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IWRM: State of the art and the way forward

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OBJECTIVES

Frame the debate

Main challenges to do with the practical implementation of IWRM

New paradigms that bring complexity into the picture and which are yet to be given full consideration

Illustrate some of these points based on the Spanish experience

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WHAT IS IWRM?

"A process which promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems and the environment" (GWP 2000)

IWRM recognizes that:

- Freshwater is essential for human livelihoods and economic activities, as well as for the environment
- Water needs to be protected
- Water management should include participatory approaches to involve users, planners and policy makers at all levels

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PRACTICAL IMPLEMENTATION OF IWRM

The United Nations (2009) report several case studies dealing with on-site implementations of IWRM (U.S., Chile, China, Malaysia…)

Rogers and Leal (2010) present cases of integrated management approaches (Orange County, etc) which could loosely be interpreted as practical implementations of IWRM

However…

Despite some "success stories", the practical implementation of IWRM is proving elusive in most cases

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PRACTICAL IMPLEMENTATION OF IWRM

Critique: The breadth of the IWRM concept –its main advantage– is also its own undoing

- IWRM is useful as a policy-framing discourse, but also ambiguous and potentially contradictory (Conca 2006)
- A “nirvana concept” (Molle 2008)
- Lacks a coherent series of steps towards its practical implementation

Water management is essentially the art of choosing between equally important demands. Since every basin is different, there is no blueprint to suit them all. Within this context, claims for wide-ranging integration are unable to offer much help when dealing with specific management questions (Ioris 2008)

- Essentially hydro-centric, while most decisions affecting water are in fact made outside the water-policy scene (López-Gunn and Llamas 2008, UN 2009)

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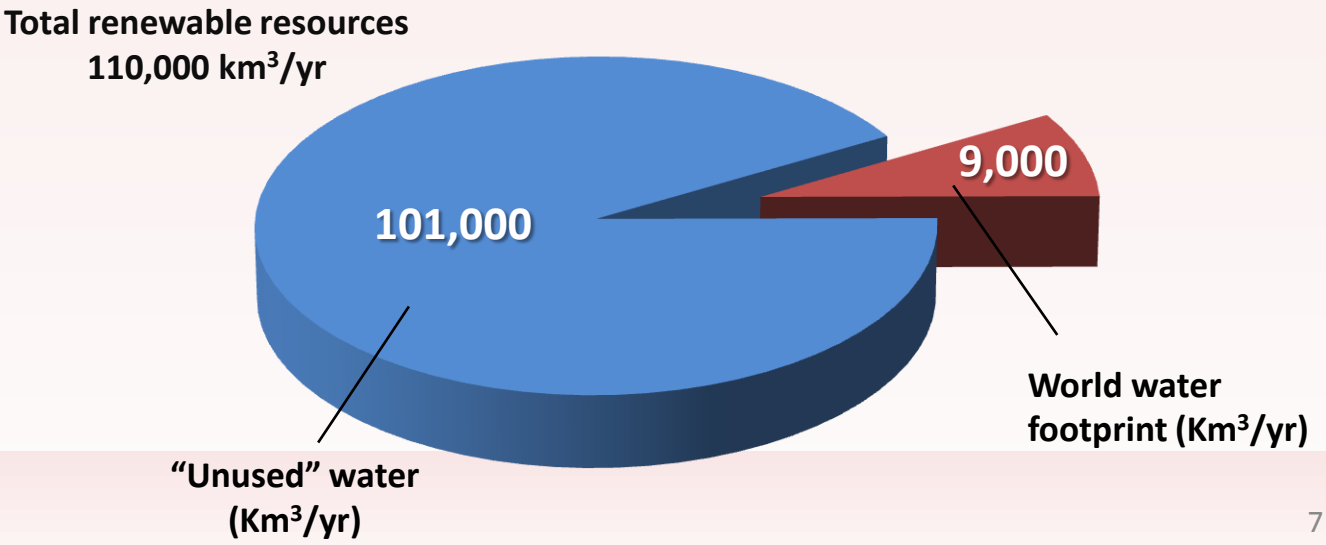
BUT FIRST, AN IMPORTANT QUESTION

How much freshwater do we actually use?

