ACADÉMIE HASSAN II
DES SCIENCES ET TECHNIQUES

SESSION PLENIERE
Rabat, 20-22 Fevrier 2008

"The groundwater development silent revolution pros and cons"

Author: Dr. M. Ramón Llamas (mrllamas@geo.ucm.es)
Royal Academy of Sciences, Spain.
Complutense University Madrid, Spain.

“The groundwater development silent revolution pros and cons”

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1.- INTRODUCTION

- **Groundwater intensive use is a recent phenomenon (about half a century).**
- **Water decision makers often suffer from "Hydroschizophrenia".**
- **Millions of modest farmers have drilled millions of water wells to abstract groundwater.**
- **This situation has produced:**
  - **a) Benefits (everywhere).**
  - **b) Technical problems (in some places).**
  - **c) Social and political conflicts (in Spain).**
- **Solutions are possible.**

2.- RELEVANT FACTS (I)

- **A spectacular increase of groundwater development for irrigation has occurred in most arid and semiarid countries. It is a “silent revolution”.**

- **Probably, about 50 % of the economic value of irrigated agriculture is obtained with groundwater but the volume of groundwater used is only a small fraction of the corresponding volume of surface water used for irrigation.**

2.- RELEVANT FACTS (II)

- **Scientific and technological advances have played a relevant role in this development.**

- **Most of this development has been made by private farmers with scarce governmental planning, funding and control.**

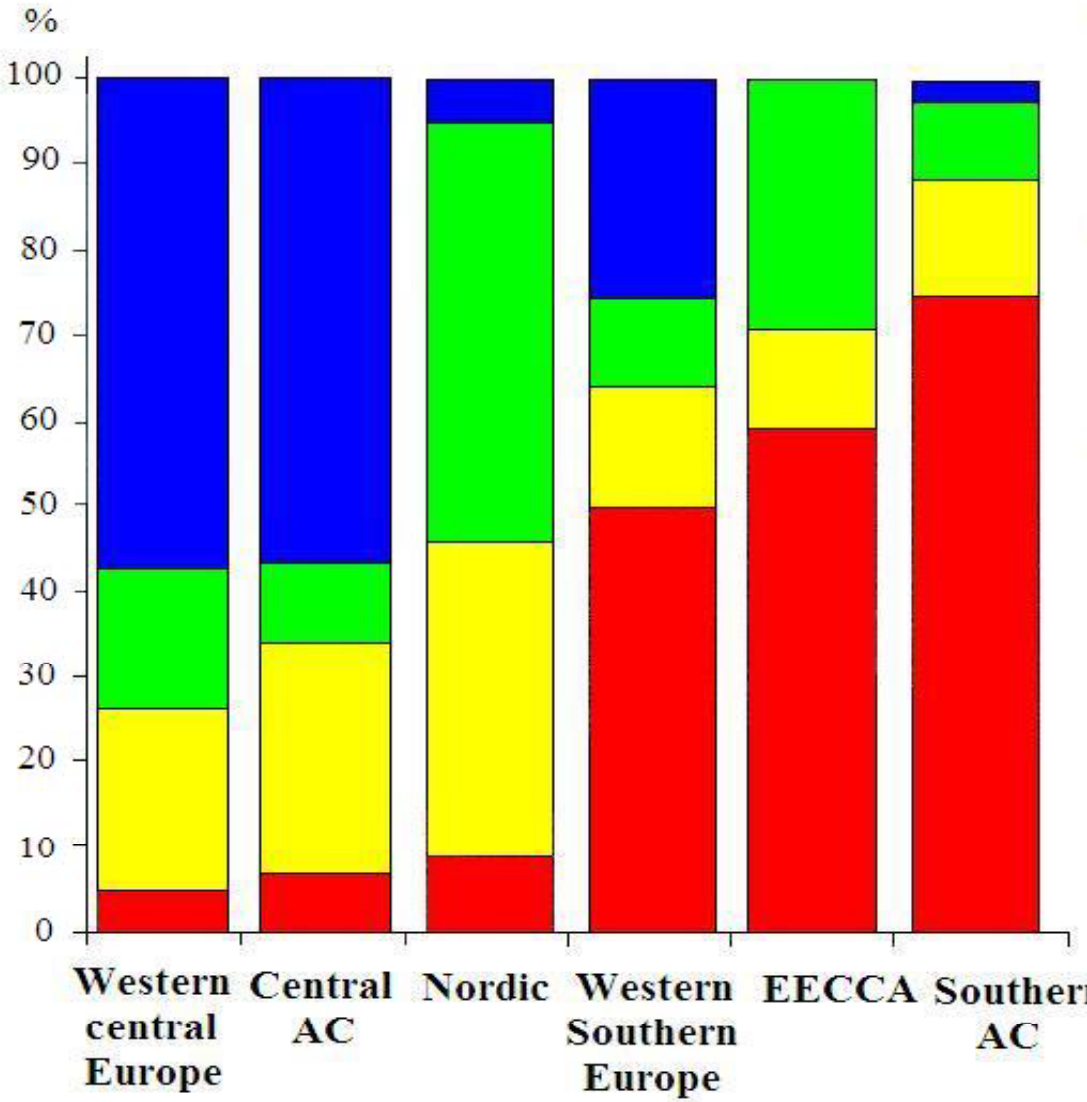
- **The fragility of groundwater resources is a pervasive "Hydromyth" (the pillar of sand).**

