Contract No. 070311/2011/603663/ETU/D1

Comparative Study of Pressures and Measures - Innovation
Contract No. 070311/2011/603663/ETU/D1

Comparative Study of Pressures and Measures - Innovation

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Summary

i Reasons
Development of innovative solutions will enable the European water sector to meet the challenges imposed by regulatory, demographic and climatic pressures. There is also an opportunity for the sector to support economic growth through the commercialisation of these innovations both at a European and global scale. The European Innovation Partnership on Water (EIP) has been established to encourage and facilitate this innovation.

ii Objectives
To understand how regulatory pressures created by the Water Framework Directive translate into measures and actions within River Basin Management Plans (RBMP) that create opportunities for innovations. Through examples, identify how an EIP might best support the creation and delivery of innovative solutions and link this to governance and integration with existing initiatives and innovation platforms.

iii Benefits
An understanding of how pressures create innovative needs and how the research community and the supply chain deal with barriers to full commercialisation will inform the development of the EIP on water to create a more innovative sector and contribute to economic growth.

iv Conclusions
The legislative requirement to develop RBMPs to meet the Water Framework Directive has created significant opportunity for innovative action. Approximately 50% of the RBMPs measures and actions offer opportunities for the application of innovative solutions. Measures to improve water and wastewater treatment, sewer and drainage systems and flood management infrastructure are the most frequent, but legal, administrative and economic measures also form a significant group. Dealing with water scarcity and chemical pollution are the principal drivers cited in the plans.

The research community and the supply chain is well informed on the needs for innovative solutions and are responding directly to the drivers arising from water policy and legislation; the larger proportion of the examples of innovation identified are aligned with water scarcity and chemical pollution; legislation is driving development of innovative solutions.

Priorities for innovation identified by a range of national and international platforms vary in time and between platforms. There are commonalities and differences between the issues and priorities defined by research organisations and platforms; some reflecting country specific needs, some referring to global issues and some influenced by topical issues that change with time. Setting priorities is very much dependent on the function and focus of the individual organisation but many reflect the drivers and measures identified from the RBMPs.
The conservative, risk-averse nature of the water sector makes breakthrough of new systems difficult. Commercial success, measured in terms of widespread application or global market penetration is not great and a number of the examples that are hailed as great innovations have not moved much beyond an initial demonstration because the business benefits have not been clarified. The academic research community is not effectively connected to the demand side and the supply chain. This leaves innovations stranded and lacking a route to commercialisation.

An EIP would provide greater visibility of innovative technologies and services enable easier penetration of the market and, through links with the existing Technology platforms, provide a steer on needs and requirements. An EIP can also provide a co-ordinated point through which innovative solutions can be demonstrated through pilots to accelerate uptake of emerging solutions by reducing the need for repeat demonstrations with each new customer.

**Recommendations**

The EIP on water should create and support greater links across the innovation path, facilitate engagement between the research, end-user and supplier communities and promote the transfer of innovative solutions across and between Member States. It should create a greater awareness of emerging innovations and actively promote and demonstrate them to accelerate commercialisation.

The EIP will need to be flexible in setting priorities, but issues to address include: effective management of water resources; exploitation of alternative sources of water; sustainable urban drainage; water scarcity and the competition for water between users and the impact of land use and hydromorphology on flood risks; small community water supply and sanitation; land management practices to improve the quality of water; water and energy interdependence; better practices and revised production methods to reduce pollution; and more water efficient processes. The EIP will also need to address non-technological innovations for governance and regulation of water; financial management and instruments to encourage innovation.

The Steering Group (SG) should have members with decision-making power and it and the Task Force need to represent a broad selection of stakeholders and disciplines/sectors. The governance structure should be flexible enough to be adapted over the lifetime of the EIP.

**Résumé of Contents**

Analysis of RBMPs highlights the opportunities for innovation, which together with a review of existing initiatives and platforms provides priorities for the EIP to consider. Consideration is given to governance of the EIP on water to promote good stakeholder engagement. A selection of examples of innovations provides a perspective on the factors that influence success or failure in wider implementation and commercialisation of innovative solutions.
1. Introduction and Overview

1.1 Background

Innovation in the water sector is invariably driven by a need to respond to and meet new regulations, a need to reduce costs or, a need to mitigate changing pressures on resources. Innovation can be conceptually divided into different types:

Technology-based innovation - e.g. new sensors and monitors, new treatment processes for water and wastewater, improved (real-time) control and intelligent decision support systems, new methods for controlling/applying pesticides/nutrients, new irrigation technologies etc.

Innovative Management approaches - e.g. integrated and/or adaptive catchment management, applying the ecosystem services approach (ESA), educational and awareness raising programmes, using new media such as social-networking or e-learning.

Innovative approaches to regulation - e.g. catchment based and variable (seasonal) consenting, participatory planning and “real options” policy design.

This Report, which covers Task 4a in the ‘Comparative Study of Pressures and Measures in the Major River Basin Management Plans’ (Contract No. 070311/2011/603663/ETU/D1), provides an analyses of how the Pressures and Measures set out in the River Basin Management Plans can provide opportunity for innovation within Europe and how a European Innovation Partnership (EIP) on water might support the creation and commercialisation of such innovation.

Four linked activities were undertaken:

1. An analysis of River Basin Management Plans (RBMPs), which are driven by the need to meet the requirements of the Water Framework Directive (WFD), whereby each of the identified measures was categorised as to whether it provided an opportunity for innovation.

