# Groundwater Governance in the Arab World: Taking Stock and Addressing the Challenges

International Water Management Institute (IWMI)

Funded by USAID

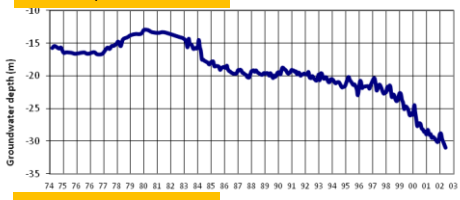
Research partners:
INRGREF (Tunisia), Beirut Arab University (Lebanon), International Center for Biosaline Agriculture (UAE), The University of Jordan (Jordan), LISODE (France)

# Introduction

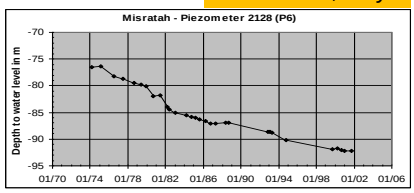
# Challenges affecting groundwater in the Arab world

- Groundwater essential for domestic and industrial supply, especially in rural areas
- Irrigation systems based on surface water are receiving less water (competition with cities and climate change), and need to complement with groundwater
- Agriculture consumes 85 percent of water in the region, but it remains a strategic resources for rural livelihood
- Agricultural development in desert areas based on (often deep) groundwater as a profitable venture (and/or subsidized by the state)
- Agricultural policies often disconnected from water realities, and water/agricultural ministries have inconsistent policies (if not antagonistic)
- Groundwater quality degradation (salinity and contamination from agriculture and urban areas)
- Transboundary aquifers

