THE MANIFOLD DIMENSIONS OF GROUNDWATER SUSTAINABILITY

by

M. Ramón Llamas
Royal Academy of Sciences
mrllamas@geo.ucm.es
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3.- WHEN GROUNDWATER DEVELOPMENT IS SOCALLY OR ECONOMICALLY UNSUSTAINABLE?

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FIRST PART (I)

ORIGIN AND AIM OF THIS SESSION

• To present the Alicante Declaration produced in the International Symposium on Groundwater Sustainability (Alicante, Spain 24-27 January, 2006)

• This Symposium was a joint venture of three conveners
  1) Spanish Royal Academy of Sciences RAS (on behalf of the Interacademy Panel)
  2) USA National Ground Water Association (NGWA)
  3) Spanish Geological Survey (Instituto Geológico y Minero de España - IGME)
FIRST PART (II)

AGENDA
A) PRESENTATION BY THE CONVENERS (40 MINUTES)
  1) Ramón Llamas (RAS): What does Groundwater Sustainability mean?
  2) Stepehn Ragone (NGWA): The Alicante Declaration
  4) Questions from de audience
FIRST PART (III)

B) ROUNDTABLE BY PANELIST (6 MINUTES EACH) AND THE AUDIENCE (TOTAL 80 MINUTES)

1) Odeh Al Y. (IUCN) Groundwater and Ecosystems

2) Alice Aureli (UNESCO) Groundwater in the International Hydrological Program

3) Rubén Chávez (CONAGUA) Disponibilidad media anual de aguas en México

4) Jennifer McKay (Australian Academy of Social Sciences) Groundwater and Law
FIRST PART (IV)

5) Luis Marín (UNAM) Groundwater Education

6) Jaroslav Vrba (UNESCO-IHP) Groundwater Sustainability Indicators

7) Rubén Covarrubias (CONAGUA-MX) Sustainable development in Santo Domingo Aquifer (Baja California)

8) Questions from the Audience
SECOND PART: WHAT DOES GROUNDWATER SUSTAINABILITY MEAN? (I)

THE MANIFOLD DIMENSIONS OF THE SUSTAINABILITY CONCEPT

- Dimensions considered by some authors (from 10 to 50)
  - 1 Hydrological
  - 2 Ecological
  - 3 Economic
  - 4 Social
  - 5 Legal
  - 6 Institutional
  - 7 Intrigenerational solidarity
  - 8 Intergenerational solidarity
  - 9 Political
- The topic is developed in detail in the Proceedings of the International Symposium of Alicante
SECOND PART: WHAT DOES GROUNDWATER SUSTAINABILITY MEAN? (II)

Some Hydromyths and/or obsolete Paradigms – 1

- Frailty, frailty thy name is woman (Hamlet)
- Frailty, frailty thy name is groundwater (most water decision makers)
SECOND PART: WHAT DOES GROUNDWATER SUSTAINABILITY MEAN? (III)

Some Hydromyths and/or obsolete Paradigms - 2

- “More crops and jobs per drop”
- In many regions is changing to:
- “more cash and nature per drop”
SECOND PART: WHAT DOES GROUNDWATER SUSTAINABILITY MEAN? (IV)

When Groundwater Development is socially or economically unsustainable?

- Usually the economic impact of water table depletion is exaggerated.

- No documented case of real relevant socio-economic failure is known in:

- However, there exist many predictions of disasters.

- What about ecological impacts?
SECOND PART: WHAT DOES GROUNDWATER SUSTAINABILITY MEAN? (V)

ROUGH GROUNDWATER POLICY TRENDS IN ARID AND SEMI-ARID COUNTRIES (I)

• The silent revolution of the Intensive Groundwater Use in Arid and Semiarid countries is a real and recent phenomenon

• See invited editorial of the ASCE Journal on Water Resources Planning and Management (September, 2005)
SECOND PART: WHAT DOES GROUNDWATER SUSTAINABILITY MEAN? (VI)

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

- **STAGE 1**: HYDROISCHIZOPHRENIA
  - California (1920)
  - Texas (1930)
  - Arizona (1950)
  - Spain (1960)
  - India (1990)
  - Mexico (1980)

- **STAGE 2**: SILENT REVOLUTION
  - California (1930)
  - Texas (1940)
  - Arizona (1960)
  - Spain (1970)
  - India (1970)
  - Mexico (1970)

- **STAGE 3**: FARMER LOBBIES
  - California (1950)
  - Texas (1970)
  - Arizona (1970)
  - Spain (1980)
  - India (1990)
  - Mexico (1990)

- **STAGE 4**: CONSERV. LOBBIES
  - California (1960)
  - Texas (7)
  - Arizona (1980)
  - Spain (1990)
  - India (7)
  - Mexico (7)

- **STAGE 5**: SOCIAL CONFLICT
  - Spain (Ebro Transfer, 2000)
  - California (Bay-Delta Plan, 1999)
  - India (Energy Subsidies, 2004)

- **DEPTH TO WATER TABLE (m)**
- **GROUNDWATER UNIT VOLUME COST ($/m³)**
- **TIME**
- **INCREASE**
- **DECREASE**
SECOND PART: WHAT DOES GROUNDWATER SUSTAINABILITY MEAN? (VII)

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

<table>
<thead>
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<th>Stage</th>
<th>Example Countries</th>
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<td>Stage 5</td>
<td>Spain (Ebro Transfer, 2000), California (Bay-Delta Plan, 1999), India (Energetic Subsidies, 2004)</td>
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</tbody>
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- CROP VALUE ($/ha)
- DEPTH TO WATER TABLE (m)
- IRRIGATION COST ($/ha)
- GROUNDWATER UNIT VOLUME COST ($/m³)
SECOND PART: WHAT DOES GROUNDWATER SUSTAINABILITY MEAN? (VIII)
SECOND PART: WHAT DOES GROUNDWATER SUSTAINABILITY MEAN? (IX)

SUGGESTED ACTIONS

- Solutions must be “taylor-made”, there is, no “blueprint”.
- Groundwater users active participation is crucial.
SECOND PART: WHAT DOES GROUNDWATER SUSTAINABILITY MEAN? (X)

- Hydrogeological education is a must to achieve efficient participation.

- Reliability and transparency in data and activities is necessary to achieve the previous points.