AQUAREC SEEKS FOR BEST MANAGEMENT PRACTICES IN WATER RECYCLING AND REUSE

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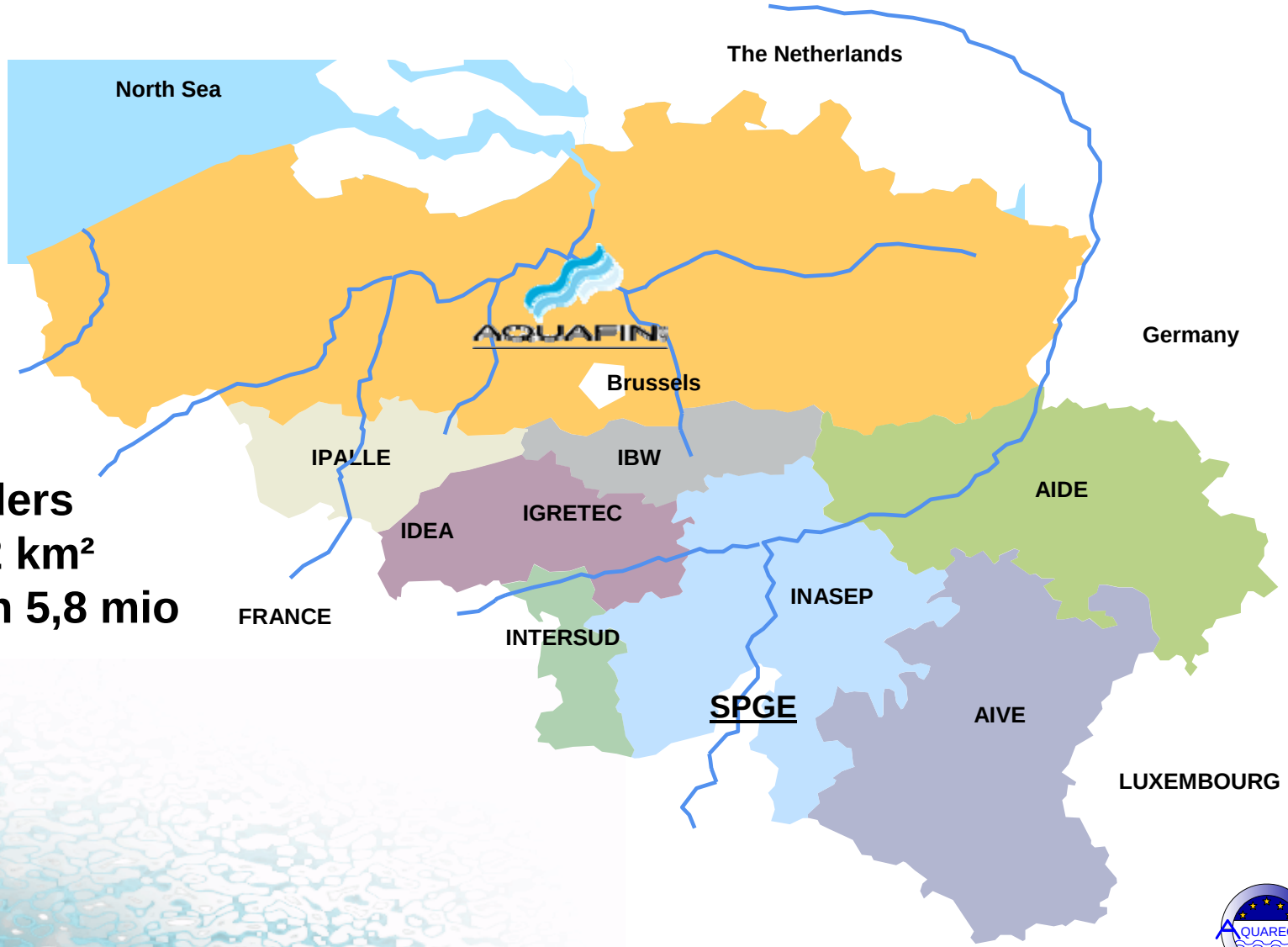
Water treatment in Belgium



Flanders
13 512 km²
Population 5,8 mio

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After 15years Aquafin NV (1999-2005)

- **Waste water to WWTP's: from 30% to 60%**
- Prefinancing, Technological Plans, Building Supervision, Operation.
- **Waste water treatment infrastructure**
  - +1 WWTP per month (+200)
  - +1 pumpingstation per week (800)
  - +1 km pipelines per working day (3700)

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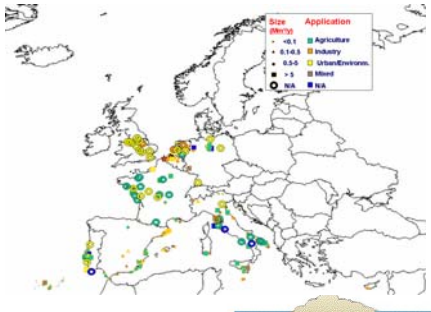
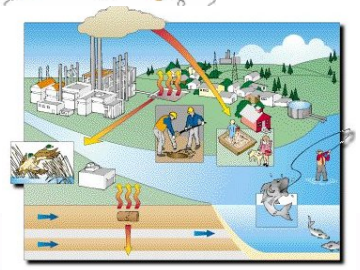
This presentation focuses on the results of the AQUAREC project

1. The Aquarec project



2. Current status of water reclamation and reuse in Europe



3. Common issues for an increased use of treated wastewater

4. WFD and Water Reuse

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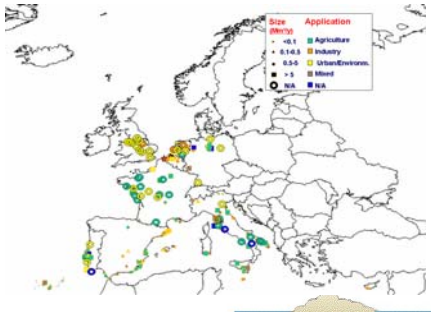

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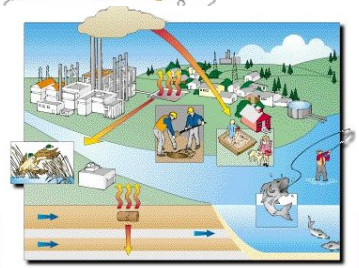

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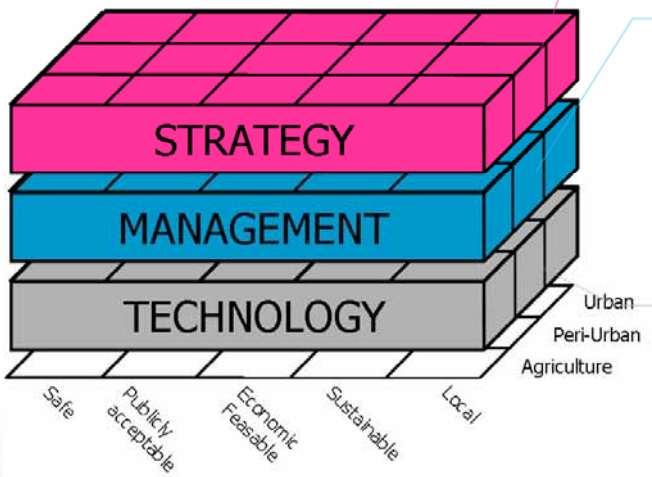
The AQUAREC Objectives

- Provision of policy guidelines and water quality standards for municipal wastewater reclamation and reuse
- Collection and validation of best management practices
- Development of reference manuals and tep by step guidelines for future end-users
- Evaluation, selection and standardisation of technological concepts and components for wastewater recycling
- Integration of various activities towards sustainable wastewater recycling world-wide