2. A review of the priorities set by existing platforms and organisations relevant to the sector to inform the emerging EIP on what specific or general issues should be addressed.

3. An assessment of different approaches to governance in a selected set of innovation platforms/initiatives, with the aim of identifying good and poor practice, and critical success factors that could be translated into concrete recommendations for the governance structure and working procedures of the EIP on Water.
4. A search for examples of relevant, implemented innovative solutions with, for selected examples, an appreciation of what the driver was, where the concept originated, whether it was a commercial success, whether any factors had acted as barriers, incentives or accelerators in bringing the product to market, and how an EIP on water might have supported it.

This section provides an overview of the findings and indicates how an EIP can be used to add value into the innovation process to create new solutions for the European waters sector and commercial opportunities for the supply chain.

1.2 RBMP analysis

The RBMP analysis has indicated that there is a substantial need and opportunity for innovative solutions to be applied in response to the pressures that individual basins are under. Approximately 50% of the identified measures offer opportunities for innovative solutions.

Whilst the categorisation of the measures and actions are not fully consistent between countries, chemical pollution and water scarcity are the biggest drivers. There is scope for innovation to be applied in many different ways and there are some actions that can be highlighted:

Construction was 35% of all actions and includes water and wastewater treatment, sewer and drainage systems and flood management infrastructure.

Legal/Admin/Economic together were 14% of all actions and relate to issues around, for example, the governance of water. They are non-technical innovations and can often be ignored in promoting innovation despite their potential for changing behaviour and water use.

Restoration was 22% of all actions and relates to the provision of ecosystem services, green infrastructure and, to some extent, flood risk management. They offer innovative approaches to reducing drinking water treatment requirements (by improving the quality of the raw water) and through hydromorphological actions can impact on both quality and quantity of water.

Demand/Efficiency was 5% of all actions and represents the principal responses to water scarcity. Innovation is possible through the use of smart meters and through water reuse, recycling and alternative sources such as rainwater harvesting.

The level of detail within the RBMP does not indicate whether the solution chosen to address the measure, and undertake an action, is innovative or not; the analysis therefore can only provide an indication of where there is an opportunity for innovation. However, the activities of the technology platforms and the examples of innovation identified do indicate that the research community and the supply chain are seeking innovative solutions to deliver on these actions; legislation is therefore driving the development of innovative solutions.
1.3 **Priorities for Innovation**

There are many views on the priorities facing the water sector. There are strategic level issues such as climate change and tactical issues such as leakage; setting priorities is very much dependent on the function and focus of the individual organisation and change from one year to the next.

Translating these into a single, simplistic list of challenges provides a snapshot of current thinking, but priorities change and new challenges emerge. The challenges and key issues that form the basis for the EIP to shape a programme include:

- More effective management of water resources and exploitation of alternative sources of water; sustainable urban drainage; resource efficiency, including water and the use of energy and resources that result in the contamination of water bodies.
- Water quantity, in particular water scarcity and the competition for water between users and the impact of land use and hydromorphology on flood risks; small community water supply and sanitation; land management practices to improve the quality of water.
- Water and energy generation; prevention of pollution through better practices and revised production methods; more water efficient processes.
- Governance and regulation of water; financial management and instruments to encourage innovation; understanding the value of water; water and energy interdependence; climate change.

1.4 **Governance**

The hierarchy of a Steering Group with a Task Force to take forward the decisions of the Steering Group represents a good model that has succeeded elsewhere.

A Steering Group made up from individuals with decision-making power provides an effective body that is able to focus on taking strategic decisions drawing from information and discussions that take place at the Task Force level. A large number of members can be problematic and create logistical problems but it is important that the full range of relevant stakeholders and themes are covered; 30 members is often seen as an upper limit.

A Task Force will be most effective when it represents a broad selection of sector stakeholders including: representatives from the Technology Platforms and European innovation initiatives; SME representative bodies: venture capital and financing organisations: standards organisations; members of large relevant research programmes; and “thought leaders” to provide an independent and balancing view.
A governance structure that is flexible will allow adaptation over the course of the work of the EIP on Water and enable it to respond to the changing needs of the sector. Continuity and engagement can be provided by a permanent staff position with the sole purpose of “keeping the network alive”.

1.5 Innovation in Practice

Innovation generally results from a need; the larger proportion of examples identified in the study relate to water scarcity and chemical pollution, which aligns with the principal opportunities for innovation identified in the RBMP assessment.

In the majority of cases, innovative solutions have been developed to enable end-users (water companies, municipalities and industrial companies) to respond to regulatory pressures. They have also been developed in response to a need to reduce costs, mitigate the impact of changing climate and to create better engagement with the community to make more effective use of water.

Innovations that have been developed within an academic environment appear to stall because of a lack of a commercial partner to properly exploit the opportunity. Technology transfer from outside the water sector is made difficult by the low value of the product (water) and the significant regulatory requirements. Successful commercialisation of a new innovation depends to a large extent on the determination of the supplier to establish the service or product and this may be achieved better in less conservative markets outside of Europe.