2.- RELEVANT FACTS (III)

- **There is no blue print (a universal model). Situations are rather different in industrialized and in developing countries, and in urban and rural areas.**

- **Nevertheless, “water crises” occur mainly in arid and semiarid regions, where water for irrigation represents 90 % of the total water use.**

- **The market is usually the driving force of this silent revolution. Groundwater abstraction is usually cheep in comparison to the obtained benefits.**



Western Central:

Denmark, Germany, Belgium, U.K., Ireland, Austria, Luxembourg, Switzerland, The Netherlands, Liechtenstein.

Central accession countries:

Poland, Czech Republic, Estonia, Lithuania, Latvia, Romania, Slovakia, Hungary, Slovenia, Bulgaria.

Nordic:

Finland, Swden, Norway, Iceland.

Western Southern:

Spain, France, Greece, Italy, Andorra, Portugal, San Marino, Monaco.

EECCA:

Kazakhstan, Turkmenistan, Tajikistan, Kirgyzstan, Ukraine, Russian Federation, Belarous, Uzbekistan, Republic of Moldova, Armenia, Azerbaijan, Georgia.

Southern accession countries:

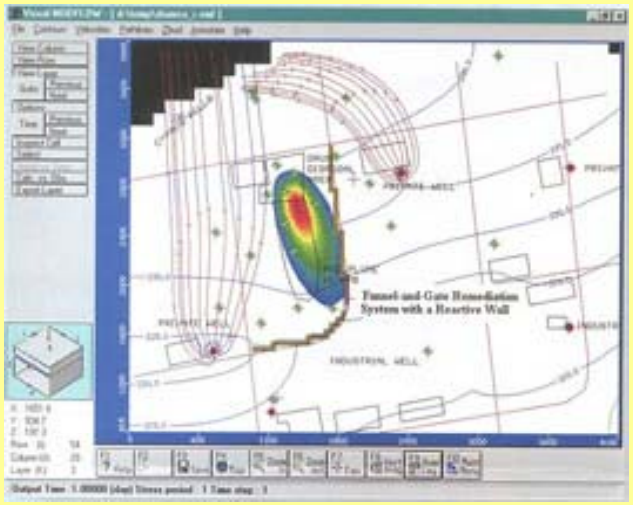
Cyprus, Malta, Turkey.

Sources: Eurostat new Cronos, EEA questionnaire (2002); Aquastat (FAO), 2002 for EECCA countries.

From the dug-well to the deep borehole.

From the water wheel to the pump.

From the water-witches to Hydrogeology.



2.- RELEVANT FACTS (IV)

Comparison of surface/groundwater irrigation in Andalusia, Spain.