Project structure, application contexts, evaluation criteria



WP1: Analysis of European water market and supply & demand studies

WP2: Definition of key objectives for water reuse concepts

WP3: Development of integrated water reuse strategies

WP4: Development of analysis tools for social, economic and ecological effects of water reuse

WP5: Methodologies for public acceptance studies and consultation

WP6: Management guidelines for the implementation and operation of water reuse cycles

WP7: Characterisation and assessment of technology in water reuse cycles

WP8: Development and validation of system design principles for water reuse systems

WP9: Project management and dissemination

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Strategy

- WP 1 : Analysis of European Water Market and Supply & Demand Studies
  - GIS based approach for demand & supply
- WP 2 : Definition of key objectives for water reuse concepts
  - Propose alternatives for Europe on legislation and guidelines, based on existing guidelines worldwide
- WP 3 : Development of Integrated water reuse strategies
  - Water Potential in Europe, conceptual model

Management

- WP 4 : development of Analysis tools for social, economic and ecological effects of water reuse
  - Feasibility studies (planning)
- WP 5 : Methodologies for public acceptance studies and consultation
  - Participatory approach
- WP 6 : Management guidelines for the implementation and operation of water reuse cycles
  - Once decided to build it, how to proceed

Technology

- WP 7 : Characterisation and assessment of technologies in water reuse cycles
  - State-of-the-art standardised reclaim water technologies, based on case studies
  - White paper on innovation

- WP 8 : Development and validation of system design principles for water reuse systems
  - Open software for planning all technology aspects, including expert approach

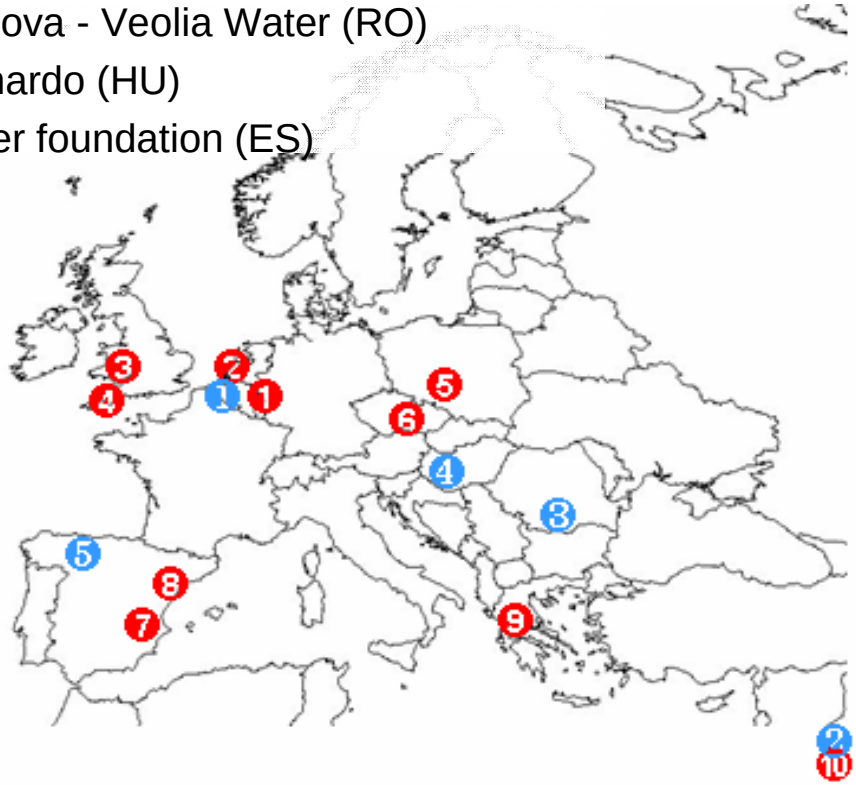
The AQUAREC Consortium

Universities

1. RWTH Aachen (D)
2. Techni.Uni.Delf (NL)
3. Cranfield Uni. (UK)
4. Exeter Uni. (UK)
5. Uni. Lodz (PL)
6. Brno Uni. (CZ)
7. Valencia Uni. (ES)
8. Uni. Barcelona (ES)
9. CPERI (GR)
10. Ben-Gurion Uni.(IL)
11. Uni. Wollongong (AUS)

Companies

1. Aquafin (BE)
2. Mekorot Water Ltd (IL)
3. Apanova - Veolia Water (RO)
4. Geonardo (HU)
5. Gaiker foundation (ES)



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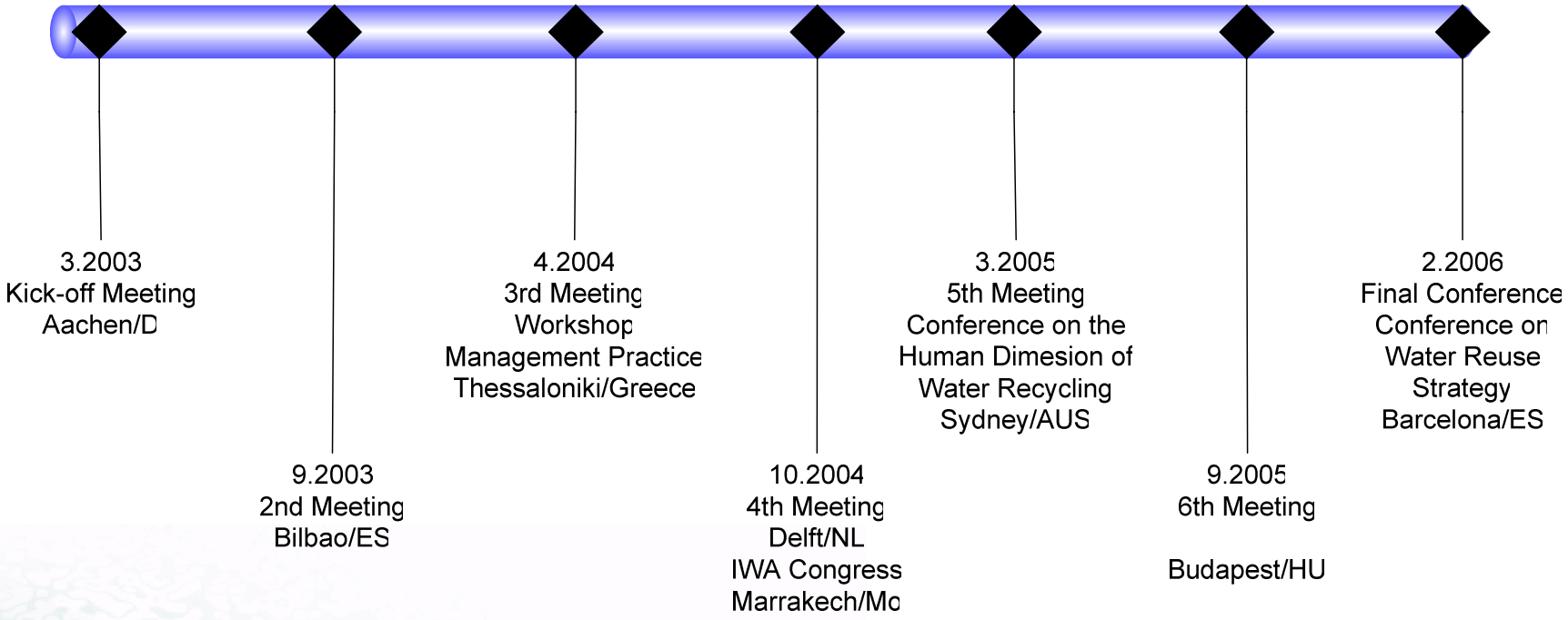
Time-line