Commercial success, measured in terms of widespread application or global market penetration is not great and a number of the examples that are hailed as innovations (through promotional material and the technical press) have in reality not moved much beyond an initial demonstration. Innovation can only be considered to have occurred if there is a recognisable beneficial change that has resulted from the implementation of a new system/process/technology. Solution developers and early end users may be attracted by the leading edge nature of the technology and not fully address the business case early in the programme; this is a feature of some technologies which, whilst effective, fail to convert into financial savings for the end-user and innovation fails.

Commitment is needed from the top of an organisation attempting to introduce innovative solutions. There needs to be a recognition that innovation is not just about the technology, the business processes and people may need to adapt to new systems and ways of working. Sometimes courage and risk taking is needed to accrue full benefit from transformational innovation.

The conservative, risk-averse nature of the water sector makes breakthrough of new systems difficult. Few water suppliers or wastewater treatment operators wish to be early adopters. Innovative solutions can stall because even “fast followers” are reluctant to commit without their own trials and demonstrations, which adds unsustainable costs to the suppliers.
1.6 **Added value from an EIP**

The EIP on Water has two interdependent objectives: to facilitate the development of innovative solutions to address water-related challenges, and to facilitate European companies and organizations to fully exploit the commercial opportunities in markets within and outside Europe.

The water sector is conservative and risk adverse because it is a primary agent in the protection of public health and the environment and it has substantial long-term investments tied up with infrastructure. Additionally, it is a fragmented complex market, with many small and medium enterprises dealing with large numbers of differently structured end-users that range from small municipalities to international private companies. This creates significant barriers for companies to get new products into the market, with onerous testing and demonstration requirements that delay access to the wider market.

National and European initiatives target significant investment for academic and other research institutes to create innovative solutions but few of these develop into fully commercialised products because there is poor linkage across the innovation path. A number of the innovations reviewed within this report emerged from European funding, but they have not progressed because the link between academic researcher and commercial partner is absent.

There is also substantial investment into the European Technology Platforms and National Research Organisations, and whilst they aspire to drive the implementation of innovation, they tend to lack the direct engagement with the supply chain. Their primary role is to identify and communicate the needs of the water sector to research and technology providers, but with few exceptions, they tend to focus on the generation of new knowledge and concepts rather than the development and implementation of innovative solutions. They are key players in the chain but they operate in partial isolation and the EIP can provide a greater focus and steer of their outputs towards building greater capacity in the supply chain.

The EIP in Water will enhance Europe’s competitiveness in the water sector if it provides a single focus, bringing existing initiatives together and linking all stakeholders across the innovation path, from concept through to commercialisation, connecting the supply and demand sides of the innovation value chain. A single focus will be of particular value as small and medium-sized enterprises find the large number of National and European-wide initiatives confusing and difficult to navigate.

An EIP would provide greater visibility of emerging innovative technologies and services, enable easier penetration of the market and provide opportunities for academic organizations to better link with commercial partners to take innovations to market. The proposed “e-marketplace” could be a valuable platform for sharing information, and for offering a way to communicate important research gaps and needs — and therefore “innovation needs” — between research and practice. However, it needs to lead to more clarity and streamlining —
just one more platform where information can be found would not be useful, as users are overwhelmed already.

In addition to supporting the generation and gestation of innovations the EIP can also create greater recognition of the role of innovation in the field of legislation, standardization, public education, and financing mechanisms. By mobilising and linking up stakeholders across relevant policies, sectors and borders it will be able to bring the benefits of breakthroughs and innovation to society more quickly. Innovations such as regulatory or financial incentives are not suited to commercialisation; they are often specific to the local institutional and political environment. The EIP will be well placed to support and promote such innovations for adoption or adaption by other regions or countries.

The key stakeholders that the EIP will need to engage and interact with include water consumers, providers of water services, urban planners and local government, regional water management and land use/planning authorities, farmers and farming organisations, manufacturing associations and standards bodies. Other EIPs such as Agricultural Production and Sustainability, Joint Programming Initiatives, national research programmes, European Technology Platforms, offer the means to achieve this engagement, promote synergies and avoid duplication.
2. Opportunities for Innovation in River Basin Management Plans (RBMPs)

2.1 Overview and conclusions

The RBMP analysis has indicated that there is a substantial need, and opportunity for innovative solutions to be applied in response to the pressures that individual basins are under. The average across all measures indicates that approximately 50% offer opportunities for innovative solutions.

The categorisation of the measures and actions are not fully consistent between countries but it is possible to identify actions, or groups of actions, that stand out, and which the EIP could consider when setting priorities. These include opportunities for innovation in both technical and non-technical areas:

Construction – 35%: These actions include water and wastewater treatment, sewer and drainage systems and flood management infrastructure.

Legal/Admin/Economic – 14%: These relate to issues around, for example, the governance of water.

Restoration – 22%: These actions relate to the provision of ecosystem services, green infrastructure and, to some extent, flood risk management and are largely linked to rural water management. They offer innovative approaches to reducing drinking water treatment requirements (by improving the quality of the raw water) and through hydromorphological actions can impact on both quality and quantity of water.

Demand/Efficiency – 5%: Managing demand and making more efficient use of water represent the principal responses to water scarcity. Innovation is possible through the use of smart meters and through water reuse, recycling and alternative sources such as rainwater harvesting.