INDICATOR	SURFACE WATER	GROUNDWATER	TOTAL
Irrigated surface (10^3 ha)	600	210	810
Total production (10^6 €)	1,950	1,800	3,750
Average consumption at origin (m^3/ha/year)	7,400	4,000	6,500
Water productivity (€ / m^3)	0.42	2.16	0.72
Employment generated (EAJ/10^6 m^3)	17	58	25

EAJ: Equivalent annual job

Source: Llamas et al. (2001). Data from Corominas (1999) and MIMAM (2000).

2.- RELEVANT FACTS (V)

Groundwater is already contributing significantly to achieve two of the UN Millennium Goals.

To halve by the year 2015 the number of people worldwide who do not have access to drinking water.

To halve by the year 2015 the number of malnourished people worldwide.

3.- THE BENEFITS (I)

- **Especially in developing countries: ready access to drinking water, irrigation to mitigate or abolish malnourishment.**
- **Security against drought: guarantee urban public supply, encourage agricultural investment.**
- **Positive social transition in poor rural areas (this is a crucial input to global change).**

3.- THE BENEFITS (II)

- **Groundwater irrigation is more efficient from the economic and social point of view than surface water irrigation: significantly more crops and jobs per drop.**

- **Groundwater projects demand:**
  1) A shorter timeframe implementation
  2) Smaller investments
  3) Are less prone to bribery and corruption.

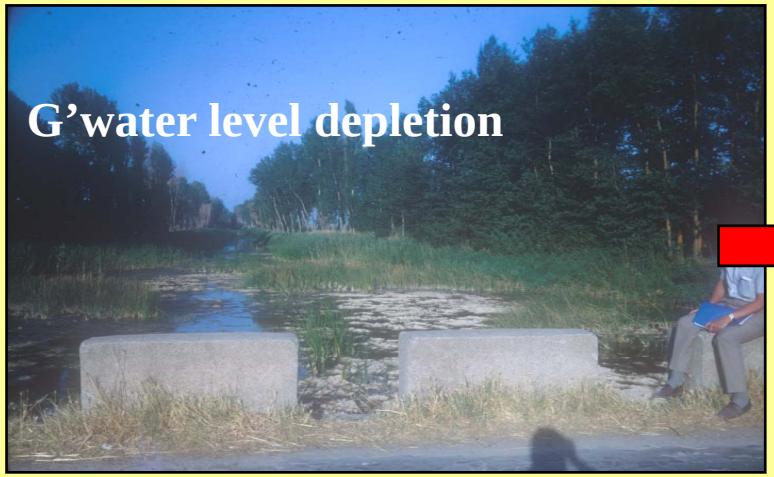
4.- THE PROBLEMS (I)

- **The problems are:**
  - **Sometimes real.**
  - **Sometimes exaggerated.**
  - **Sometimes not caused by groundwater development.**

- **Frequent lack of adequate regulations on water rights or their enforcement.**

4.- THE PROBLEMS (II)

- **Groundwater level variation:**
  - **Excesive depletion (more energy needed or adverse side effects).**
  - **Excesive raising up by different causes (flooding of urban structures or soil waterlogging).**
- **Degradation of groundwater quality. (The most important)**
- **Land subsidence or collapse.**
- **Reduction of springs and streams base-flow.**
- **Ecological impacts on aquatic ecosystems (developed countries).**



Land subsidence: sinkholes and collapse

4.- THE PROBLEMS (III)

- **Unethical attitudes: Ignorance, arrogance, neglect and corruption.**
- Existence of “perverse subsidies” in some countries.
- Pervasive hydromyths about groundwater.

4.- THE PROBLEMS (IV)

- **Groundwater is not a panacea that will solve all the world's water problems.**
- If anarchy persists, serious problems might arise within two-three generations.
- This is unlikely in the short term, given the large storage capacity of most aquifers.

5.- THE CONFLICTS: SPANISH EXPERIENCE (I)

- Frequent exaggeration of real problems due to unethical attitudes.

- Legal and administrative chaos in groundwater rights and management.