Land mass	Surface ('000 km²)	Population (millions)	Average rainfall (mm)	Total rainfall (mm)	Avg. Evap. (mm)	Total Evap. (mm)	Runoff (Km³)	Water footprint[1] (m³/person)	Water footprint (Km³)	Water footprint as % rain
Asia	43820	4216	650	28500	410	18000	10500	1150	4850	17,0
Africa	30370	1072	740	22500	630	19000	3500	1300	1400	6,2
North America	24490	346	800	19500	470	11500	8000	2800	970	5,0
South America	17840	596	1600	28500	900	16000	12500	1900	1130	4,0
Europe	10180	740	820	8400	590	6000	2400	1700	1250	15,0
Oceania	9010	37	440	4000	400	3500	500	1150	45	1,1

Water –related figures have been rounded



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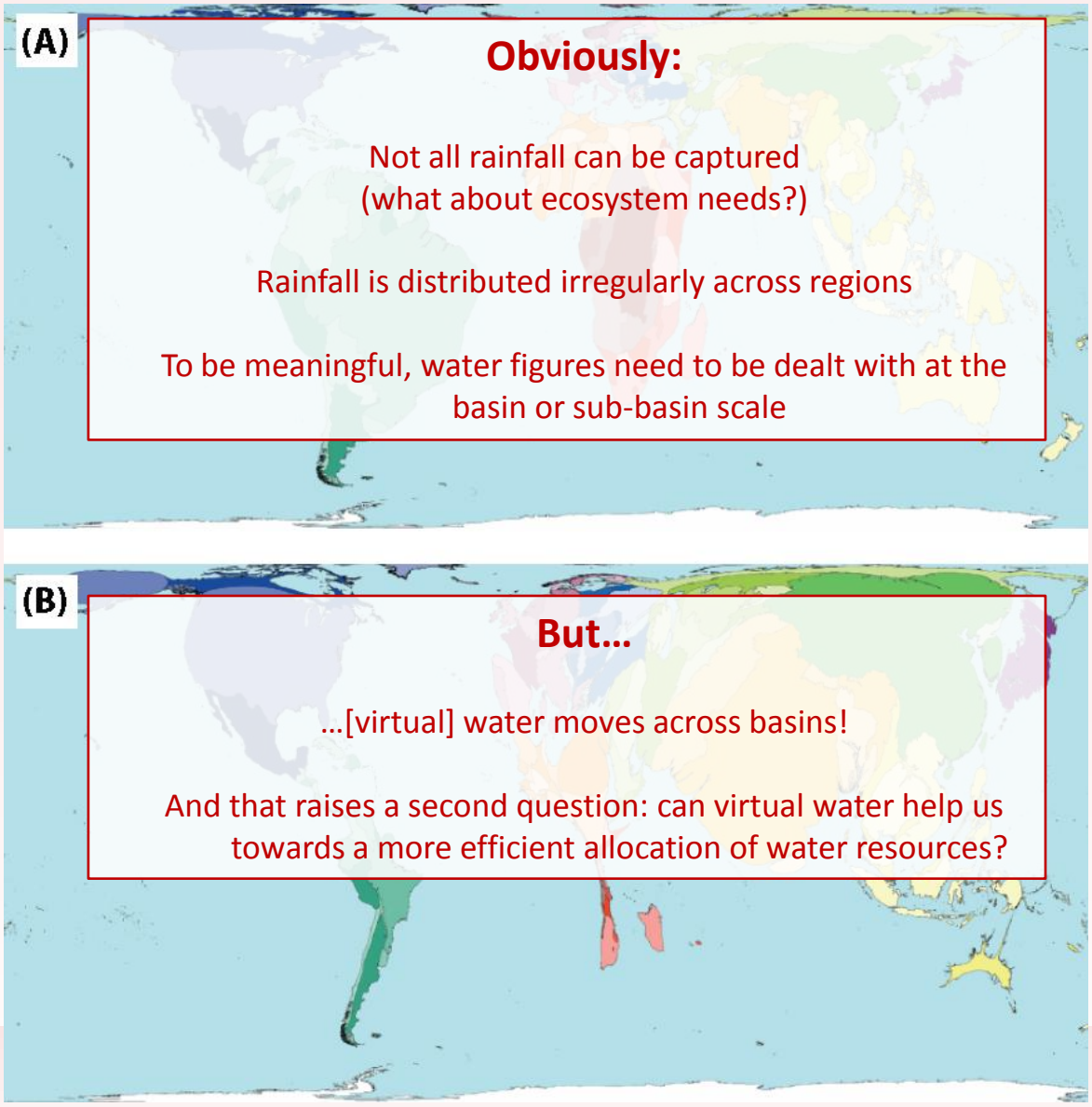
BUT FIRST, AN IMPORTANT QUESTION