The level of detail within the RBMP does not indicate whether the solution chosen to address the measure, and undertake an action, is innovative or not; the analysis therefore can only provide an indication of where there is an opportunity for innovation. However, the activities of the technology platforms (Section 3) and the examples of innovation (Section 5) do indicate that the research community and the supply chain are seeking innovative solutions to deliver on these actions; legislation is therefore driving the development of innovative solutions.
2.2 **Approach**

An analysis was conducted to establish what proportion of measures proposed by Member States under RBMPs provided opportunities for innovation. The analysis aimed to determine the distribution of innovative measures across selected Member States based on environmental drivers and sub-sets of water resource management.

The environmental drivers are water scarcity (WS), chemical pollution (CP), hydromorphology (H), flood management (FM) and biological/ecological disruption (B/E).

The water resource management sub-sets that were selected are industrial water management, rural water management and urban water management. These are generally recognised divisions and although somewhat arbitrary, were a useful way of getting an overview of the spread of opportunities for innovation.

An *Opportunity for Innovation* was defined as the scope for the development of new approaches, methods, regulation or technologies within each of the specific measures described.

Summary reports on measures proposed within RBMPs selected from Cyprus, Germany, Spain, Finland, Hungary, Netherlands, Slovakia and the United Kingdom were used for the analysis. These countries were selected to provide a representative sample across Europe and because the level of detail within the RBMPs was sufficient to allow a judgement to be made on each measure. The RBMP information was obtained from the Atkins WISE database as of January 2012. The details and descriptions of measures are in national languages; these were roughly translated into English using Google translate tool and were tabulated within Microsoft Excel.

The information provided for each country defined: the river basin, the type of project measure (e.g. administration, education, construction, etc.), a textual description of the measure, and the extent to which the measure would be implemented within the Member State. Because there was no consistent approach to defining and describing measures between countries and between RBMPs, it was not possible to automate the analysis and a manual process was adopted. Each individual measure was read and assessed by the researcher; this limited the number of RBMPs that could be assessed within the time and resources available but the analysis covered 1036 individual measures and 11 separate RBMPs across 8 Member States.

Measures were categorised by the environmental impacts driving the measures and the management sector each measure was associated with. The environmental impacts driving the measures were usually unambiguous. Where the impact of a measure was not clear, it was classified as ‘unknown’. In some cases more than one area of impact could be identified and the measure was defined as a combination of impact drivers. The management sectors (urban, rural or industrial) were mostly well defined within the measure information; where the
management sector was unclear they were classified as unknown. Some measures were found to be within the remit of more than one management sector, in such cases, they were defined as combination measures.

The *Opportunity for Innovation* for each measure was judged on the description of the measure and activity planned. For example: terms such as “scheme” or “infrastructure” or “developing models” or “education programmes” were taken to indicate the opportunity to apply innovative technological or management solutions; terms such as “investigation” or “expand monitoring” or “implement legislation” were taken as offering limited or no opportunity for innovation, the implication of the measure being a need to gather more information or apply existing legislation. In some cases the descriptions were insufficient in detail and the opportunity for innovation could not be determined; in such instances they were classified as “unknown”.

Whilst this is a subjective approach, initial trailing by different researchers provided a degree of consistency, and gave confidence that the results would be meaningful, although not fully quantitative.

### 2.3 Results

#### 2.3.1 Potential for Innovation

The proportion of measures identified as having potential for innovative solutions, within each member state assessed, is shown in Table 2.1 and Figure 2.1.

The average across all measures indicates that approximately 50% offer opportunities for innovative solutions. Differences between the states are generally small, with the exception of Cyprus (CY), where there was a large proportion of measures relating to further investigations, and Germany (DE), which had a large proportion (32%) of activities that could not be easily categorised by type of action, but which did not fall into those indicating no potential for innovation. These comparisons do not indicate how innovative the countries are, only where there is an identified opportunity for innovation. It is very likely that further investigations will identify new opportunities. It can also be argued that countries that are less sophisticated in their existing level of technological/administrative development have more scope for being innovative.

**Table 2.1** Proportion of measures with potential for innovative solutions for different Member States

<table>
<thead>
<tr>
<th>Member State</th>
<th>Innovative Measure</th>
<th>Non-Innovative Measure</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY</td>
<td>24%</td>
<td>68%</td>
<td>8%</td>
</tr>
<tr>
<td>DE</td>
<td>76%</td>
<td>24%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Table 2.2 displays the distribution of proposed measures categorised by the Member State.

<table>
<thead>
<tr>
<th>Member State</th>
<th>Innovative Measure</th>
<th>Non-Innovative Measure</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES</td>
<td>42%</td>
<td>58%</td>
<td>0%</td>
</tr>
<tr>
<td>FI</td>
<td>63%</td>
<td>35%</td>
<td>2%</td>
</tr>
<tr>
<td>HU</td>
<td>44%</td>
<td>46%</td>
<td>10%</td>
</tr>
<tr>
<td>NE</td>
<td>46%</td>
<td>54%</td>
<td>0%</td>
</tr>
<tr>
<td>SK</td>
<td>54%</td>
<td>46%</td>
<td>0%</td>
</tr>
<tr>
<td>UK</td>
<td>52%</td>
<td>48%</td>
<td>0%</td>
</tr>
<tr>
<td>Average</td>
<td>51%</td>
<td>47%</td>
<td>2%</td>
</tr>
<tr>
<td>n</td>
<td>530</td>
<td>496</td>
<td>10</td>
</tr>
</tbody>
</table>

2.3.2 Drivers for Innovation - impact

The predominant environmental driver for each potentially innovative measure was assessed, the sum of each driver calculated and the distribution of drivers assessed within the Member States. Table 2.2 displays the distribution of proposed measures categorised by the

The clear message is that there is a significant number of opportunities for applying innovative solutions and that there is a substantial potential market across the EU for innovative solutions in response to the pressures exerted by the need to implement RBMPs.
environmental driver (impact) for the selected Member States, which presents an opportunity for innovation. There are differences between countries, as would be expected.