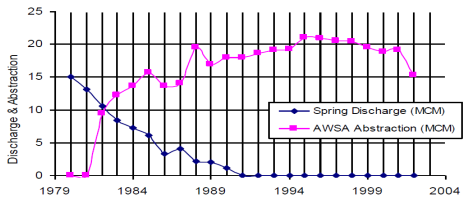
Haouz, Morocco



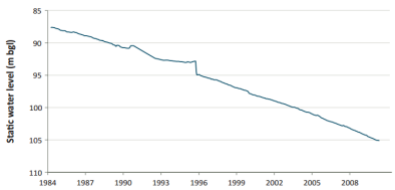

Misratah, Libya



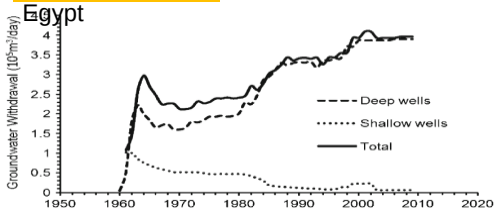

Azraq, Jordan



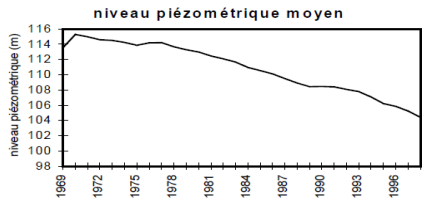

Ram aquifer, Saudi




Kharga oasis, Egypt




Kairouan, Tunisia

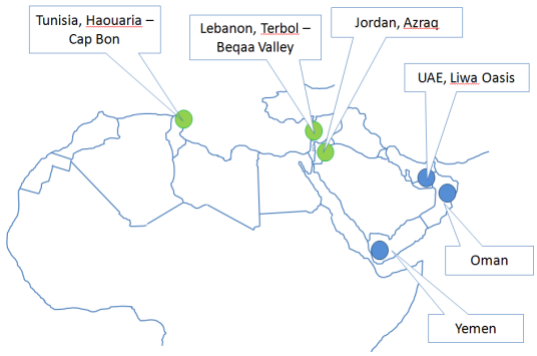


## Groundwater Governance in the MENA region

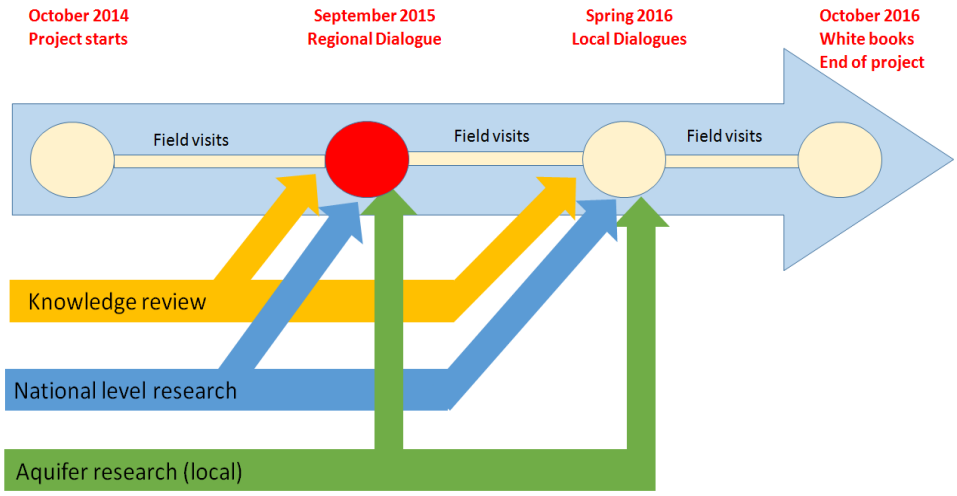
IWMI, ICBA
LRBA (Lebanon)
INRGREF (Tunisia)
University of Jordan
LISODE (France)
*Consultants*

*Why is there groundwater overdraft, and why is it so hard to curb or regulate?*

*What are the governance options available for different contexts, and how can we make them work?*




## Project timeline



## Main objectives of the project

- ✓ Review how groundwater abstraction is dealt with at the world level, with a focus on the MENA region (to feed the project reflection and process)
- ✓ Analyze in details the groundwater policy process story in 6 selected countries (to understand how we got there)
- ✓ Inject new perspectives in the on-going policy process in Tunisia, Lebanon, Jordan
- ✓ Study 3 problem aquifers in details and analyze differences between formal policies dynamics on the ground
- ✓ Conduct 'local dialogues' to foster social learning and interactions between national and local scales
- ✓ Prepare 'White books' for each aquifer, with recommendations and ideas for addressing groundwater overdraft

## Programme of the workshop

**D1**

*Morning*

*Introduction of participants

*Elements on the Knowledge base (3 parts)

*Afternoon*

*Role game around a (virtual) aquifer

**D2** Field visit

**D3**

*Morning*

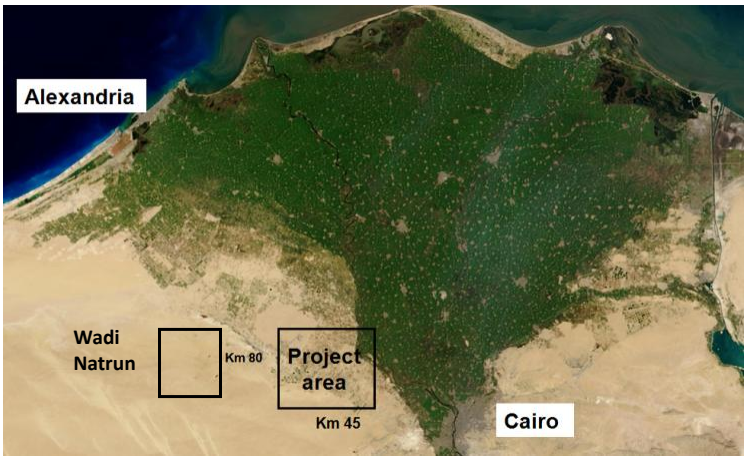
*3 case studies: challenges from the group

*Afternoon*

*Exploring the concept of 'co-management'

*Feedback

**D2**




*Presentation of the West delta PPP (Dr Safwat)
*Visit of Shorouq farm
*Discussion on land expansion/ water governance in Wadi Natrun
*Visit of a cooperative of small investors in West Delta area