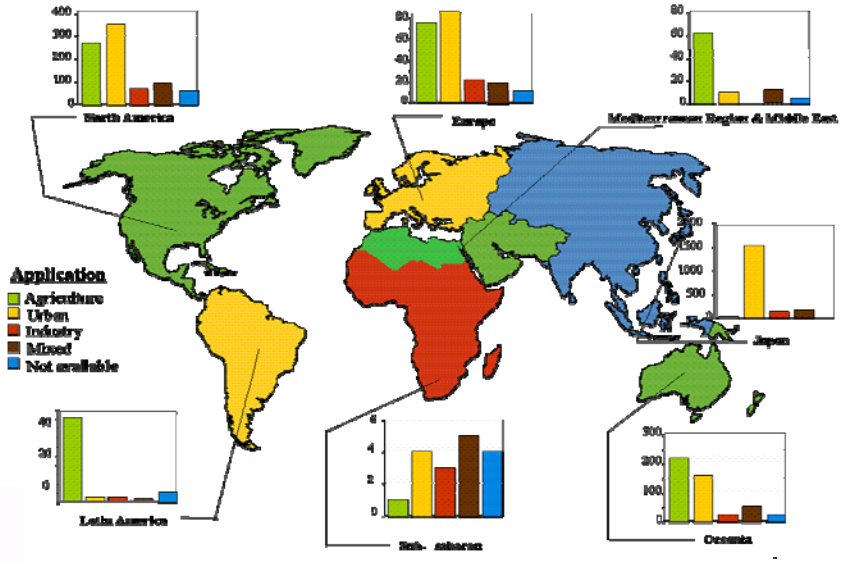

3.2003
Kick-off Meeting
Aachen/D
9.2003
2nd Meeting
Bilbao/ES
4.2004
3rd Meeting
Workshop
Management Practice
Thessaloniki/Greece
10.2004
4th Meeting
Delft/NL
IWA Congress
Marrakech/Mo
3.2005
5th Meeting
Conference on the
Human Dimesion of
Water Recycling
Sydney/AUS
9.2005
6th Meeting
Budapest/HU
2.2006
Final Conference
Conference on
Water Reuse
Strategy
Barcelona/ES

Work Package 6: management guidelines for the implementation and operation of water recycling schemes

- **The objectives are:**
  - **Mapping of water recycling installations around the world**
  - **Collection of best practice examples in terms of management and operation of water recycling schemes**
  - **Provision of a handbook for end-users**

We are in the process of writing the handbook

- **Realistic because we focused on practices applied on full-scale:**
  - **Reviewed 200+ publications**
  - **Identified information about more than 3,300 projects**
  - **Conducted in-depth interviews in 6 countries and additional postal survey in the EU, Israel, and Australia**



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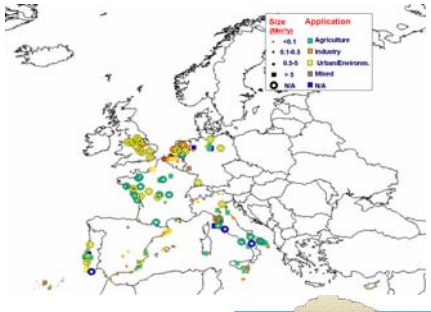

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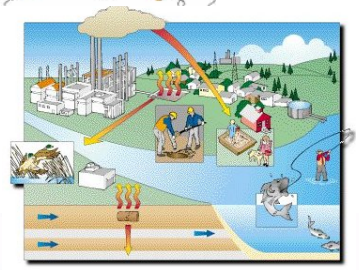


3. Common issues for an increased use of treated wastewater

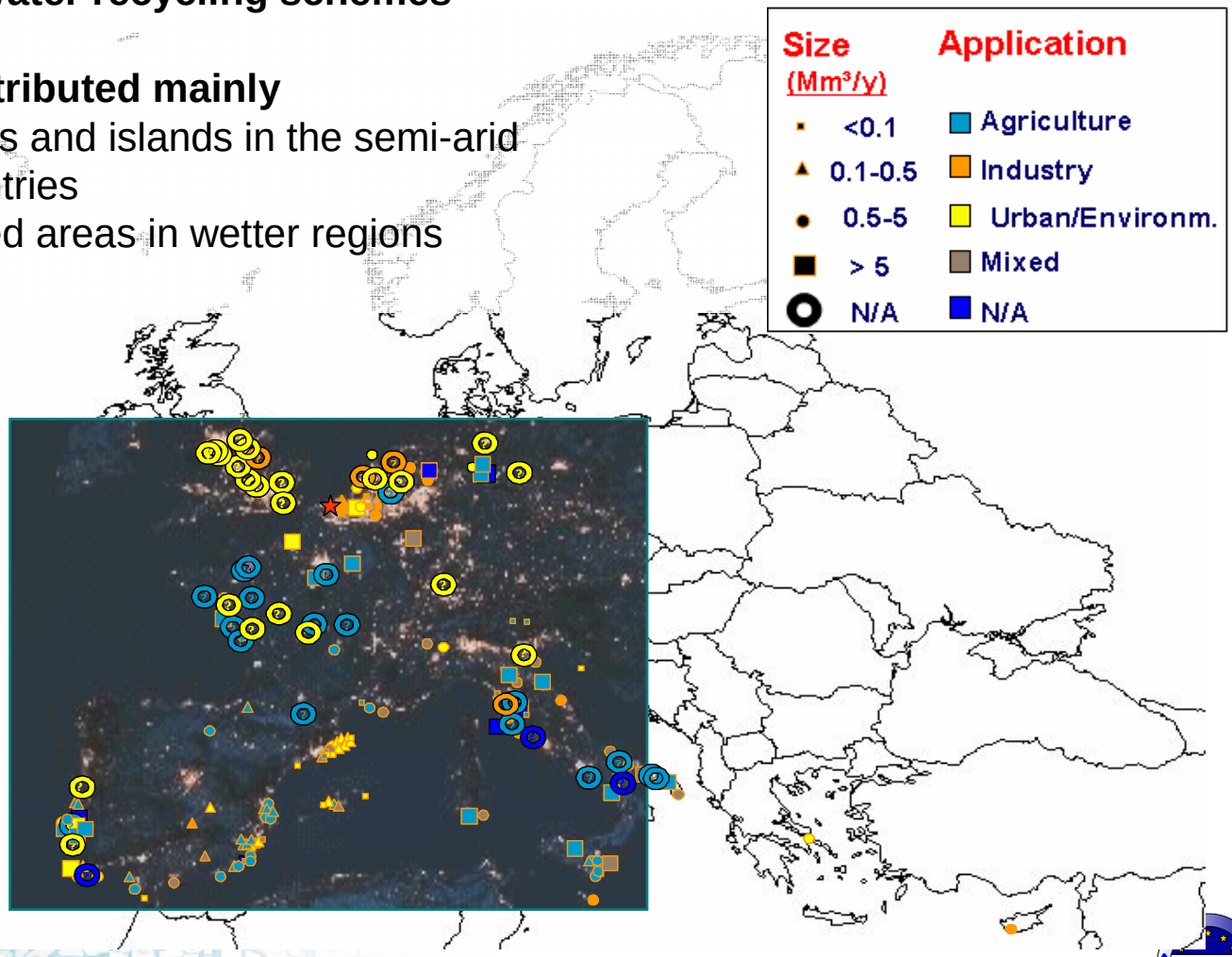
4. WFD and Water Reuse

In Europe water recycling is becoming an essential and reliable water supply option for many municipalities

We identified 200+ water recycling schemes

The projects are distributed mainly

1. on the coastal areas and islands in the semi-arid Mediterranean countries
2. in densely urbanised areas in wetter regions



