# Water

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# Actors / Stakeholders in water research

Universities
Public Research Centers
Private Research Centers
Enterprises
Other

# Research: definition?

Someone must change their mind

Is a public service
Is a general interest service

Experience / opinion ?

# Obtaining funds... in a changing situation

- No more easy money

- EU funds are increasingly competitive

- EU Commission is asking for more applied research

- New policies **favors big groups** (changes from time to time) and **big number of partners**

- Instead of diminishing (as it was said), **bureaucracy is increasing** thus reducing the time devoted to research

- People specialized in recovering money from the research teams (not well justified, old contracts…) is appearing in the market (earn a percentage)

- Project coaching?

# Big, classic universities (south European) are experiencing difficulties

- Management support: scarce and sometimes not good
- It is difficult to create and maintain good research teams
- The senior researchers cannot promote
- No replacement for seniors
- The national funds for research are scarce (and lately paid) and sometimes…

# The small and new universities are usually more efficient (in several items…)

# Water & Research

R
R + D
R + D + i

Research
Development
Innovation

**AGAIN: The present European Union policy is the cooperation Industry – University (D + i)**

# WATER & RESEARCH BASIC SUBJECTS

Water resources & supply
Wastewater & sewerage
Non-conventional resources
New water uses
Analytical tools
Hazard & Risk
Information & socio-economy, rules and regulations
Technology (analysis, treatment, economy)
Industrial wastewater

# Water resources

Quantity, Quality, Transportation

Conventional
Non conventional (**reuse**, runoff, desal)

¿Offer or demand as a tools?

More “everything” per drop of water

**Water supply**

ENERGY

Drinking water

Water and tourism

Safety (Water Safety Plans)

# Changing patterns (fashions)

Organic microcontaminants: endocrine disruptors
Drugs: antibiotics, anti-inflammatories, contrast material
(Personal care & medicaments: PCPP)

Nitrates

Next? To search is to find

# Bottled water

Prize
Quality
Safety
Sustainability
Availability
Marketing

Why bottled water?

# Wastewater

ENERGY

Small communities
Advanced treatments
Natural treatments
Nutrients
Disposal
Reclamation and reuse (safety)

Once treated or disposed is a resource again (indirect reuse)

# Water & Wastewater: Disinfection

Chlorine: yes or not?
Ozone
Ultraviolet Radiation
PAA
Chlorine Dioxide
Lagoons
Other natural systems

BY-PRODUCTS

## Other water uses

Agriculture: energy, efficiency
Bathing water: quality (inland and seawater)
Leisure uses: Aquaparks, golf courses
Cooling water: *Legionella*
Aquaculture
Navigation: Disposal from leisure and merchant ships at the sea, harbours, coast...
Natural waters: eutrophication

# Chemistry

- Toxicology, Ecotoxicology:
  Environmental toxicogenomics
  Analysis of micropollutants
  Effects of cocktails

- Nutrients
- Heavy metals
- Xenobiotics

# Hazards/risks in the water world

- Risk and precautionary principles
- HACCP / Hazard Analysis and Critical Control Points
- RAM (Risk Assessment and Management)
- GP: Good Practices concept
- Excess of people's mobility: pathogens' dispersion
- Risk Groups
- Planned Epidemiology

# Technologies

- Membranes (for potable, wastewater & industry)
- Desalinization (for tap water, irrigation & industry)
- Natural, extensive systems (for wastewater treatment)
- Less expensive in terms of energy
- By-products
- Odor & Taste Control

# Laws, rules and regulations

- Precautionary principle
- Information to citizens principle
- Transversal policy: relationship with health

# Supply

Water sources, treatments and materials
Microorganisms in water
Quality changes inside home
Biofilms
Reduction of water losses
Nitrates
Water for agriculture
Taste & odors
Bottled water
Problems when additional devices are located after the tap (filters, ice cubes…)

# Wastewater

Centralized/decentralized
Natural systems
Small communities
On-site treatments
Disinfection and by-products
Nutrients
Membranes
Disposal
Stockbreeding wastewater
Xenobiotics/microcontaminants elimination
Reclamation and reuse
Odors

# Analytical tools: example

## Biology

- Real time analysis (< 4 hours)
- Genetics in pathogens
- Present indicators of fecal pollution (usefulness)
- New indicators: virus & parasites
- VBNC organisms
- Emergent and re-emergent pathogens
- Resistance & Pathogenicity transmission
- Indicators of treatment efficiency

# General

- Good sampling procedures
- Global indicators of the quality of natural waters
- Real cost of controls

# Other

- Civil servants, politicians must become compromised with the environment and water problems
- How to establish interdisciplinarity
- Consumer protection

In all financed projects (European, national, regional)

The bureaucracy associated reaches paranoia

Up to four audit levels…

Innovative? ideas

Do not work uniquely with your colleagues
Question old ideas
Listen to the lay people

Consider other points of view

International cooperation activities

Surprises (or less…)

Europe a lot of countries)

- What is irrigated agriculture
- South vs North (e.g. ww reuse)
- Difficult to implement new ideas
- Corporatism
- …

Latin America (Costa Rica, Mexico, Bolivia, Colombia, Argentina)

- Cooperative work
- Different speed
- Cooperation with USA / Canada
- Nepotism
- Uneven levels of development

Africa (Morocco, Egypt, Namibia)

- Old knowledge is being lost
- If needed, quick developments (e.g. reuse)
- Political instability

Australia:

- Really innovative (no old prejudices)
- Quickly adapting to changing circumstances (drought)

Asia (Israel, Jordan, Vietnam, China)

- Old knowledge is also being lost (agriculture and water transportation)
- Uneven levels of knowledge
- Poor English (refereed papers)

# Some projects

CATCHWATER
RECLAIM WATER
AQUAREC
AQUASTRESS
MEDIWAT
AQUASYN
MINAQUA

# Current Keywords

Smart city
Climatic change
CSO (Combined Sewer Overflow)
Green infrastructures
Water footprint / Energy footprint
Water colours