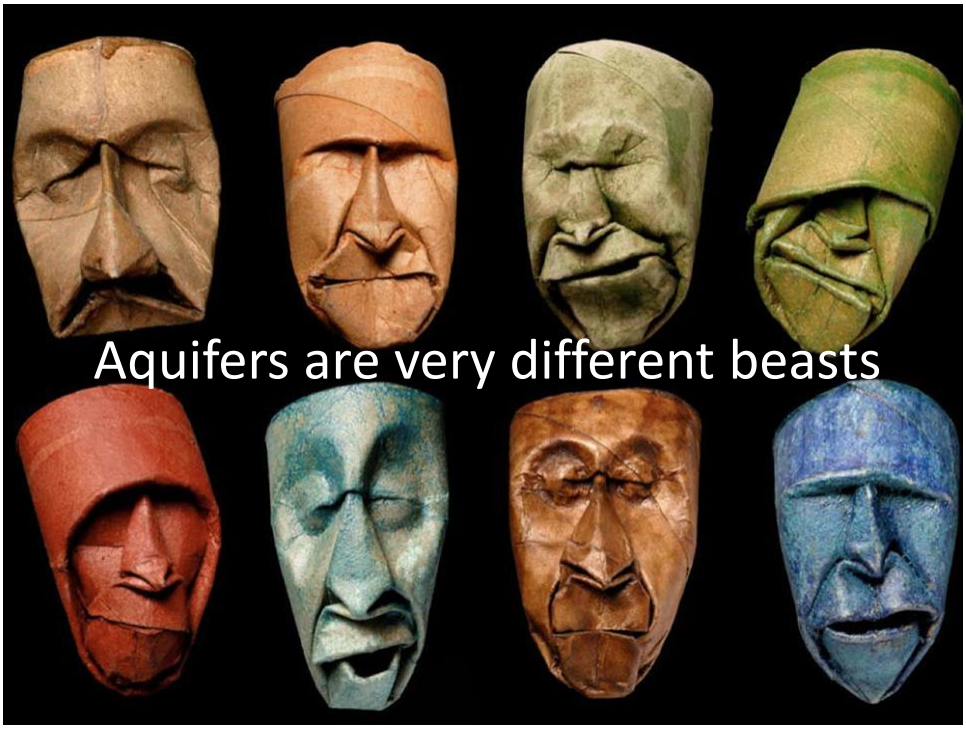
This morning's presentations and discussions in three parts

1. Aquifers are very different 'beasts'
2. Aquifers are not (or rarely) an additional stock of water
3. Groundwater use schemes are also very different

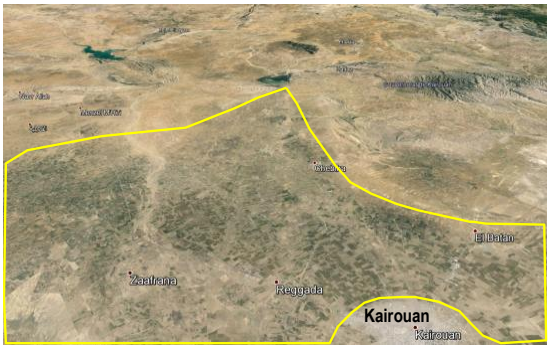
1. Who should regulate water use? The state!
2. Who should regulate water use? The users!

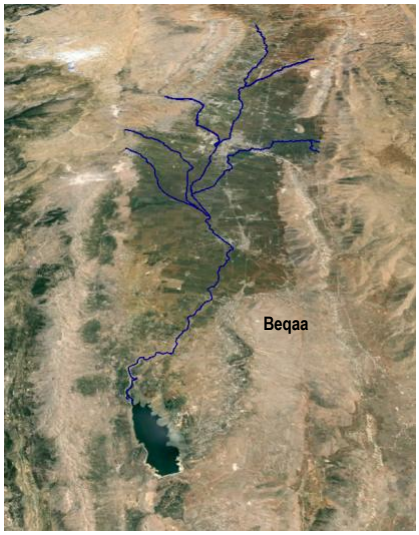
1. Co-management by the state and users
2. Three examples

# P1
# Aquifers and users



## 1a. Large alluvial inner plains




*** Internal**

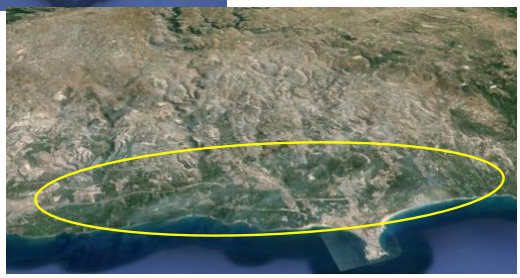
Beqaa (Lebanon)
Ghab (Syria)
Jordan valley
Kairouan plain (Tunisia)
Tadla (Morocco)

