

LONDON WATER RESEARCH GROUP SEMINARS

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INTENSIVE GROUNDWATER USE: SILENT REVOLUTION

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**OBSERVATORY OF WATER RESOURCES MANAGEMENT
TRENDS**

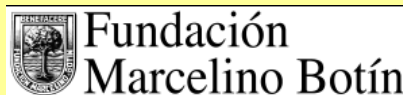


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1.- INTRODUCTION

- **GROUNDWATER: STILL OUT OF SIGHT BUT LESS OUT OF MIND (A. SKINNER, 2008).**
- **ROLE OF GROUNDWATER IN CHANGING PERVASIVE PARADIGMS IN ARID AND SEMIARID REGIONS.**
- **FROM “MORE CROPS AND JOBS PER DROP”**
- **TO “MORE CASH AND NATURE PER DROP”**

2.- GROUNDWATER IN SOCIAL ETHICS AND ENVIRONMENTAL ETHICS (I)

- **SOCIAL ETHICS DEALS WITH VALUES IN RELATIONS BETWEEN HUMANS. IT IS RATHER OLD. ARISTOTLE.**
- **ENVIRONMENTAL ETHICS DEALS WITH VALUES IN RELATIONS OF HUMANS WITH NATURE. IT IS RATHER NEW.**
- **ONLY MODERN TECHNOLOGY HAS ALLOWED MAN TO SIGNIFICANTLY IMPACT ON ECOSYSTEMS.**

2.- GROUNDWATER IN SOCIAL ETHICS AND ENVIRONMENTAL ETHICS (II)

- **GROUNDWATER IS THE CHEAPEST AND FASTEST WAY TO ACHIEVE THE MILLENNIUM DEVELOPMENT GOALS.**
- **GROUNDWATER DEVELOPMENTS ARE LESS PRONE TO CORRUPTION THAN SURFACE WATER INFRASTRUCTURES e.g. timeframe and investment.**
- **GROUNDWATER DEVELOPMENT MAY IMPACT ECOSYSTEMS.**
- **THESE IMPACTS MAY BE COMPENSATED BY POSITIVE SOCIO-ECONOMIC ADVANTAGES.**

3. GROUNDWATER IN IWRM – VIRTUAL WATER TRADE AND WATER FOOTPRINT (I)

- MOST PEOPLE ADVOCATE THE NEED OF AN INTEGRATED WATER RESOURCES MANAGEMENT (IWRM); BUT WHAT DOES IWRM MEAN?**
- THERE IS AN INCREASING NUMBER OF AREAS THAT HAVE TO BE INTEGRATED (GREEN AND BLUE WATER, SURFACE AND GROUNDWATER, ECOLOGY, LAND USE, ECONOMY, CULTURE, OTHERS).**

3. GROUNDWATER IN IWRM – VIRTUAL WATER TRADE AND WATER FOOTPRINT (II)

- THE CONCEPT OF **VIRTUAL WATER** HAS INTRODUCED A NEW AND WIDER DIMENSION IN **IWRM**.
- THE ANALYSIS OF VIRTUAL WATER TRADE IS PROVIDING NEW PERSPECTIVES IN GLOBAL WATER POLICY.
- THE PARADIGMS OF WATER AND FOOD SCARCITY HAVE TO BE RE-THOUGHT.

3. GROUNDWATER IN IWRM – VIRTUAL WATER TRADE AND WATER FOOTPRINT (III)

- **REGIONS WITH LESS WATER CAN BUY STAPLE FOOD FROM REGIONS WITH ABUNDANT WATER (USUALLY GREEN WATER) AND USE THEIR SCARCE WATER FOR CASH CROPS OR OTHER BENEFICIAL USES.**
- **GREEN WATER AND MOST SURFACE WATER IRRIGATION SYSTEMS CANNOT GUARANTEE CROPS BECAUSE OF CLIMATE VARIABILITY.**
- **THIS IS WHY CASH CROPS ARE USUALLY OBTAINED WITH GROUNDWATER IRRIGATION.**

4. FACTS ABOUT GROUNDWATER

INTENSIVE USE (I)

- **CURRENT ANNUAL BLUE WATER IRRIGATION USES (WITH ILLUSORY ACCURACY).**
- **SURFACE WATER: ABOUT 2,000Gm³ (km³)/yr**
- **GROUNDWATER: ABOUT 1,000 Gm³ (km³)/yr**
- **TOTAL (BLUE AND GREEN) AGRICULTURAL CONSUMPTIVE USES 5,000 – 6,000 Gm³ (km³).**
- **THE CHARACTERISTICS AND FUNCTIONING OF WORLD AQUIFERS ARE GENERALLY WORLD KNOWN (IGRAC).**