Total rainfall

Water use

Source: *González-Vallvé (2012)*

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WHAT IS VIRTUAL WATER?

Virtual water refers to the water needed to produce a good or service

When a country imports a product instead of producing it domestically, it is saving its own water, which can be used for other purposes

1 shipload of wheat

=

1000 shiploads of water

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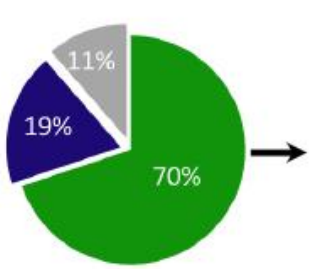
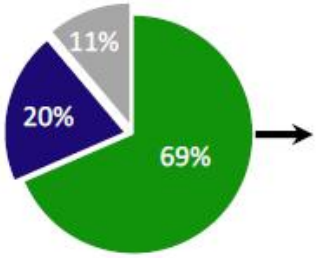
WHAT IS VIRTUAL WATER?



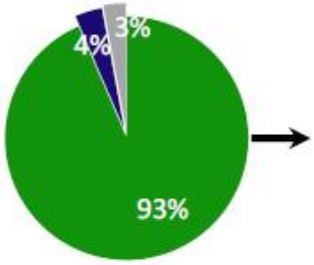
1600 litres water

1 kg wheat bread



2500 litres water

1 kg rice



15400 litres water

1 kg beef

Source: *Mekonnen and Hoekstra (2011)*

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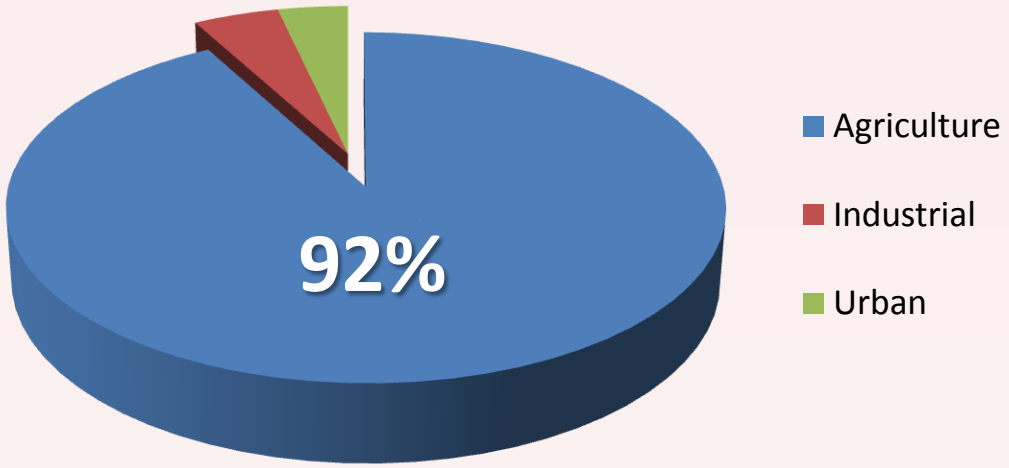
WHAT IS VIRTUAL WATER?