## 1.b Alluvial/sedimentary plains and deltas


*** Coastal**

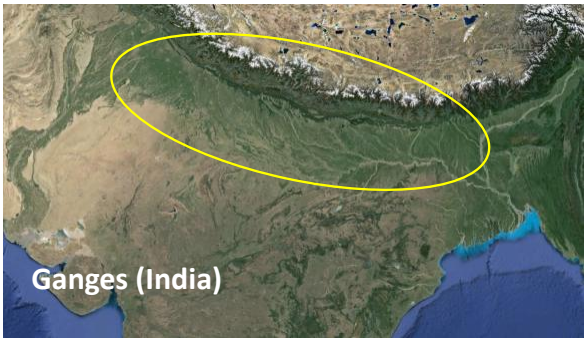
Nile delta
Cap Bon (Tunisia)
Gharb (Morocco)

South Lebanon (Sour)

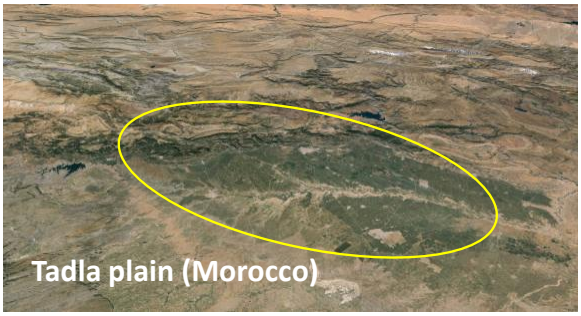


Superficial clay layer
(Nile, Beqaa, etc)
Little or no transmissivity

## 1. Large alluvial plains and deltas




- Recharged by flood and rainfall (and irrigation)




- Recharged by irrigation (and river)

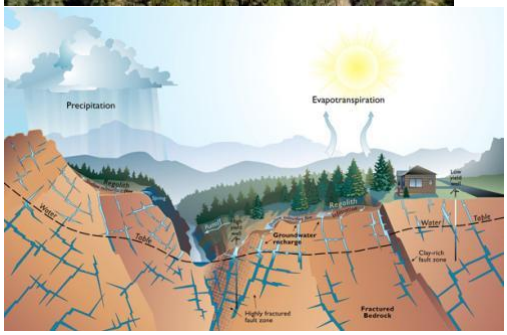
## 2. Sedimentary plateau/basins (limestone, sandstone, gravels, etc)