4. FACTS ABOUT GROUNDWATER INTENSIVE USE (II)

- **THE ESPECTACULAR INCREASE IN GROUNDWATER USE HAS OCCURRED IN THE LAST HALF CENTURY (FROM 100 TO 1000 Gm³/YEAR).**
- **PROBABLY TODAY THE GLOBAL ECONOMIC VALUE OF GROUNDWATER IRRIGATION IS GREATER THAN THE CORRESPONDING VALUE OF SURFACE WATER IRRIGATION. E.G Spain 10% irrigation generates 90% of the value.**

5.- THE CAUSES OF THE SILENT REVOLUTION (I)

- **MINDSET (HYDROESCHIZOFRENIA) OF MOST HIGH LEVEL WATER DECISION-MAKERS.**
- **PERVASIVE OBSOLETE IDEAS OR HYDROMYTHS.**
- **50 CENTURIES VERSUS 50 YEARS.**

5.- THE CAUSES OF THE SILENT REVOLUTION (II)

- **MODERN TECHNOLOGY (DRILLING RIGS AND PUMPS) ALLOWS MILLIONS OF FARMERS TO ABSTRACT GROUNDWATER CHEAPLY AND EASILY.**
- **HYDROGEOLOGY IS NOWADAYS A SOLID SCIENCE.**

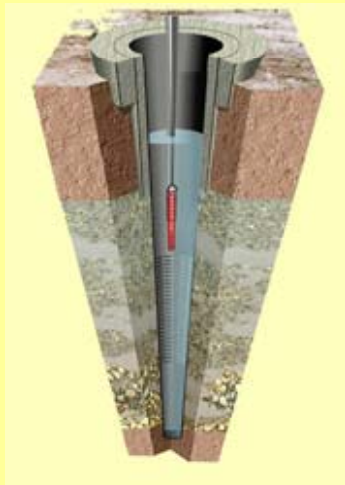
5.- THE CAUSES OF THE SILENT REVOLUTION (III)

- **GROUNDWATER RESOURCES ARE USUALLY RESILIENT TO DROUGHT. WHEN THERE IS A DRY SPELL FARMERS WITH GW IRRIGATION MAKE MORE PROFIT.**
- **THEY CAN BE DEVELOPED INDIVIDUALLY.**
- **GW INTENSIVE DEVELOPMENT HAS BEEN DRIVEN BY THE MARKET, EXCEPT IN VERY POOR COUNTRIES, WITH SUSBSISTANCE LIVELIHOODS.**

5.- THE CAUSES OF THE SILENT REVOLUTION (IV)



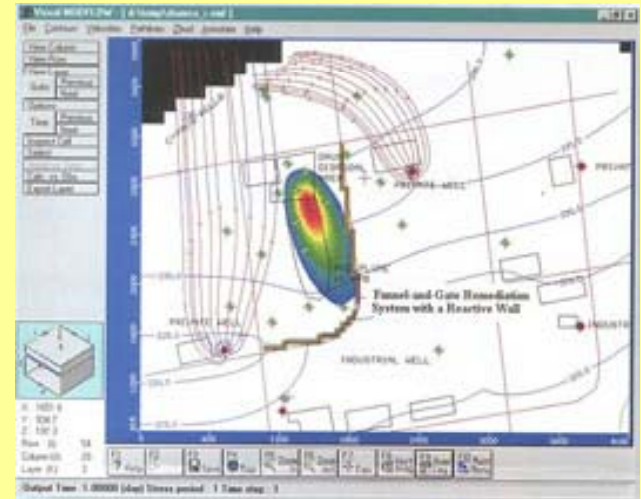
From the dug-well to the deep borehole.



From the water wheel to the pump.