The level of treatment seems consistent with the US EPA guidelines

Increasing level of treatment

PRIMARY TREATMENT
sedimentation

→

SECONDARY TREATMENT
Biological Oxidation, disinfection

→

TERTIARY/ADVANCED TREATMENT
chemical coagulation, filtration, and disinfection

No uses recommended at this level

- **Surface irrigation of orchards and vineyards**
- **Non-food crop irrigation**
- **Restricted landscape impoundments**
- **Groundwater recharge of non-potable aquifer**
- **Wetlands, wildlife habitat, stream augmentation**
- **Industrial cooling (non-food)**

- **Landscape and golf course irrigation**
- **Toilet flushing**
- **Vehicle washing**
- **Food crop irrigation**
- **Unrestricted recreational impoundment**
- **Indirect potable reuse: groundwater recharge of potable aquifer and surface water reservoir**

Increasing level of human exposure

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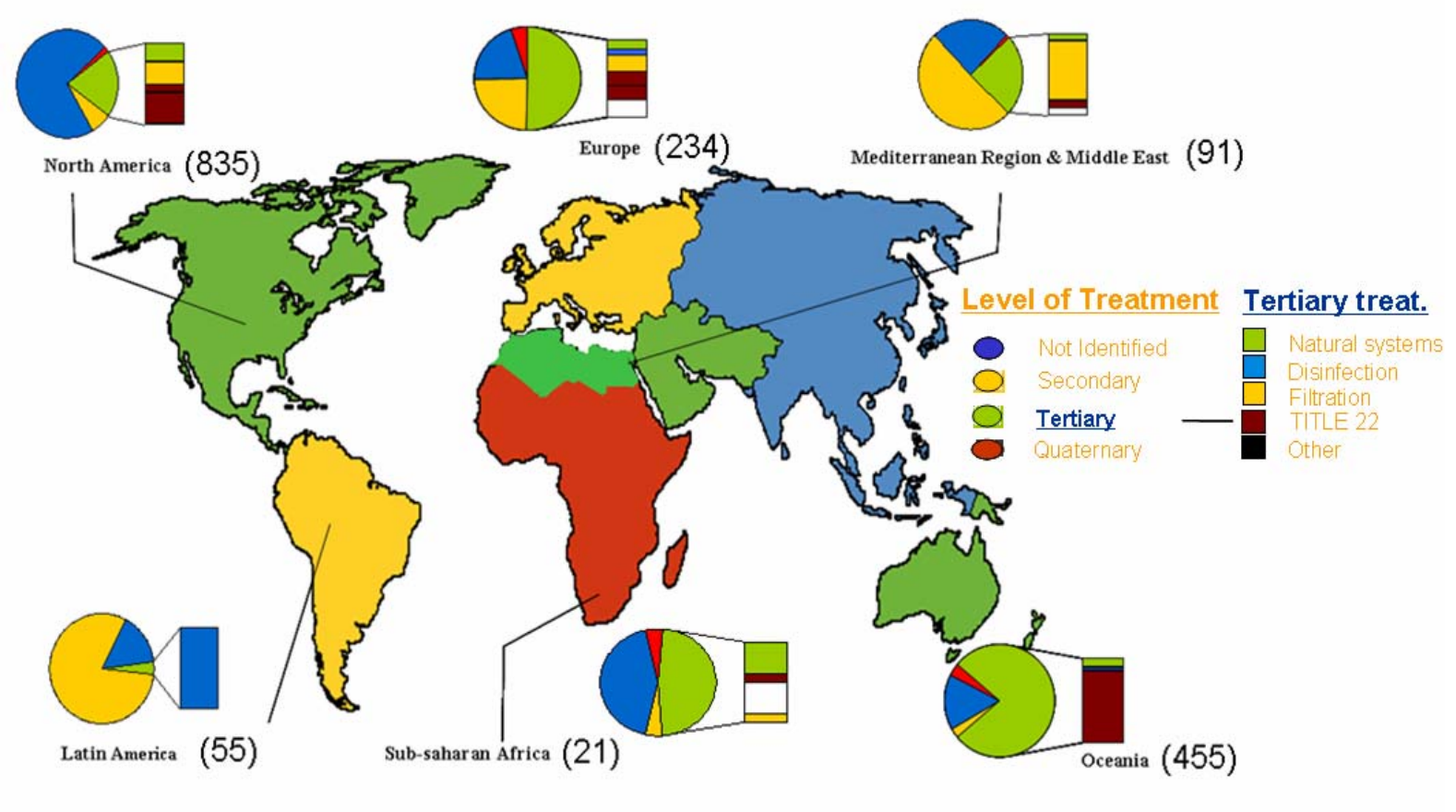
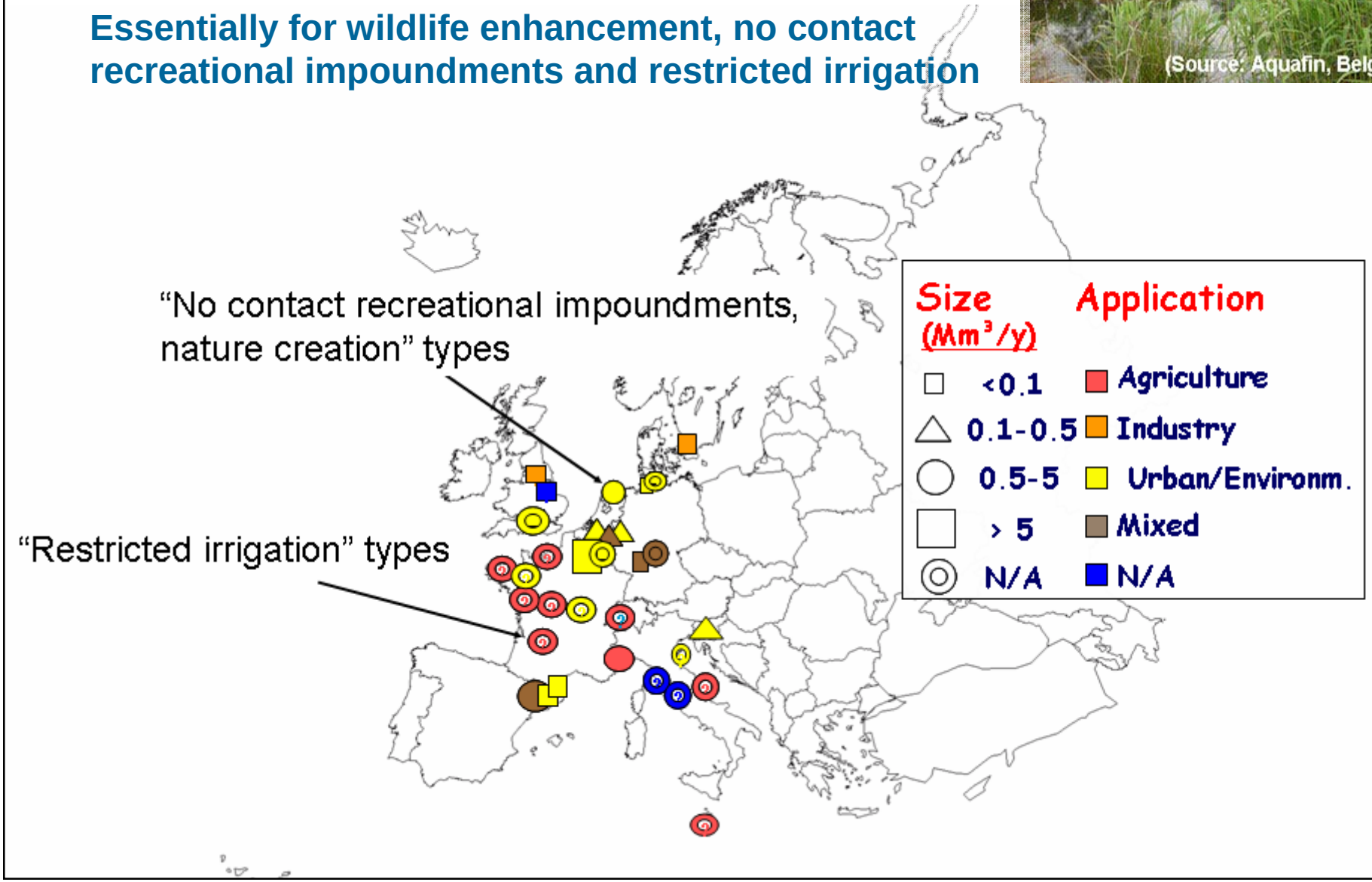
Tertiary/advanced treatment treatment is provided to approx. 70% of the European projects