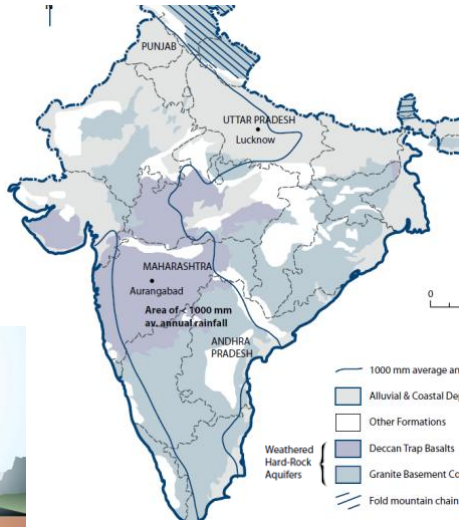


The river system drains the soil

Deep (fossil) aquifers as a special case

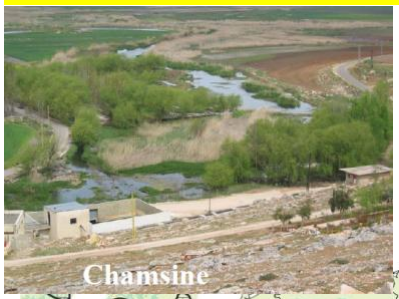
## 3. Fractured rocks

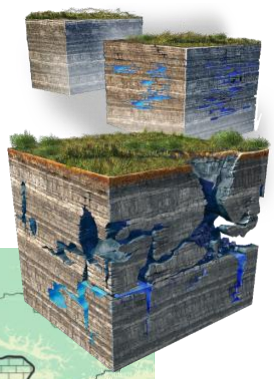



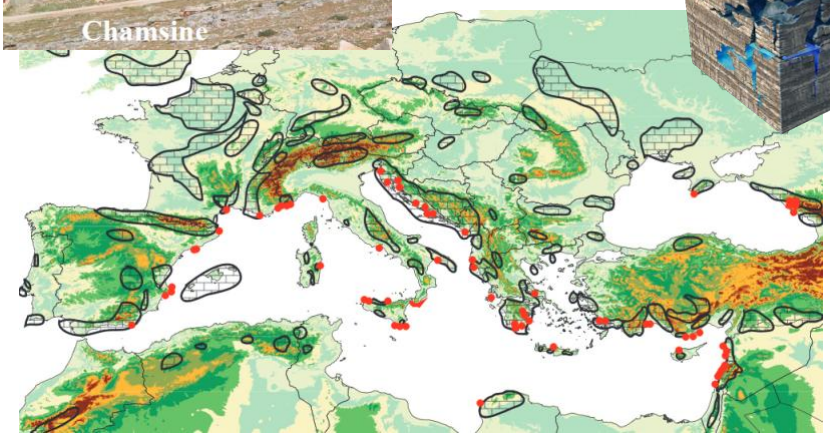



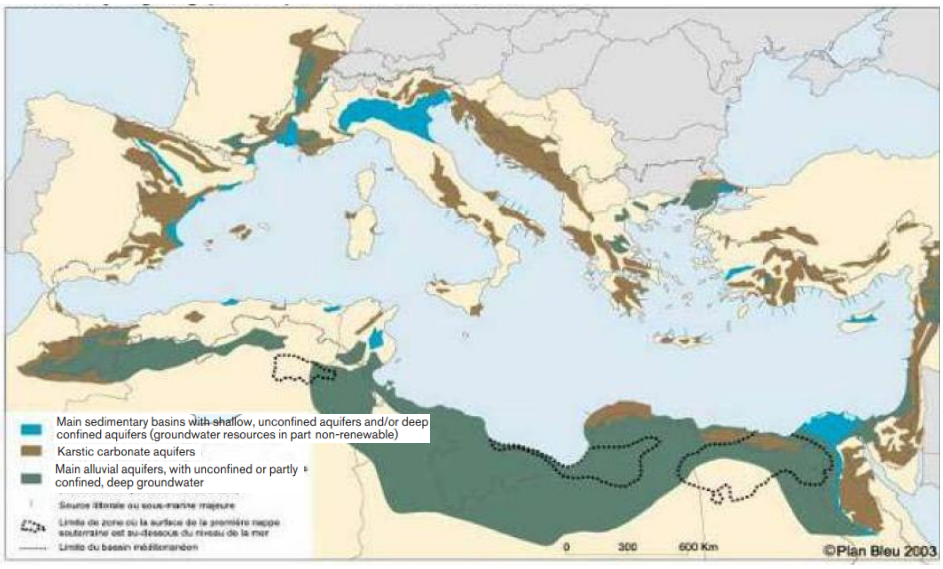

**Wadi Mujib**

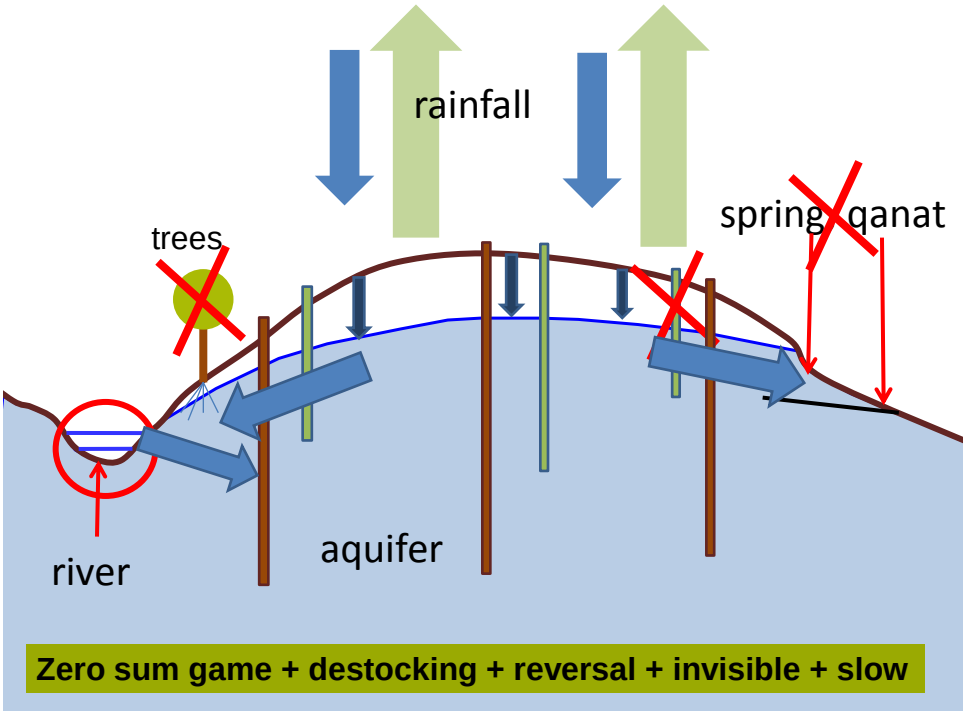
## 4. Karst aquifers






Main sedimentary basins with shallow, unconfined aquifers and/or deep confined aquifers (groundwater resources in part non-renewable)
Karstic carbonate aquifers
Main alluvial aquifers, with unconfined or partly confined, deep groundwater
0
300
600 Km
©Plan Bleu 2003


rainfall
trees
spring
qanat
river
aquifer
Zero sum game + destocking + reversal + invisible + slow

## Winners

- New users of groundwater

## Losers

- Spring (and their users)
- Qanat (and their users)
- GW-fed vegetation
- Baseflow recharge (and its users)
- Environment (wetland, etc)
- Existing well users (deepen, pumping costs)
- Future users (decrease in stocks)

## Winners

- New users of groundwater

## Losers

- ~~Spring~~ (and their users)
- ~~Qanat~~ (and their users)
- GW-fed ~~vegetation~~
- ~~Baseflow~~ recharge (and its users)
- ~~Environment~~ (wetland, etc)
- Existing well users (deepen, pumping costs)
- Future users (decrease in stocks)

Only in this (sad) case, can we compare recharge and abstraction meaningfully

## Aquifers

are not an additional stock of water waiting to be used when surface water is fully used

## they are

- masses of water
- fed by recharge and
- flowing
- slowly and invisibly
- to outlets
  - Sea
  - Rivers
  - Springs
  - Wetlands

**If we pump part of it, we *decrease* the outflow in quantity (and often quality)**

| | | Return flows affected by pumping | Users/functions affected |
|---|---|---|---|
| 1a |  | Flow to the sea | Well users themselves |
| 1b |   | Baseflow to river and wetlands | Downstream users in dry season |
| 2 |   | Baseflow to river springs and wetlands | Environment and downstream users |
| 3 |  | Baseflow to river or other outlets | Downstream users |
| 4 |  | The springs | Spring users |

## In general there is no such thing as "safe yield"

*understood as*

"the volume we can 'safely' pump without affecting anyone or the environment"

**The « safe yield » is the level of pumping for which what is lost is considered '*acceptable*', compared with what is gained**

The assessment depends on **who** does it and with which criteria (the state, existing users, Green NGOs, etc…)!!

Therefore « *how much we can/should pump* » is a political question (that concerns the society)