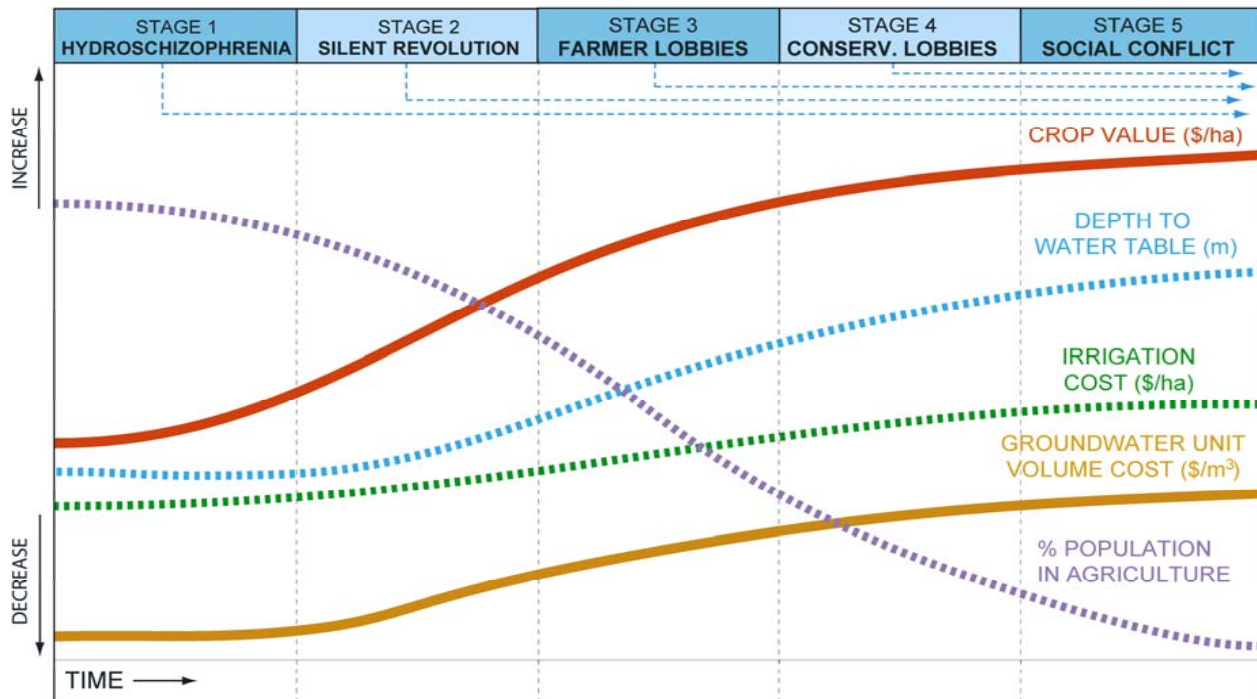


From the water-witches to Hydrogeology.



6.- EVOLUTIONS AND TRENDS (I)

ROUGH (GROUND)WATER POLICY TRENDS IN ARID AND SEMI-ARID COUNTRIES



EXAMPLES	STAGE 1 HYDROSCHIZOPHRENIA	STAGE 2 SILENT REVOLUTION	STAGE 3 FARMER LOBBIES	STAGE 4 CONSERV. LOBBIES	STAGE 5 SOCIAL CONFLICT
	California (1920) Texas (1930) Arizona (1950) Spain (1960) India (1960) Mexico (1960)	California (1930) Texas (1940) Arizona (1960) Spain (1970) India (1970) Mexico (1970)	California (1950) Texas (1970) Arizona (1970) Spain (1980) India (1990) Mexico (1990)	California (1980) Texas (?) Arizona (1980) Spain (1990) India (?) Mexico (?)	Spain (Ebro Transfer, 2000) California (Bay-Delta Plan, 1999) India (Energy Subsidies, 2004)

6.- EVOLUTION AND TRENDS (II)

