring	no regular monitoring program	monitoring, ad-hoc data exchange	monitoring routines established	monitoring programs used for Decision Support
INSTITUTIONAL INSTRUMENTS				
Water Rights	customary water rights	occasional local clarification of water rights (via court cases)	recognition that societal changes override customary water rights	dynamic rights based on management plans
Regulatory Provisions	only social regulation	restricted regulation (e.g., licensing of new wells, restrictions on drilling)	active regulation and enforcement by dedicated agency	facilitation and control of stakeholder self-regulation
Water Legislation	no water legislation	preparation of groundwater resource law discussed	legal provision for organization of groundwater users	full legal framework for aquifer management
Stakeholder Participation	little interaction between regulator and water users	reactive participation and development of user organizations	Stakeholder organizations co-opted into management structure	stakeholders and regulator share responsibility for aquifer management
Awareness and Education	groundwater is considered an infinite and free resource	finite resource (campaigns for water conservation and protection)	economic good and part of an integrated system	effective interaction and communication between stakeholders
Economic Instruments	economic externalities hardly recognized (subsidized)	only symbolic charges for water abstraction	recognition of economic value (reduction & targeting fuel subsidies)	economic value recognized (adequate charging and possibility of reallocation)
MANAGEMENT ACTIONS				
Prevention of Side Effects	little concerns for side effects	recognition of (short- and long-term) side effects	preventive measures in recognition of <i>in-situ</i> value	mechanism to balance extractive uses and <i>in-situ</i> values
Resources Allocation	limited allocation constraints	competition between users	priorities defined for extractive use	equitable allocation and <i>in-situ</i> values
Pollution Control	few controls over land use and waste disposal	land surface zoning but no proactive controls	control over new point source pollution	control of all point and diffuse sources of pollution; mitigation of existing contamination

Management Needs

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Awareness and Education				
Economic Instruments				
MANAGEMENT ACTIONS				
Prevention of Side Effects				
Resources Allocation				
Pollution Control				



Identified Major
Deficiency Areas

Need to be here!

Conclusion and Recommendations

- Groundwater sustainability challenges are **Governance & Management first** (i.e., institutions, legislations, participation, economic value of water, data, ...), and **Technical second**
- Major **capacity building and training efforts** in groundwater specialization are needed; groundwater-related academic programs need **to include social, economic and political topics** in addition to the traditional physical and engineering topics
- Major **groundwater awareness programs** to groundwater stakeholders (users, regulators, and policy/decision makers) are needed to overcome wrong perceptions
- Use of **modern technology in groundwater management** is more cost-effective than traditional manual methods (e.g., wireless monitoring, simulation models, RS, ...)
- **Users “self-reporting” should be implemented and enforced** in certain aspects of groundwater monitoring such as groundwater quality and abstraction to internalize groundwater management costs
- **Groundwater models are tools** (not objectives) and should be used continuously in the decision-making process, planning, and management of groundwater resources

**Thank
You!**