Small groundwater user in Bangladesh

Small groundwater user in Egypt

*Individual shallow wells*

Traditional groundwater lifting in India

Large centre pivot agri-business farms in Jordan

Small/large farmers in Egypt


*Individual deep wells*

Deep borehole owner in Texas

**Collective wells in India**

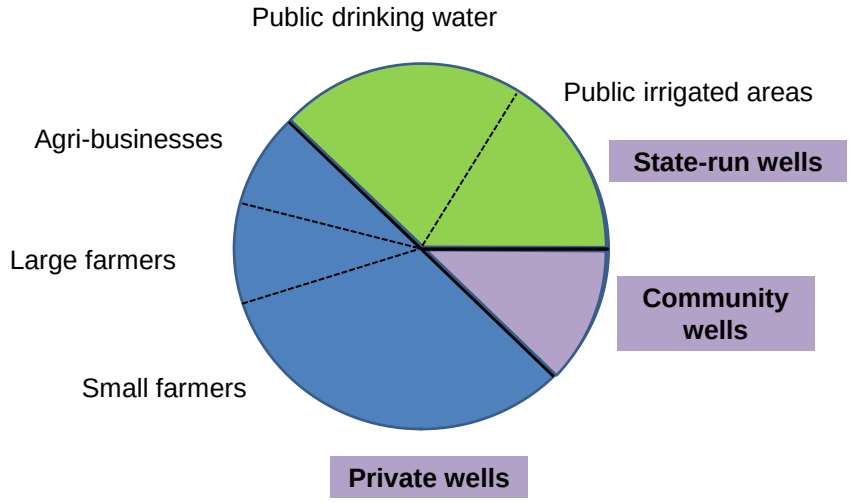
***Community wells***

**Collective well in Algeria**

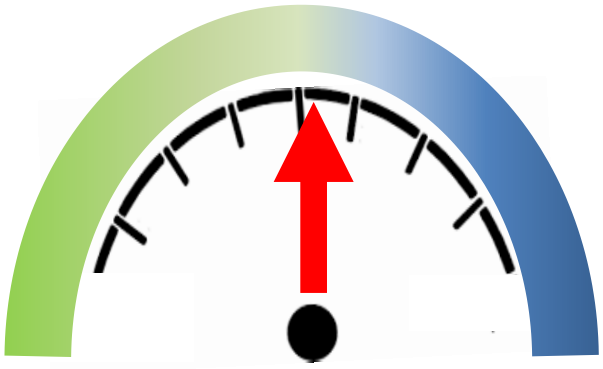
**Qanats in oases**

# A typology of groundwater schemes

***A very rough well typology - ownership***

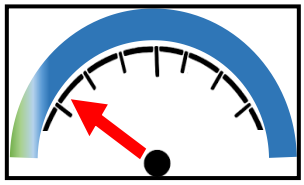



## Type of management – what will it be: Public or Private?



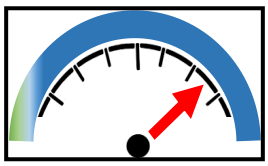
Public management

Private management



Public Management

- Public wells
  -  *For irrigation, Tunisia*
  -  *For public water supply, Bekaa, Lebanon*
- Public wells and network managed for farmers
  -  *Spain Sousse, Morocco*
- Public wells co-managed with community
  -  *Mitidja, Algeria GDA, Tunisia India*