5.- THE CONFLICTS: SPANISH EXPERIENCE (II)

CREVILLENTE AQUIFER: AN EXTREME CASE (1)

Aquifer settings	90 Km^2 (limestones)
Estimated recharge/abstraction	2/16 Mm^3/year
Initial pumping elevation (1970s)	20-30 m
Current pumping elevation	500 m
Groundwater cost	0.30 €/m^3
Irrigation cost (grapes)	1000€/hectare/year (3,300 m^3/hectare/year)
Crop Value	25,000 → 15,000 €/hectare

5.- THE CONFLICTS: SPANISH EXPERIENCE (III)

CREVILLENTE AQUIFER: AN EXTREME CASE (2)

Initial solution obtained by farmers (and other lobbies):

Júcar-Vinalopó Water Transfer

Cost: 230 million €

Funded by:

2/3 EU and Spanish Government.

1/3 farmers and water supply companies.

EBRO TRANSFER CASE

SARAGOSSA, Oct 2002

BRUSSELS, Sep 2001

VALENCIA, May 2003

Clamorous example of social conflict arising from poor groundwater management.

6.- THE SOLUTIONS

- **The water decision-makers should allocate adequate man-power and economic means to water agencies to help and control groundwater users.**

- **Relevant educational campaigns on hydrogeology for farmers and the general public are necessary.**

- **More transparency on allocated (perverse) subsidies is needed.**

- **Promotion of (bottom-up) collective institutions for groundwater management.**

7.- CONCLUSIONS (I)

- In the last decades, a **Silent Revolution** of intensive groundwater development for irrigation has taken place in many arid and semi-arid countries.

- This has been carried out by millions of small farmers, with little or no planning on the part of governmental agencies.

7.- CONCLUSIONS (II)

- The silent revolution is mainly market driven, and has already contributed to achieve the UN Millennium Goals.
- Groundwater irrigation can achieve the “more crops and jobs per drop” motto, even if perverse subsidies for energy blur this reality in some countries.
- A thorough worlwide assessment on the relative surface/groundwater socio-economic efficiency is required.

7.- CONCLUSIONS (III)

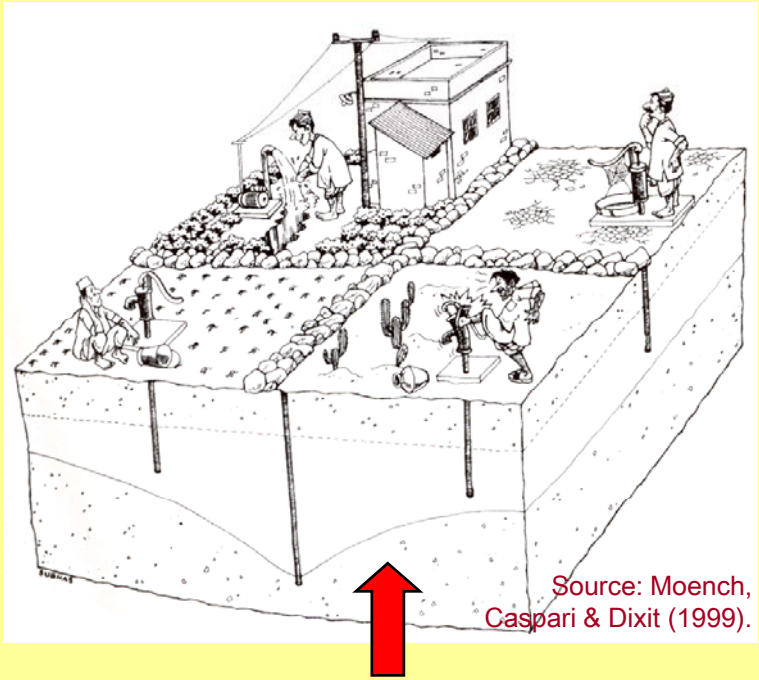
- Groundwater development is less prone to corruption that surface water projects.

- Most governments can afford the investment of putting their groundwater resources to good use, as this would only cost a small fraction of the money spent yearly on hydraulic infrastructures.

7.- CONCLUSIONS (IV)

- Groundwater is not the panacea. If anarchy persists, serious problems may appear in the mid-term (two or three generations).

- Groundwater governance requires a participatory bottom-up approach of all stakeholders. Groundwater user associations shold be developed (proactive government action).



Source: Moench, Caspari & Dixit (1999).

Current situation: anarchy

vs.

Tribunal de las Aguas de Valencia.

Example of participatory management of water resources.