This slide shows the distribution of the projects per treatment level and per type of application in 6 world regions

Natural water reclamation systems: “low-cost low-quality” solutions

Essentially for wildlife enhancement, no contact recreational impoundments and restricted irrigation



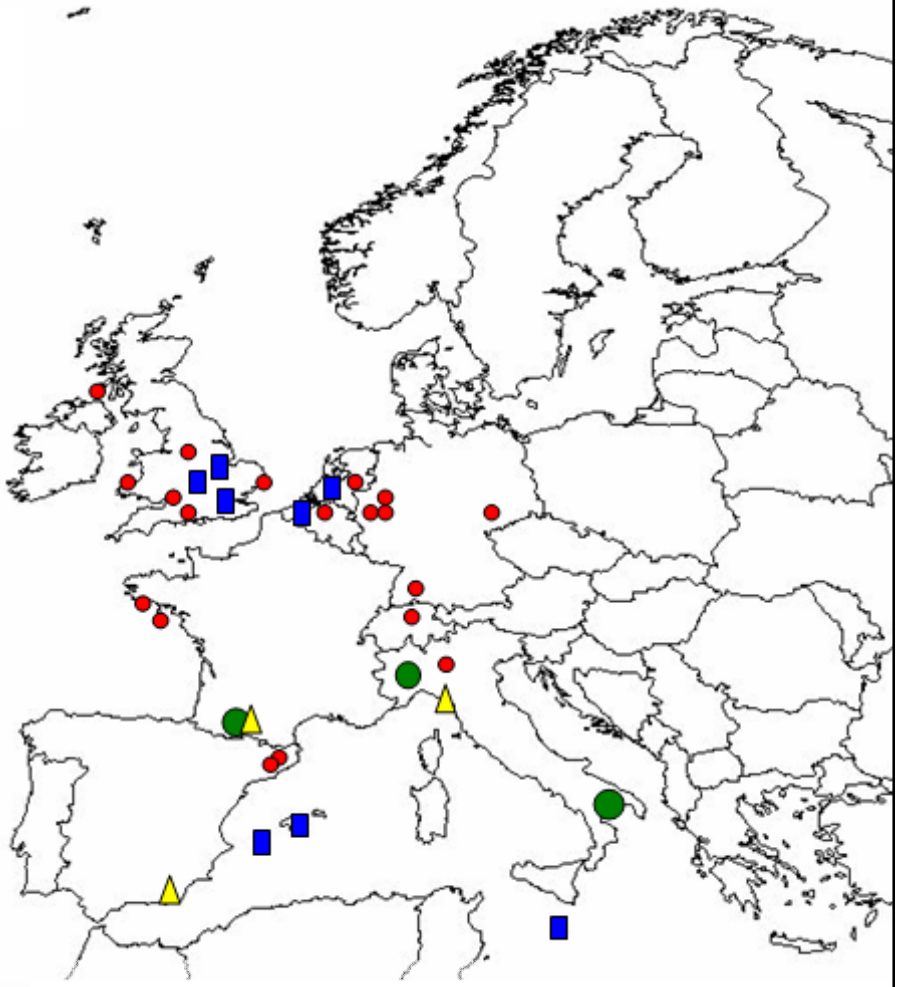
Membranes are becoming an essential part of water reclamation technology for high grade water production

DOUBLE MEMBRANE

MBR (recycling projects)

MBR (no recycling yet)

OTHERS



Essentially for urban applications, aquifer recharge and industrial applications requiring high quality water

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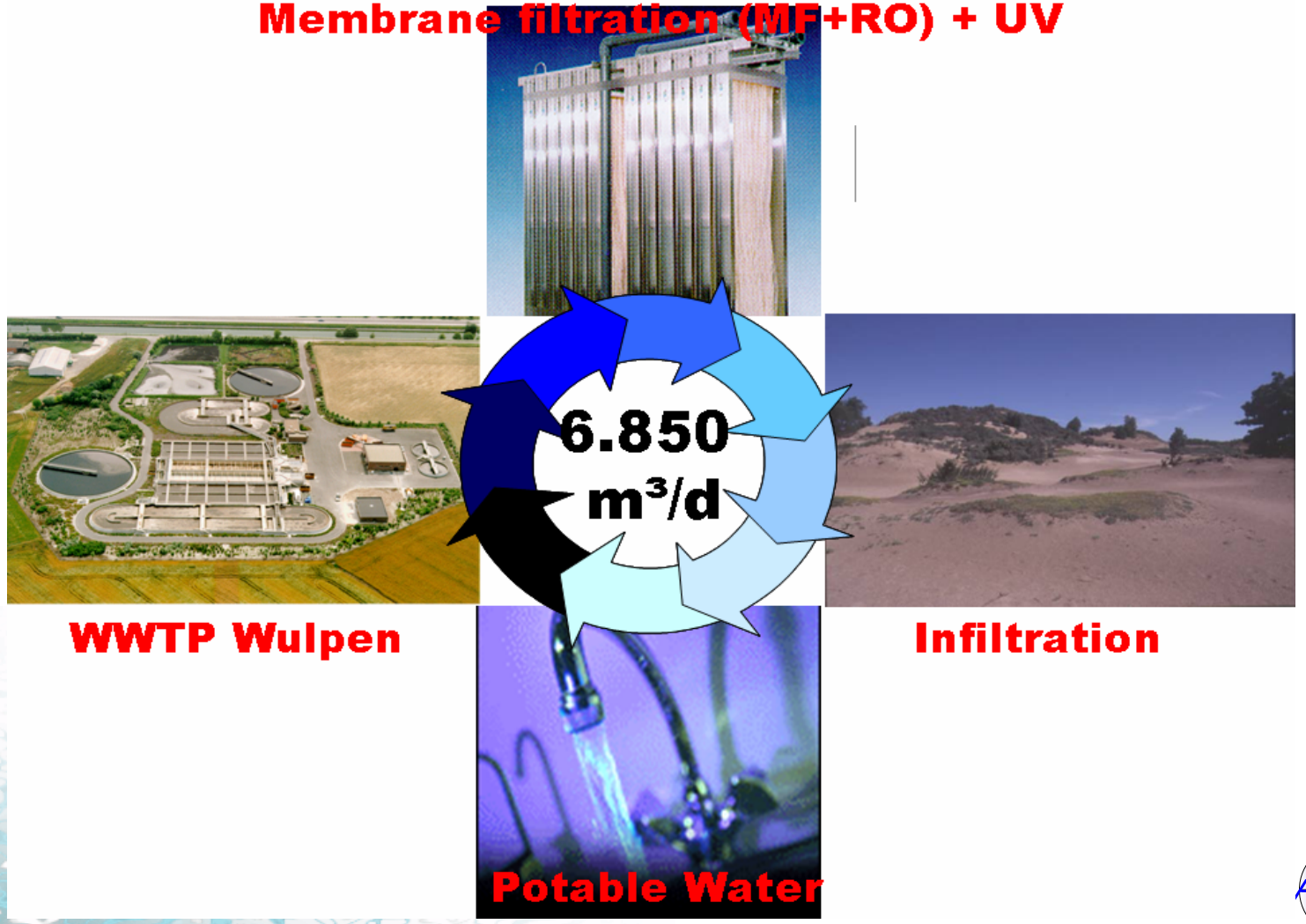
Aquifer recharge is attracting enormous interest