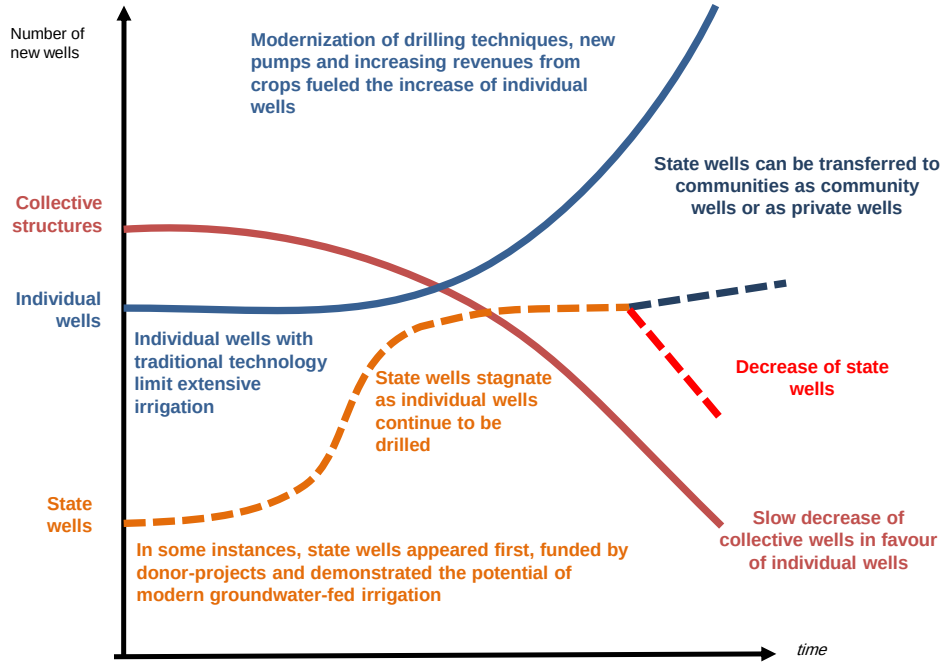


Private Management

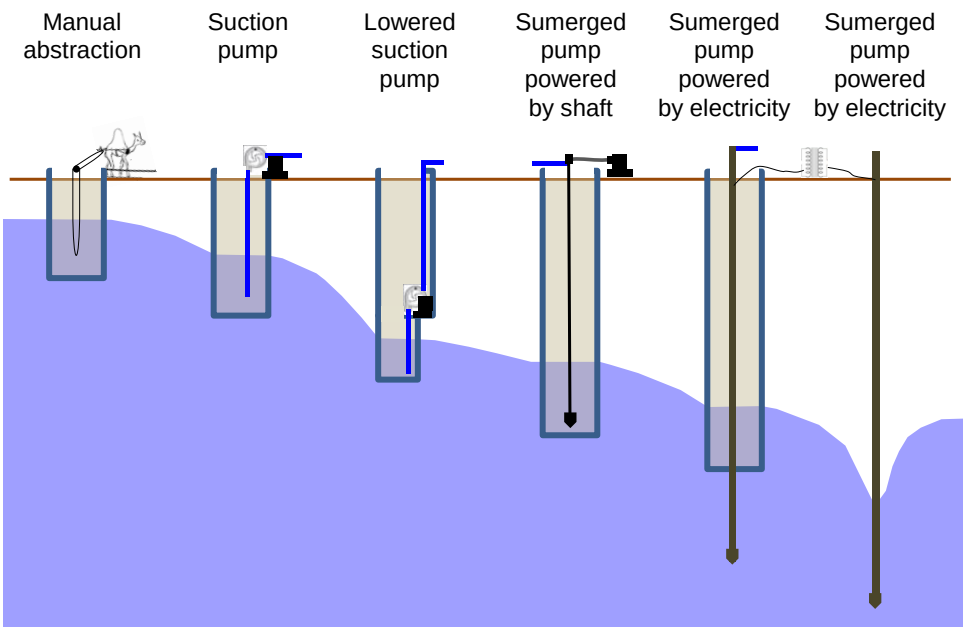
- Community/ collective
  - 
  - 

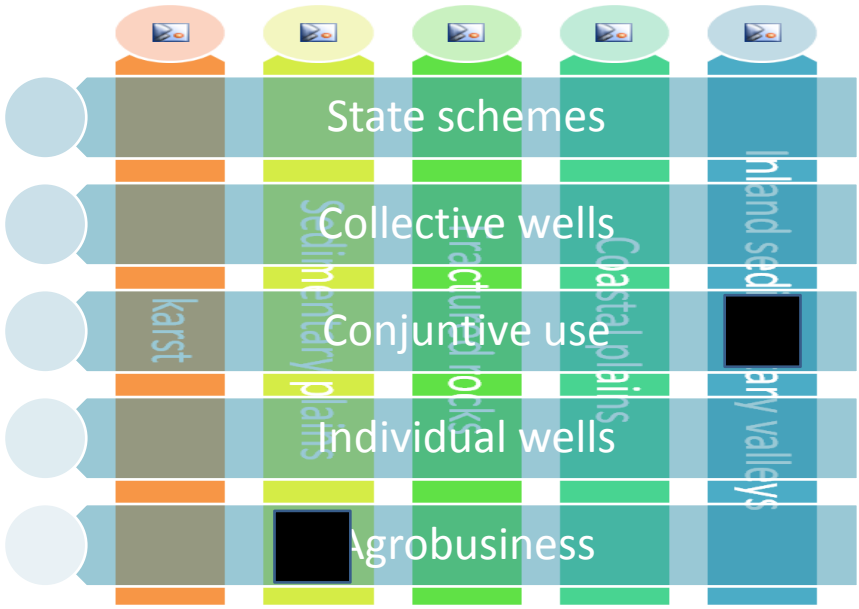
  *Well cooperatives, Bolivia Qanats*

  PRIVATE ACCESS (TO COMMUNITY MEMBERS)
  Or
  SHARED ACCESS WITH OTHER USERS (WITH ARRANGEMENTS)
- Transferred
  -  *Mitidja, Algeria*
- Individual
  - Small family farmer
    -  *Pervasive*
  - Corporate
    -  *Saudi Arabia, Jordan, Egypt*
  - Conjunctive use: private management within a public system
    -  *Delta, Egypt Morocco*




# Typical types of wells




State schemes
Collective wells
Conjuntive use
Individual wells
Agrobusiness
karst
Sedimentary plains
Fractured rocks
Coastal plains
Inland sedi
ary valleys