The need to address problems relating to chemical pollution was more common in most countries. This category covers a range of actions, and it is not always possible to determine from the plans the exact nature or source of the pollution. For example, in some cases the action refers to “reducing emissions/pesticides” (which are most likely the result of agricultural activities), in others it refers to “remediation of groundwater contamination” (unspecified).

Water scarcity was also a key impact for many countries, not surprisingly it was the biggest driver for Cyprus.

Table 2.2 The distribution of potentially innovative measures with regard to environmental drivers

<table>
<thead>
<tr>
<th>Member State</th>
<th>Water Scarcity</th>
<th>Flood Management</th>
<th>Hydro-morphology</th>
<th>Biological/Ecological</th>
<th>Chemical Pollution</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY</td>
<td>77%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>15%</td>
<td>8%</td>
</tr>
<tr>
<td>DE</td>
<td>27%</td>
<td>0%</td>
<td>11%</td>
<td>13%</td>
<td>29%</td>
<td>20%</td>
</tr>
<tr>
<td>ES</td>
<td>4%</td>
<td>8%</td>
<td>16%</td>
<td>8%</td>
<td>48%</td>
<td>16%</td>
</tr>
<tr>
<td>FI</td>
<td>5%</td>
<td>5%</td>
<td>3%</td>
<td>8%</td>
<td>58%</td>
<td>21%</td>
</tr>
<tr>
<td>HU</td>
<td>18%</td>
<td>5%</td>
<td>14%</td>
<td>14%</td>
<td>32%</td>
<td>18%</td>
</tr>
<tr>
<td>NE</td>
<td>0%</td>
<td>9%</td>
<td>4%</td>
<td>0%</td>
<td>35%</td>
<td>52%</td>
</tr>
<tr>
<td>SK</td>
<td>31%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>38%</td>
<td>31%</td>
</tr>
<tr>
<td>UK</td>
<td>17%</td>
<td>13%</td>
<td>6%</td>
<td>15%</td>
<td>48%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>18%</td>
<td>9%</td>
<td>7%</td>
<td>12%</td>
<td>45%</td>
<td>9%</td>
</tr>
</tbody>
</table>

2.3.3 Drivers for Innovation – management sub-set

Those actions offering potential for innovation were categorised according to which water management sub-set they related to: industrial, urban or rural. The results are provided in Table 2.3 and Figure 2.2. The results indicated that there are differences between countries, but that all types indicate potential for innovation, with rural water showing the larger proportion when aggregated across all countries.
Table 2.3  The Distribution of potentially innovative project proposals with regard to management sectors

<table>
<thead>
<tr>
<th>Member State</th>
<th>Industrial Water Management Sector</th>
<th>Rural Water Management Sector</th>
<th>Urban Water Management Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY</td>
<td>15%</td>
<td>23%</td>
<td>62%</td>
</tr>
<tr>
<td>DE</td>
<td>20%</td>
<td>53%</td>
<td>27%</td>
</tr>
<tr>
<td>ES</td>
<td>12%</td>
<td>76%</td>
<td>12%</td>
</tr>
<tr>
<td>FI</td>
<td>3%</td>
<td>86%</td>
<td>11%</td>
</tr>
<tr>
<td>HU</td>
<td>27%</td>
<td>45%</td>
<td>27%</td>
</tr>
<tr>
<td>NE</td>
<td>13%</td>
<td>65%</td>
<td>22%</td>
</tr>
<tr>
<td>SK</td>
<td>13%</td>
<td>44%</td>
<td>44%</td>
</tr>
<tr>
<td>UK</td>
<td>34%</td>
<td>49%</td>
<td>17%</td>
</tr>
<tr>
<td>Total</td>
<td>27%</td>
<td>53%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Figure 2.2  The Distribution of potentially innovative project proposals with regard to management sectors

Whilst this provides a simple overview it does not give a useful indication of where support for innovation might be best targeted as the headings are too general and specific innovations, such as water reuse and recycling, water efficiency measures or legislative and administrative instruments (governance) can be applied across all sub-sets.
A further analysis was carried out to provide additional information on the distribution of opportunities for innovation by action type.

2.3.4 Opportunities for Innovation by action type (supplementary measure) and country

The action type definitions are set out in Table 2.4; they are the defined supplementary measures short titles used in the reporting schemas.