World water footprint per sectors



Source: *Mekonnen and Hoekstra (2011)*

i.e. the vast majority of water is used to produce food:

"Food trade could play a balancing role in the global water cycle by re-assigning water uses indirectly"

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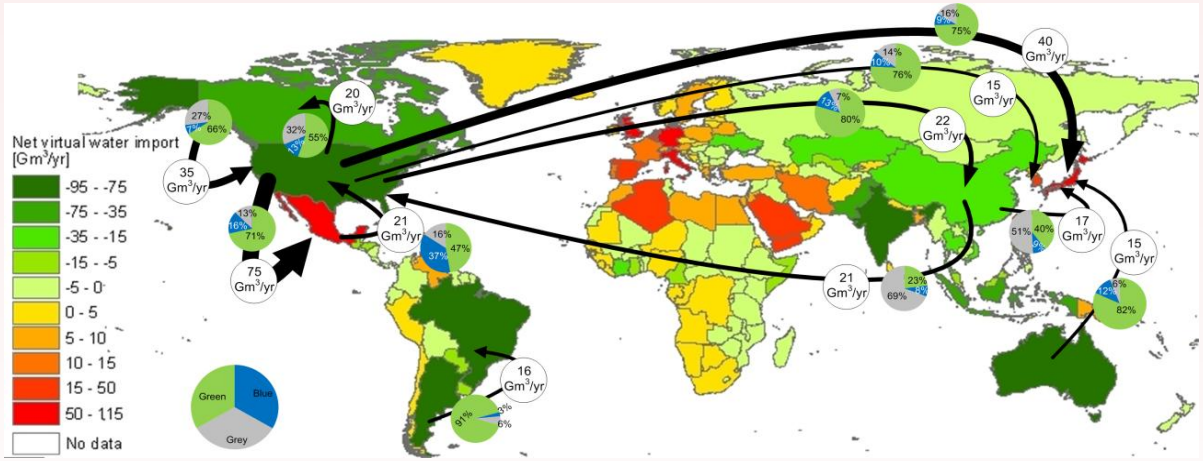
BALANCING THE WORLD WATER BALANCE: VIRTUAL WATER

Importing countries

- Dry countries access global water (usually green)
- Reduce national water demand (and impacts)
- Mitigates drought
- Helps focus on high-value crops and on nature preservation
- Alternative to inter basin water transfers

Exporting countries

- Increases exports – generates dependencies in other countries
- Raises national water demand and potential impacts (environmental and social)



Arrows show gross virtual water flows >15 Gm³/yr (1 Gm³ = 1 Km³) **Source:** *Mekonnen and Hoekstra (2011)*

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BALANCING THE WORLD WATER BALANCE: VIRTUAL WATER

Globalization, water management and food security

- Does it really make sense to be self-sufficient when you can buy your food cheaper than you can produce it?
- If you are dry country, do you really have to put pressure on your aquatic ecosystems to produce low-value crops when you can simply import the water?
- Does it make sense for Spain –the driest country in the EU– to use a lot of water to produce low-value crops? (80% blue water used to produce low-value crops)
- Should we shift to “more cash and nature per drop”?

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BALANCING THE WORLD WATER BALANCE: VIRTUAL WATER

Some important issues to look into:

- International water pricing protocols
- Agricultural policies, subsidies, etc
- Principles of transparency and non-discrimination
- Monopolies
- Political embargo

  (…)

Match IWRM (basin-related concept) to virtual water trade (global reality)

Need to develop a consistent accounting system to consider the effect of virtual water imports and exports at the basin scale

ACCOUNTING FOR WATER

"In most parts of the world, consistent water accounting systems are yet to be developed" (UNEP 2012)