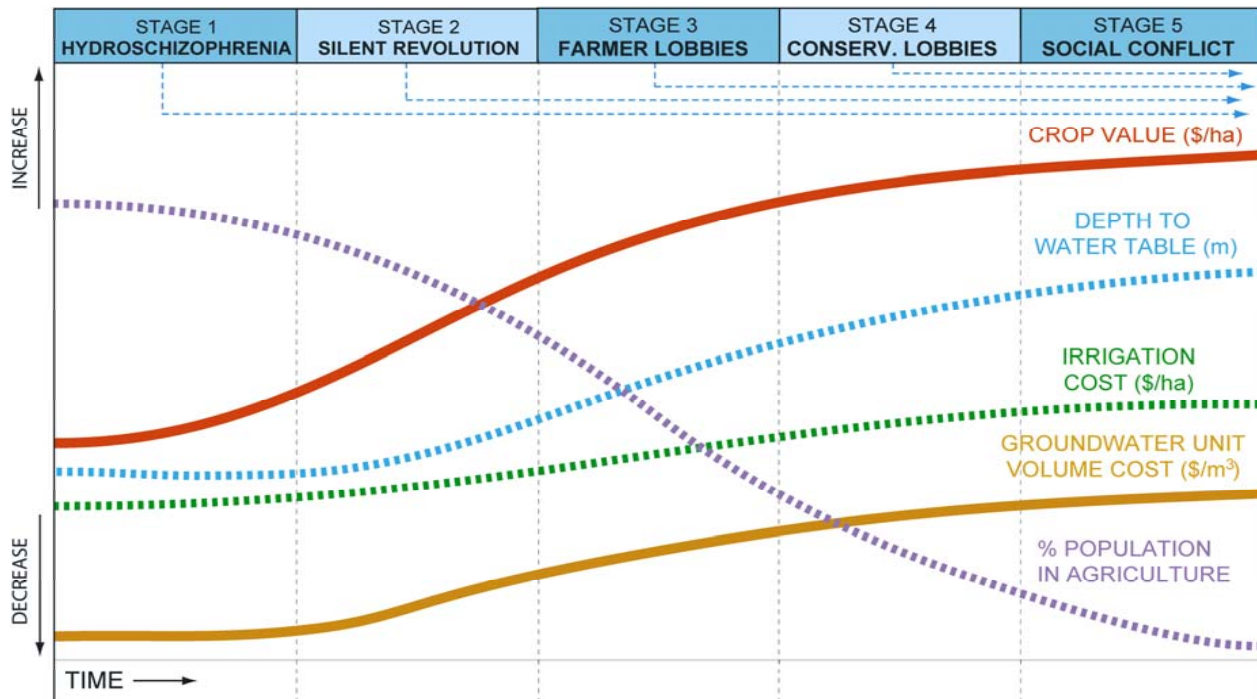
ORIGIN OF THIS GRAPH. CONFERENCE IN THE DEAD SEA AND EDITORIAL IN ASCE JOURNAL.

FIVE STAGES CAN BE DISTINGUISHED

1. HYDROESCHIZOPHRENIA
2. SILENT REVOLUTION
3. FARMERS' LOBBIES
4. CONSERVATION LOBBIES
5. SOCIAL CONFLICTS

6.- EVOLUTIONS AND TRENDS (III)

ROUGH (GROUND)WATER POLICY TRENDS IN ARID AND SEMI-ARID COUNTRIES



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6.- EVOLUTION AND TRENDS (IV)

EBRO TRANSFER CASE



SARAGOSSA, Oct 2002

Clamorous example of social conflict arising from poor groundwater management.



BRUSSELS, Sep 2001



VALENCIA, May 2003

6.- EVOLUTION AND TRENDS (V)

- GROUNDWATER MANAGEMENT REQUIRES DIFFERENT INSTITUTIONS THAN THOSE FOR SURFACE WATER MANAGEMENT, WHERE A “LORD OF THE GATE” EXISTS.
- USUALLY “COMMAND AND CONTROL SYSTEMS” DO NOT WORK WITH GROUNDWATER USERS.
- INDIAN FEDERAL REPORT (SEPTEMBER 2007) ON THE POTENTIAL WAY TO SOLVE THE INDIAN GW CHAOS:THE SOLUTION IS NOT THE SPANISH WAY (DECLARATION OF PUBLIC DOMINION OF GW).

7.- CONCLUSIONS (I)

- THE CURRENT VIRTUAL WATER TRADE REQUIRES RE-THINKING FORMER PARADIGMS ON WATER AND FOOD SECURITY.
- THE NEW MOTTO, AT LEAST IN INDUSTRIALIZED COUNTRIES, IS NOT “MORE CROPS AND JOB PER DROP” BUT “MORE CASH AND NATURE PER DROP”.
- TO ACHIEVE THIS MOTTO GROUNDWATER IRRIGATION WILL PLAY A RELEVANT ROLE BECAUSE ITS RESILIENCE TO CLIMATE VARIABILITY IN CONTRAST WITH RAIN-FED AGRICULTURE AND SURFACE WATER IRRIGATION SYSTEMS.

7.- CONCLUSIONS (II)

- IN ARID AND SEMIARID REGIONS, THIS SILENT REVOLUTION HAS PRODUCED GREAT SOCIO-ECONOMIC BENEFITS, BUT ALSO SOME ECOLOGICAL PROBLEMS.
- GROUNDWATER MANAGEMENT IS SIGNIFICANTLY DIFFERENT FROM SURFACE WATER MANAGEMENT. IT NEEDS AN APPROACH “BOTTOM-UP” WITH GROUNDWATER USERS ASSOCIATIONS.

THANKS FOR YOUR ATTENTION