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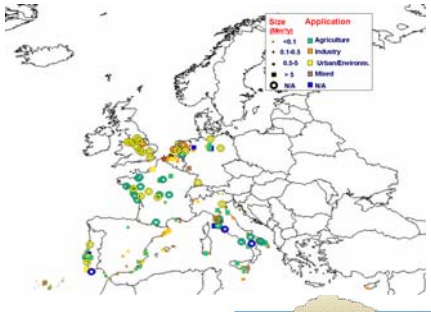

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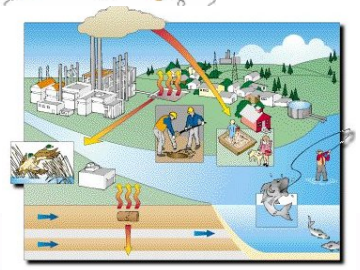

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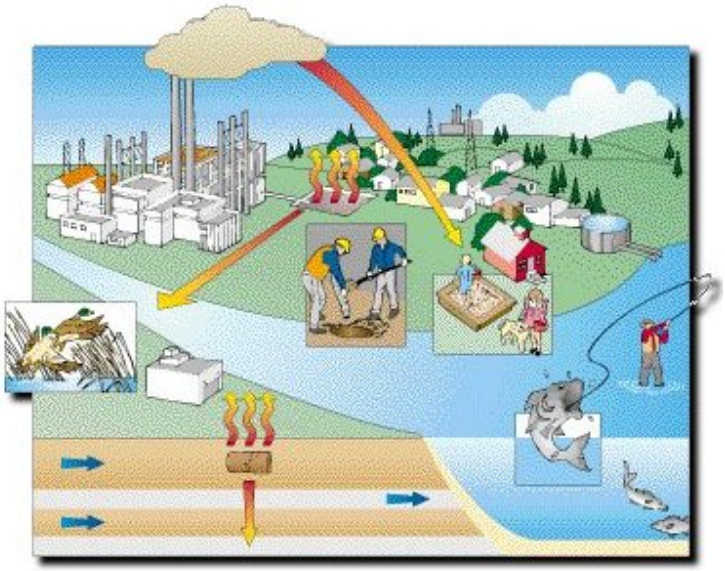
4. WFD and Water Reuse

The implementation of water recycling in Europe has been anything but smooth sailing

- **The projects suffered of many types of constraints. Common issues highlighted by the water utilities** (*through a dedicated workshop**, *questionnaires and interviews*)**:**
  - **Financing** is the first and utmost problem
  - Inconsistent or inadequate **regulation/guidelines**
    - which leads to delays / misjudgements
  - Need for better **institutional arrangements**
  - More **effort** to increase **stakeholder awareness and involvement** is needed
  - **Technical** issues exist, but can be managed)



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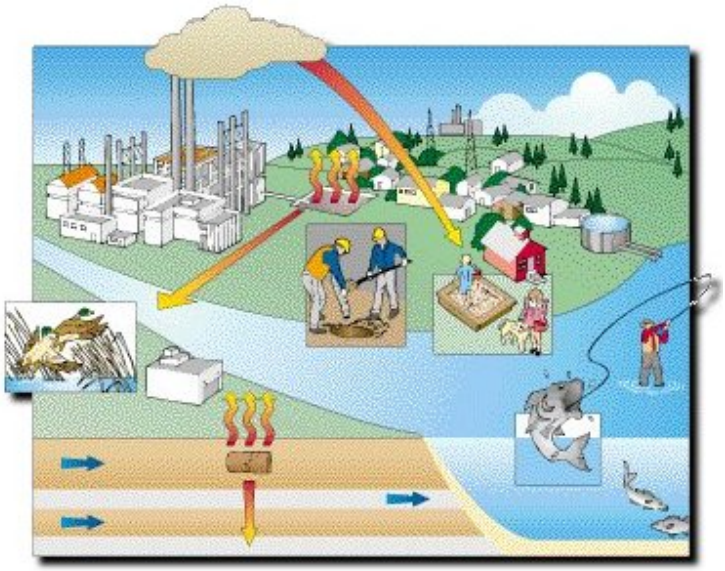

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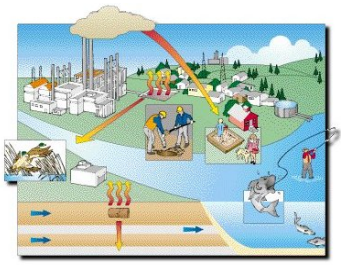

- The level of treatment required for reuse is a key financial driver
- The price for conventional water does not reflect its value
  - especially for heavily subsidised sectors such as agriculture
  - Even when the full cost recovery is applied, non-water-supply benefits such as
    - scarcity of water
    - marginal cost of new sustainable sources
    - burden of effluent disposal to the environment

    are not accounted for
- In summary, targeted subsidies are often needed to make the project working on a commercial basis

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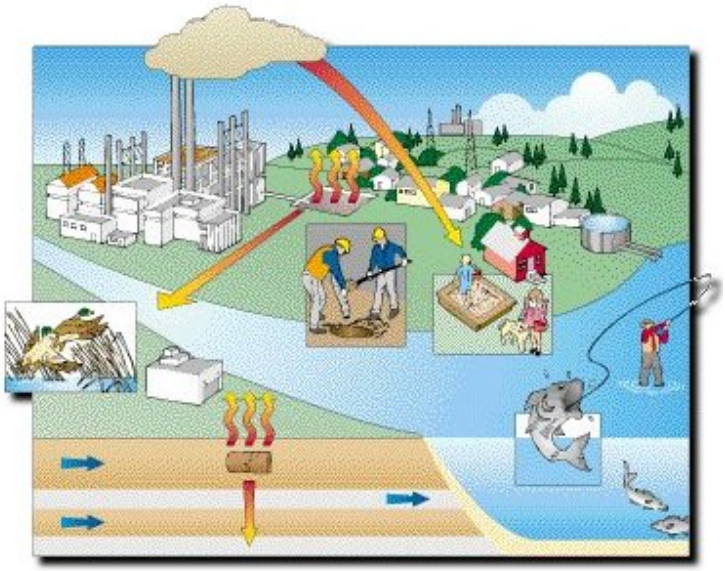

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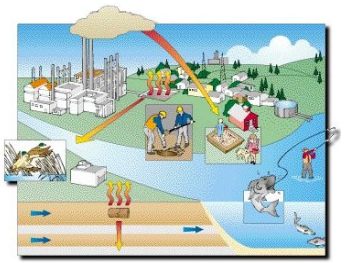
Already many reuse applications without really any guidelines at EU level to refer to