Blue water accounting in Spain

Sector	Blue water withdrawals			Blue water consumption	
	MIMAM (2001)*	F. MAPFRE (2012)	MIMAM (2007)	Garrido et al. (2010)	Mekonnen and Hoekstra (2011)
Urban supply	4,667	4,941	3,619	4,042	479
Agriculture	24,094	16,211	11,897 (crop) 259 (livestock)	16,178 (crop) 260 (livestock)	14,136 (crop) 750 (livestock)
Industry	1,647	1,772	1,268	1,700	330
Cooling	4,915	6,795	-	-	-

** Actual consumption = 20,783 Mm^3/year; Returns = 14,539 Mm^3/year (MIMAM 2001)*

Different accounting methods and assumptions

Terminology: Withdrawals, demands, consumptive and non-consumptive uses, returns…

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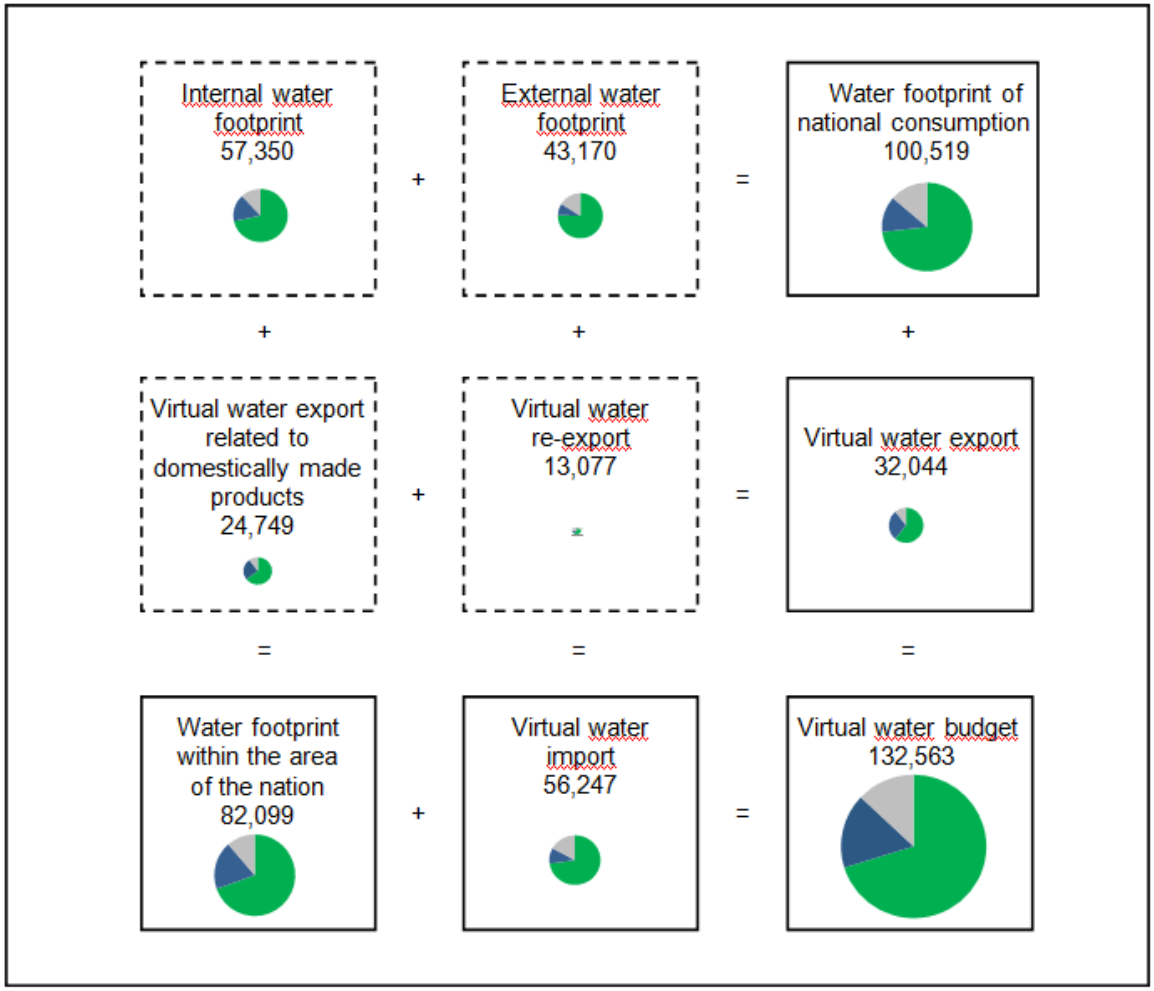
BALANCING THE WORLD WATER BALANCE: VIRTUAL WATER