### Table 2.4 Supplementary measures (Article 11.4, 11.5, Annex VI, Part B)

<table>
<thead>
<tr>
<th>Description of Supplementary Measure – Article 11.4</th>
<th>Short title in schema</th>
<th>Number of measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) legislative instruments</td>
<td>Legal</td>
<td>31 (6%)</td>
</tr>
<tr>
<td>(ii) administrative instruments</td>
<td>Admin</td>
<td>25 (5%)</td>
</tr>
<tr>
<td>(iii) economic or fiscal instruments</td>
<td>Economic</td>
<td>15 (3%)</td>
</tr>
<tr>
<td>(iv) negotiated environmental agreements</td>
<td>Negotiated</td>
<td>-</td>
</tr>
<tr>
<td>(v) emission controls</td>
<td>Emission</td>
<td>9 (2%)</td>
</tr>
<tr>
<td>(vi) codes of good practice</td>
<td>Practice</td>
<td>6 (1%)</td>
</tr>
<tr>
<td>(vii) recreation and restoration of wetlands areas</td>
<td>Restoration</td>
<td>116 (22%)</td>
</tr>
<tr>
<td>(viii) abstraction controls</td>
<td>Abstraction</td>
<td></td>
</tr>
<tr>
<td>(ix) demand management measures, inter alia, promotion of adapted agricultural production such as low water requiring crops in areas affected by drought</td>
<td>Demand</td>
<td>18 (3%)</td>
</tr>
<tr>
<td>(x) efficiency and reuse measures, inter alia, promotion of water-efficient technologies in industry and water-saving irrigation techniques</td>
<td>Efficiency</td>
<td>10 (2%)</td>
</tr>
<tr>
<td>(xi) construction projects (incl. asset improvement)</td>
<td>Construction</td>
<td>183 (35%)</td>
</tr>
<tr>
<td>(xii) desalination plants</td>
<td>Desalination</td>
<td>-</td>
</tr>
<tr>
<td>(xiii) rehabilitation projects</td>
<td>Rehabilitation</td>
<td>7 (1%)</td>
</tr>
<tr>
<td>(xiv) artificial recharge of aquifers</td>
<td>Recharge</td>
<td>-</td>
</tr>
<tr>
<td>(xv) educational projects</td>
<td>Educational</td>
<td>43 (8%)</td>
</tr>
<tr>
<td>(xvi) research, development and demonstration projects</td>
<td>Research</td>
<td>16 (3%)</td>
</tr>
<tr>
<td>(xvii) other relevant measures</td>
<td>Other</td>
<td>41 (8%)</td>
</tr>
</tbody>
</table>
The analysis of Table 2.4 suggests that there are some measures (or groups of measures) that stand out and where the EIP might provide focus to stimulate the application of innovative solutions.

Construction – 35%: These actions include water and wastewater treatment, sewer and drainage systems and flood management infrastructure. Examples provided in Section 5 show that there is innovation in these areas; the Technology Platforms (Section 3) also identify these areas for developing innovation. The EIP should give consideration to these when setting priorities.

Legal/Admin/Economic – 14%: These relate to issues around, for example, the governance of water; some examples are provided in Section 5 of how countries such as Spain and Germany have introduced innovative instruments to encourage specific practices or technologies. They are non-technical innovations and like the Educational measures (8%) can be often be ignored in promoting innovation despite their potential for changing behaviour and water use. They should be considered as an important aspect of the EIP’s activities.

Restoration – 22%: These actions relate to the provision of ecosystem services, green infrastructure and, to some extent, flood risk management and are largely linked to rural water management. They offer innovative approaches to reducing drinking water treatment requirements (by improving the quality of the raw water) and through hydromorphological actions can impact on both quality and quantity of water. The EIP should consider these when setting priorities.

Demand/Efficiency – 5%: Managing demand making more efficient use of water represent the principal responses to water scarcity. Innovation is possible through the use of smart meters and through water reuse, recycling and alternative sources such as rainwater harvesting; these are topics highlighted by the technology platforms and some examples are provided in Section 5. The EIP should consider these when setting priorities.

Additional background information by each country is presented, showing the number of measures offering potential for innovation against the category of action proposed. The categories vary between countries, and the same category may not always mean exactly the same thing. In some countries the category is “other”, which does not provide useful information. However the analysis is helpful in showing how countries vary in the types of actions, and the number of actions identified.

**Cyprus**

The categories identified were: Educational, Efficiency, Legal, Rehabilitation and Research. The distribution of these projects is displayed in Figure 2.3. The commonest category was Educational, followed by Efficiency and Rehabilitation.
The educational measures included pollution awareness, campaigns and measures aimed at the reduction of chemical pollution and water scarcity within river basin districts. The measures surrounding efficiency (with regard to water scarcity) included new strategies for monitoring and managing water resources within river basin districts covering both the industrial and urban management sectors. The legal-based proposed measures detailed action for the reduction of agricultural pollution within the rural water management sector. The rehabilitation measures aimed at mitigating water scarcity by the construction of water efficiency measures for water bodies. The research measure described the development of a model for the distribution of agricultural runoff.

**Germany**

The categories listed for the German proposed measures are displayed in Figure 2.4. The most frequent category is Construction, but there are a large proportion only defined as “Other”.

![Figure 2.3 Cypriot potentially innovative measures by type](image)
Construction actions include: expansion of municipal treatment plants, elimination/improvement of hydraulic structures and new construction for separation and treatment of combined foul and surface waters. Others included: measures to reduce nutrient input from agricultural activity, improvement of habitats in the river channel and use-related measures to reduce peak flows.