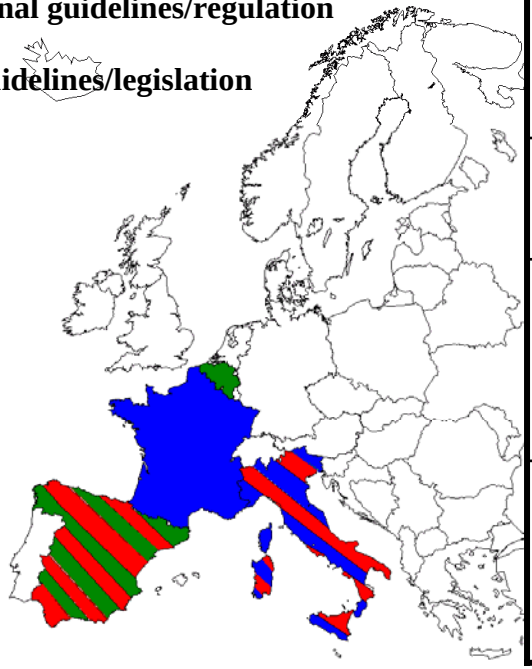


National regulation

Provisional standards/draft legislation

Regional guidelines/regulation

No guidelines/legislation



Belgium (2003)	**Flanders: proposed standards based on Australian EPA guidelines, awaiting approval**
Cyprus (1997)	**Stricter than WHO standards, less strict than Title 22 (TC<50/100ml in 80% of the cases on a monthly basis and <100/100 ml always)**
France (1991 ->1994)	**Standards only for irrigation based on WHO standards, additional restrictions**
Italy (1977 ->2003)	**National standards sets minimum requirements that can be strengthened by the regional authorities** **Regional guidelines based on Californian Title 22, except for Sicily (based on WHO standards)**
Spain (1985 -> 2005?)	**Proposed legislation is similar to Californian Title 22** **Regional guidelines particularly for irrigation purposes, based on WHO guidelines**

The EC Directive Urban Waste Water Treatment 271/91/EC that states "Treated wastewater must be reused whenever appropriate" leaves open the question to be addressed in future guidelines of when is it "appropriate"

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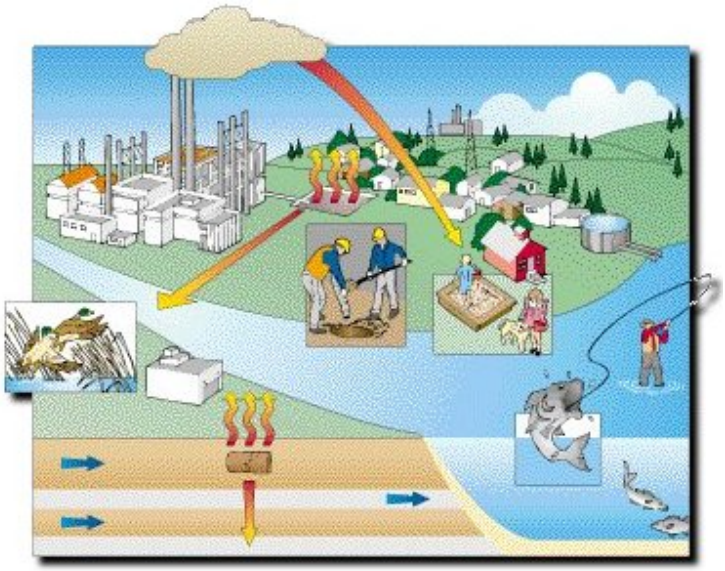

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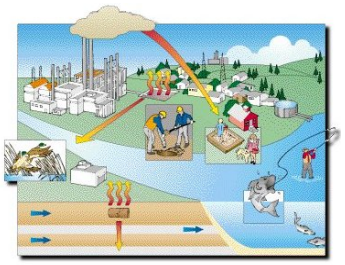
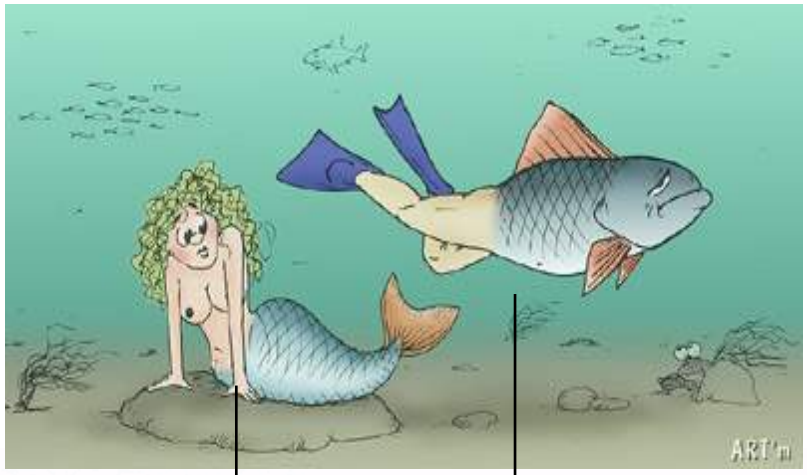
Better institutional arrangements are required



Piecemeal approach to water management



Water supply **Water sanitation**

- In the past, a **piecemeal approach to water management**, with the virtual separation of water consumption and disposal, created not only an institutional barrier to water recycling (*who's responsible?*) but also a mental barrier to integrated water cycle management

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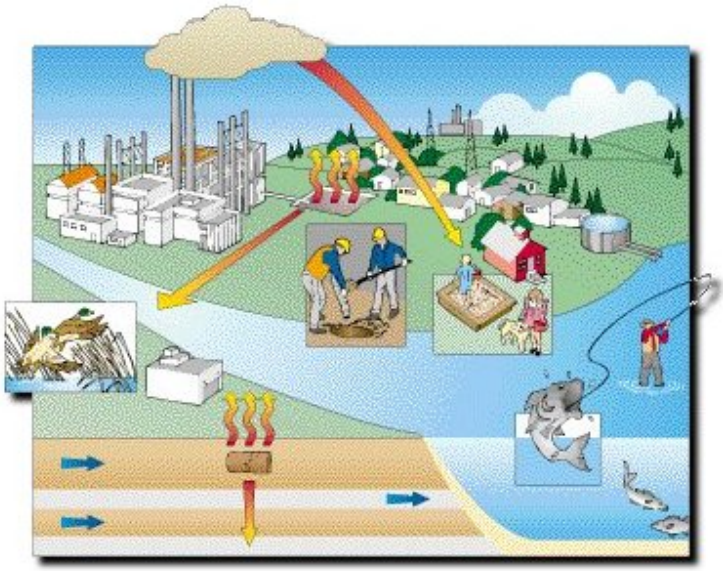

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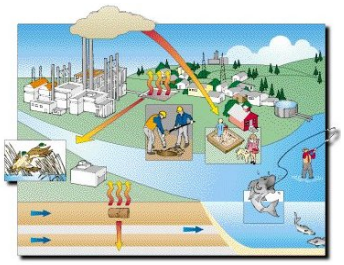
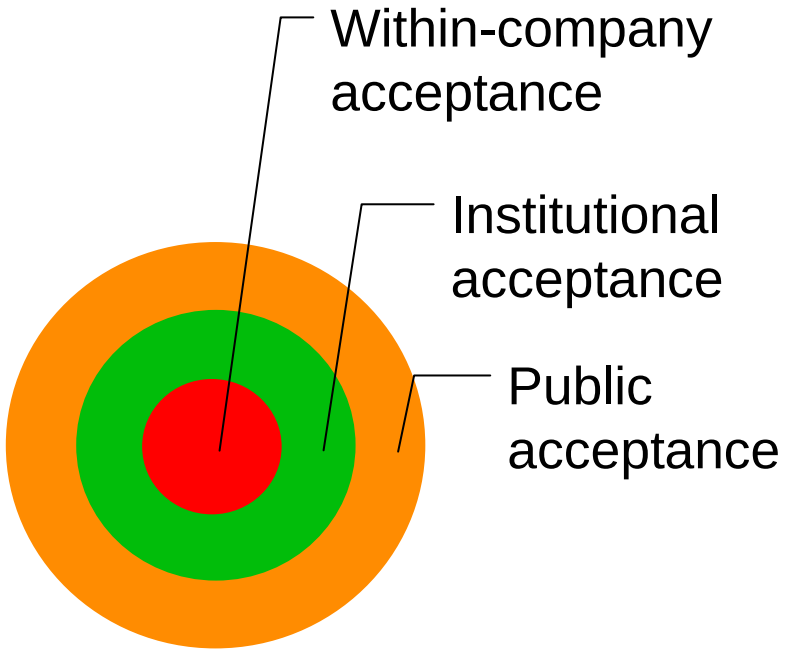
Water recycling is not only a question of money !