Data in Mm^3/yr

Source: *Mekonnen and Hoekstra (2011)*

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WHAT ABOUT THE ENVIRONMENTAL FLOWS?

Environmental flows

- The water required to maintain ecosystem goods and services is 75% per cent of the total rainfall - includes both blue and green water (Falkenmark and Rockström 2004)
- Lots of work to be done in terms of reliable methods to compute environmental flows
- Some environmental degradation is inevitable. Where is the limit?

AGRICULTURAL VS URBAN CONTAMINATION

Contamination

- In most industrialized nations, water quality improvement efforts have focused on two approaches:
  - Water and wastewater treatment facilities
  - Regulations aimed at individual point source-polluters
- As a result, the technology used for cleaning urban and industrial waters has improved dramatically over the last decades
- The issue of water quality in rivers is gradually becoming a matter of money, political will and social awareness

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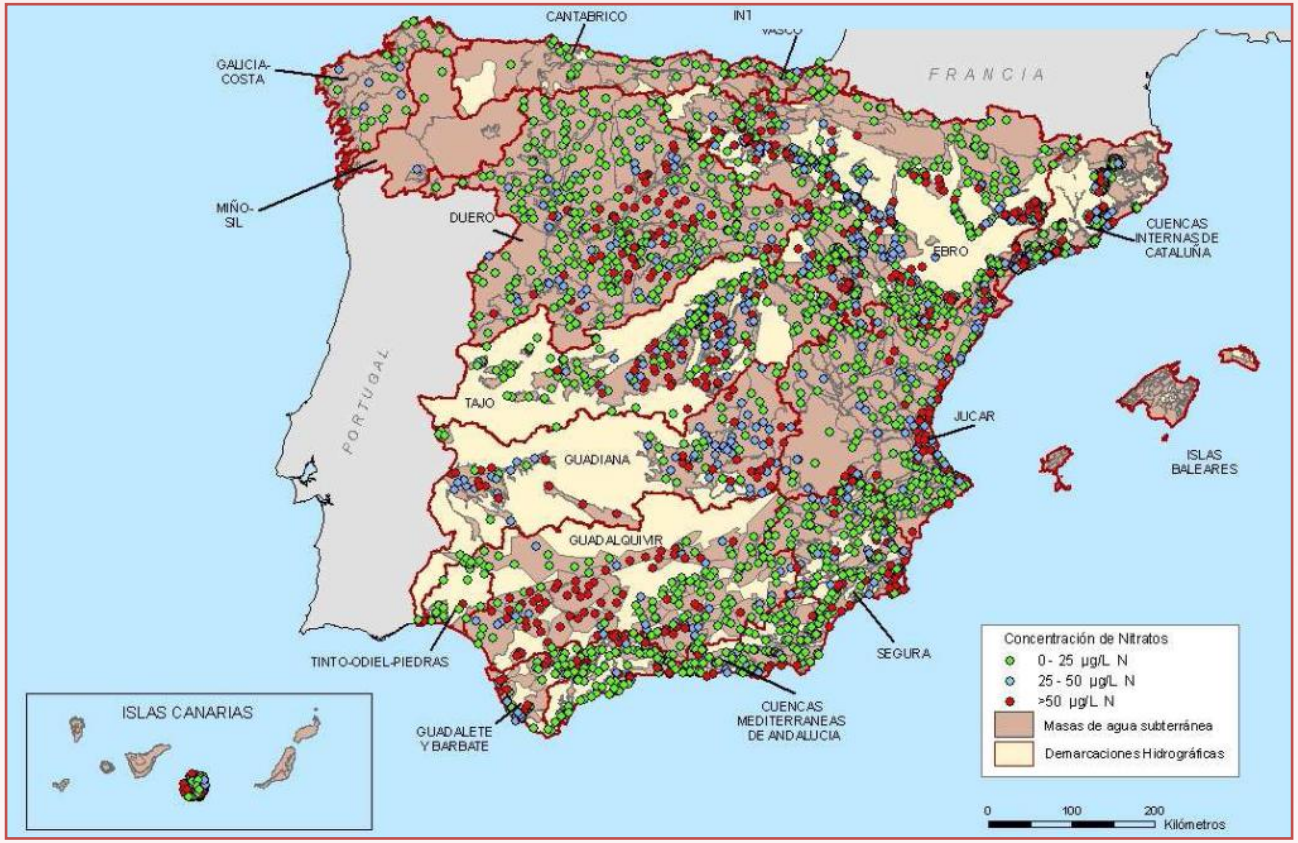
AGRICULTURAL VS URBAN CONTAMINATION