**Spain**

The categories listed for the Spanish proposed measures are displayed in Figure 2.5. The most frequent category is “Efficiency”, but this does not reflect that actual nature of the activity, which includes “Measures directed to environmental control, control of spills and accidental pollution”. Construction is another frequent category and some of these relate to urban flooding schemes, others relate to rural water supplies.
Figure 2.5  Spanish potentially innovative measures by type

![Bar chart showing the distribution of potentially innovative measures by type of action in Spain. The most common category was Construction, followed by Administration. Construction activities included dealing with pollution from forestry activities, creation of groundwater protection schemes and hydro-morphological constructions. The Administration and Legal actions provide opportunities for innovative policies and regulations.](chart)

**Finland**

The distribution of potentially innovative measures by type of action is displayed in Figure 2.6. The most common category was Construction, followed by Administration. Construction activities included dealing with pollution from forestry activities, creation of groundwater protection schemes and hydro-morphological constructions. The Administration and Legal actions provide opportunities for innovative policies and regulations.

Figure 2.6  Finnish potentially innovative measures by type

![Bar chart showing the distribution of potentially innovative measures by type of action in Finland. The most common category was Construction, followed by Administration. Construction activities included dealing with pollution from forestry activities, creation of groundwater protection schemes and hydro-morphological constructions. The Administration and Legal actions provide opportunities for innovative policies and regulations.](chart)
Hungary

The distribution of potentially innovative measures by type of action is displayed in Figure 2.7. There was no dominant category; the examination of the detailed description of the actions, show that identical types of action were categorised as Economic and Construction. There is little that can be drawn from this categorisation.

Figure 2.7   Hungarian potentially innovative measures by type

![Hungarian potentially innovative measures by type](image)

Netherlands

The distribution of potentially innovative measures within the Netherlands, with regard to type of action, is displayed in Figure 2.8. The commonest category was Emission, which included: “reduce agricultural nutrient emissions”, “address sewer overflows” and “remediate contaminated land soil / groundwater”.

![Netherlands potentially innovative measures by type](image)
Slovakia

The distribution of potentially innovative measures within Slovakia, with regard to type of action, is displayed in Figure 2.9

**Figure 2.8** Dutch potentially innovative measures by type

**Figure 2.9** Slovakian potentially innovative measures by type
The commonest category was Educational measures, which included: “Training of staff in the management and operation of water resources”. “Research” included “Developing quality technical equipment and technologies for adaptation and use of groundwater”.

**United Kingdom**

The distribution of potentially innovative measures within the UK, with regard to type of action, is displayed in Figure 2.10.

![Figure 2.10 UK potentially innovative measures by type](image)

The commonest category was “Asset Improvement”, a category not used in other countries examined, which generally included “schemes to improve “; the improvements included “poor waters”, “discharges”, or “schemes to deal with increased volumes of discharge” and largely relate to improved wastewater treatment plant or drainage. The large proportion of “Restoration / hydromorphology” actions reflected the largely rural nature of the river basin, and included the creation of wetlands and improved land management to reduce siltation.

### 2.4 Conclusions

The RBMP analysis has indicated that there is a substantial need, and opportunity for innovative solutions to be applied in response to the pressures that individual basins are under. The average across all measures indicates that approximately 50% offer opportunities for innovative solutions.
The categorisation of the measures and actions are not fully consistent between countries. Dividing them into rural, urban and industrial themes gave some insight, with rural based measures being the largest group, and chemical pollution and water scarcity were the biggest drivers. However, segregating opportunities for innovation in this way does not give a useful indication of where support for innovation might be best targeted, a view supported by the EIP Steering Group. A better view is given by the action level. Table 2.5 lists the different action types and these show that there is scope for innovative action that is not just technological.

### Table 2.5 Types of RBMP actions offering opportunities for innovation

<table>
<thead>
<tr>
<th>Action type</th>
<th>Number of countries (of 8)</th>
<th>Proportion of measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology led</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>7</td>
<td>35%</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>4</td>
<td>1%</td>
</tr>
<tr>
<td>Efficiency</td>
<td>3</td>
<td>2%</td>
</tr>
<tr>
<td>Demand</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>Practice</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Emission</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Non technology led</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>7</td>
<td>5%</td>
</tr>
<tr>
<td>Legal</td>
<td>4</td>
<td>6%</td>
</tr>
<tr>
<td>Economic</td>
<td>3</td>
<td>3%</td>
</tr>
<tr>
<td>Educational</td>
<td>6</td>
<td>8%</td>
</tr>
<tr>
<td><strong>Not defined</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research</td>
<td>6</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>8%</td>
</tr>
</tbody>
</table>

There are actions, or groups of actions, that stand out, and which the EIP could consider when setting priorities.

**Construction – 35%**: These actions include water and wastewater treatment, sewer and drainage systems and flood management infrastructure.

**Legal/Admin/Economic – 14%**: These relate to issues around, for example, the governance of water. They are non-technical innovations and like the Educational measures (8%) can be often be ignored in promoting innovation despite their potential for changing behaviour and water use.
Restoration – 22%: These actions relate to the provision of ecosystem services, green infrastructure and, to some extent, flood risk management and are largely linked to rural water management. They offer innovative approaches to reducing drinking water treatment requirements (by improving the quality of the raw water) and through hydromorphological actions can impact on both quality and quantity of water.

Demand/Efficiency – 5%: Managing demand and making more efficient use of water represent the principal responses to water scarcity. Innovation is possible through the use of smart meters and through water reuse, recycling and alternative sources such as rainwater harvesting.