- The only way to prevent the project to be discarded at the first crisis is to build up credibility, confidence & trust and this at all levels
- Long-term viability of projects only assured through stakeholder awareness
  - First we should inform about basic facts of the water cycle



This may take time because a change in attitudes is necessary

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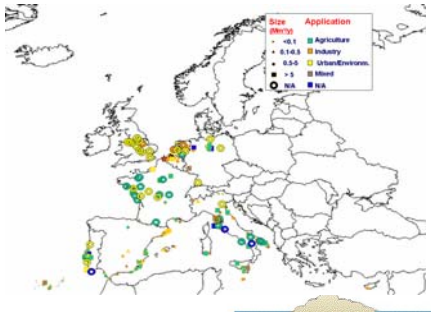

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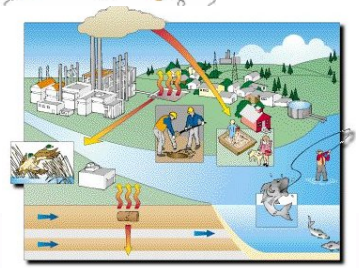

3. Common issues for an increased use of treated wastewater

4. WFD and Water Reuse

The Water framework Directive and Water Reuse

- **New guiding paradigms for SWM have been institutionalised by the EC by means of the Water Framework Directive :**
  - The WFD aims at integrating health, environmental standards, service provision and financial regulation for the water cycle, in order to achieve a better overall protection of the water cycle
  - water will have to be managed as a whole on a river basin scale
  - It should be ensured that the user bears the costs of providing and using water, reflecting its true costs:
    - Polluter pays principle
    - **FULL** cost recovery principle, that is more than simple cost recovery:
      - **Art. 9(1) "***the recovery of the costs of water services* ***including environmental and resource costs*** *associated with damage or negative impact on the environment should be taken into account*" when applying the polluter pays principle

The Water framework Directive and Water Reuse

- **Economic instruments** should have to be used to meet efficient use of water resources
  - By 2010 **water pricing policies** have to be introduced that provide incentives to efficient water uses, helping to achieve a good ecological status of the water bodies
  - **Overall costs associated with the directive** - including administrative costs, monitoring costs, costs to develop the river basin plans, costs involved in achieving the objectives of the Directive, … - **are likely to increase the water price significantly**

- Provision of subsidies for water saving devices or to reuse water. They can include tax incentives, tax credits, grants and low interest loans. If no subsidies: incentive to better environmental performance by forcing users to innovate or reduce water use (**subsidies**)

- By setting a limit on the total allowable polluting load or abstraction volume users or potential users may indulge in **trading of their permitted rights** whilst not exceeding the amount of impact that the environment can stand (**market creation**).
  - This system should lead to an efficient use of allowable environmental impact
- Setting of fines for exceeding limits, liabilities assignment, performance-bound payments (**enforcement incentives**)
- Establishment of new standards for priority substances
- To involve the public in making decisions on water management

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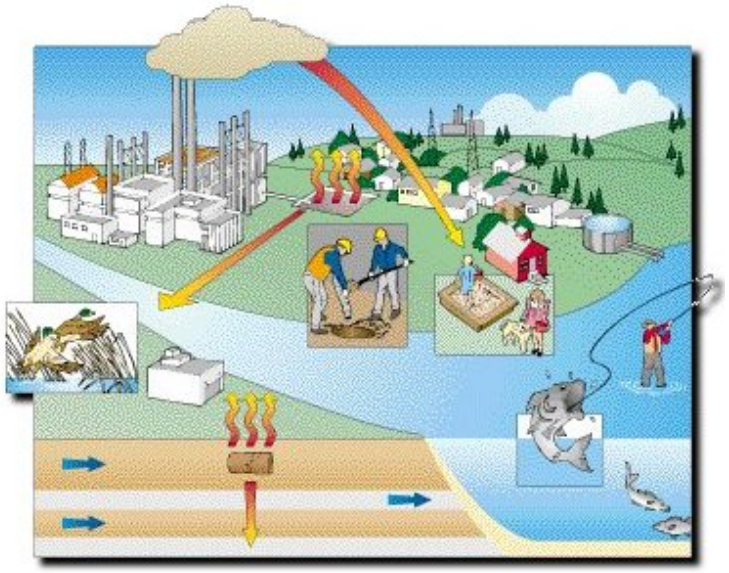
Conclusions

- **The water sector in Europe is in a** transitional phase**, with unique opportunities for water recycling to be implemented on a larger scale as sustainable practice within a framework of integrated water management**

- **Success of integrated water management policy depends on individuals, local communities and water utilities as much as on centralised rules and regulations**

- **We believe that technological innovation and the establishment of a best practice framework will help, but there can be few more pressing and critical goals than to produce a change in the underlying stakeholders' perception of the water cycle and of the management of the water resources**



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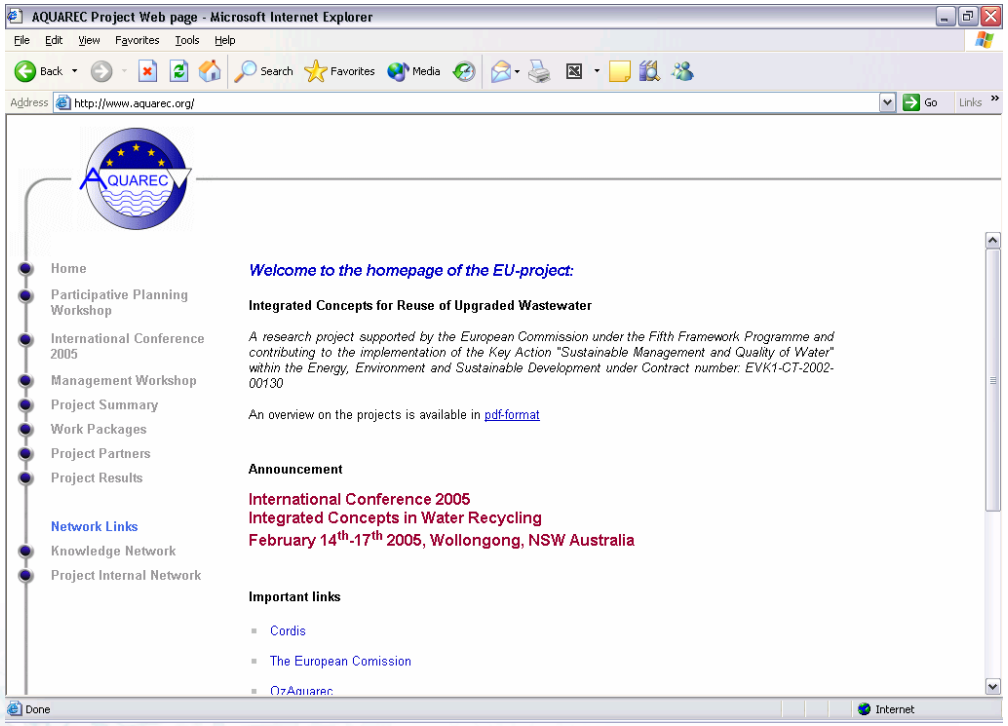
Summaries (and more): **www.aquarec.org**



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