Nitrate contamination in Spanish aquifers



Source: *Casado (2011)*

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EMERGING CONTAMINANTS

Emerging contaminants

- Contaminants that are currently not included in routine monitoring programmes (not necessarily new)
- Methy-tertiary-butyl-ether (MTBE), pesticides, perchlorate, pharmaceuticals, drugs of abuse…
- Not completely removed by standard wastewater treatments
- Ongoing research on their toxicity (Petrovic et al 2008):
  - Example: the presence of emerging contaminants has been correlated positively to hormonal changes in fish (Llobregat river) (Solé et al 2002)

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INTANGIBLE VALUES, LOBBIES AND INTERESTS

Elements that should be considered in the process of implementing IWRM but which are not easily quantifiable (culture, history, religion, politics…)

A way of looking at it is through the different interest groups

- Politicians
  - *"Efforts to implement IWRM are useless because politicians are likely to ignore whichever information that does not suit their political agenda"* (Cabezas, 2012, pers. comm.)
  - Emotional issues and election times can overrule technical opinion

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LOBBIES AND INTERESTS

HOW CAN WE MAXIMISE OUR POLITICAL BENEFIT?

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LOBBIES AND INTERESTS

- Farmers
  - Even if they represent a small share of the population, they are usually the main water users
  - Need to take them into account in all relevant water policy changes
- Corporations
  - In global terms, industrial processes tend to use relatively little water. The issue with industrial processes is more related to contamination
  - Social responsibility reports frequently pay attention to the ecological aspects, and deal specifically with water issues (Orr and Cartwright 2009)
  - This contributes to the awareness about the need to preserve water resources (but can become a “green disguise” to enhance goodwill value of commercial brands)

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LOBBIES AND INTERESTS

- Nature conservation groups
  - Often left out of formal negotiations
  - Have played an active role in public water debates
  - Have been proactive in denouncing illegal water usage and in prompting the authorities to enforce the law in case of abuses
  - Have exposed the weaknesses of water authorities, whose means are often inadequate to cope with ever-increasing responsibilities
- The general public
  - Water Framework Directive and public participation
  - Still limited in practice, largely due to the absence of a participatory tradition

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CONCLUSIONS

IWRM is a welcome addition to water management practices in the sense that it provides an all-encompassing framework

For all its shortcomings, however, IWRM is best described as a “useful utopia”

Many of those decisions which affect water are made outside the formal planning process

Perhaps the greatest challenge in modern water management consists in integrating tangible realities (consumptive and non-consumptive water use, pollutant concentrations, economic figures and related jobs along supply-chains) and intangible values (cultural, religious, political, educational and other)

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