The level of detail within the RBMP does not indicate whether the solution chosen to address the measure, and undertake an action, is innovative or not; the analysis therefore can only provide an indication of where there is an opportunity for innovation. However, the activities of the technology platforms (Section 3) and the examples of innovation (Section 5) do indicate that the research community and the supply chain are seeking innovative solutions to deliver on these actions.
3. **Innovation Priorities**

3.1 **Overview and conclusions**

There are many views on the priorities facing the water sector; these are drawn up by government bodies, research organisations and stakeholder groups. There are commonalities and differences between the issues and priorities defined by these research organisations and platforms; some reflecting country specific needs, some referring to global issues and some influenced by topical issues that change with time. There are strategic level issues such as climate change and tactical issues such as leakage; setting priorities is very much dependent on the function and focus of the individual organisation.

In Europe the agendas set by the Technology Platforms communicate the needs of the water sector to research and technology providers but, with few exceptions, tend to focus on the generation of new knowledge and concepts rather than the development and implementation of innovative solutions.

Translating these into a single, simplistic list of challenges provides a snapshot of current thinking, but priorities change and new challenges emerge; it is therefore important that a structure such as the EIP on water adopts a flexible approach, and is able to update its priorities over time. The challenges and key issues that can form the basis for the EIP to shape a programme include a number of focussed issues and a number of cross-cutting themes:

- **Focussed themes:**
  - Effective management of water resources and exploitation of alternative sources of water.
  - Sustainable urban drainage.
  - Resource efficiency, including water and the use of energy and resources that result in the contamination of water bodies.
  - Urban water management
  - Water quantity, in particular water scarcity and the competition for water between users and the impact of land use and hydromorphology on flood risks.
  - Small community water supply and sanitation.
  - Land management practices to improve the quality of water.
• Rural water management
• Water and energy generation.
• Prevention of pollution through better practices and revised production methods.
• More water efficient processes.
• Industrial water management

• Cross cutting themes:
  • Governance and regulation of water.
  • Financial management and instruments to encourage innovation.
  • Understanding the value of water.
  • Improved routes for commercialisation of developing innovations.
  • Water efficiency.
  • Water and energy.
  • Climate change.

The key stakeholders that the EIP will need to engage and interact with include water consumers, providers of water services, urban planners and local government, regional water management and land use/planning authorities, farmers and farming organisations, manufacturing associations and standards bodies, representatives of existing platforms and other EIPs such as Agricultural Production and Sustainability.

### 3.2 Approach

A review of a range of organisations and platforms was undertaken to understand their role and their priorities. This included face to face discussion, examination of web-sites, strategic plans and agendas and attendance at meetings organised by the organisations.

### 3.3 European Technology Platforms

European Technology Platforms (ETPs) were set up as industry-led stakeholder forums with the aim of defining medium to long-term research and technological objectives and developing roadmaps to achieve them. They have, to varying extent, established networks,
and working groups that develop and update their strategic research agendas, co-ordinate knowledge exchange and feed into developing EU initiatives. The ETPs grouped under “Production and Processes” have greatest relevance to water, and include the WssTP (Water industry) and SusChem (Chemical Industry) which have explicit water related agendas, although all the Production and Process platforms recognise the need to contribute to reducing water use and improving the quality of water resources. The FOREST (Forestry) platform, in the bio-based economy group, recognises the contribution that it can make to improve the water cycle through water use and from direct impact on water quality of forestry based activities.

In themselves the Technology Platforms do not explicitly create or facilitate the development and uptake of innovation in the water arena. Their main contribution is to define and promote the research and technology needs to their individual sub-sectors and to create a forum for knowledge exchange and awareness of initiatives and innovative developments.

3.3.1 WssTP

WssTP is the Water supply and sanitation Technology Platform. It was initiated by the European Commission in 2004 to promote coordination and collaboration of Research and Technology Development in the water industry. It has 70 members drawn from industry, academia/research providers and utilities. Through its activities and networks it provides a co-ordinated view on the research needs for the European water sector; these are summarised in their Strategic Research Agenda (SRA) – “WssTP a Common Vision for Water Innovation” (www.wsstp.eu 2010). The SRA provides a coherent guide on the sector’s needs and includes useful references to case studies; these provide opportunities for sharing experience and knowledge between the WssTP members and others. The SRA has defined six pilot programmes that relate to the key challenges that require research and technology development. These are:

PP1: Mitigation of water stress in coastal zones

PP2: Sustainable water management in and around urban areas

PP3: Sustainable water management and agriculture

PP4: Sustainable water management for industry

PP5: Rehabilitation of degraded water zones (Surface and groundwater)

PP6: Adaptation to hydro-climatic extremes (droughts and floods)

Within each of these programmes, the WssTP has identified a set of research and technology development needs and a number of case studies where actions are being taken within European States to address some of the challenges. The WssTP has also identified five
themes for demonstration projects (WssTP Workshop on Demonstration sites 23rd April 2012– Brussels):

- Urban – Sustainable and resilient Urban Water Cycle (including economic instruments, law, etc.).
- Urban – Use of green space in cities.
- Urban – Smart Cities.
- Industrial – Urban – Resource Efficiency – Energy recovery from Wastewater, Nutrient Recovery and Bio-products; Water reuse between Municipal wastewater treatment and industry (and agriculture); Industrial Symbiosis (where the waste of one is the resource of another).

### 3.3.2 SusChem

SusChem is the European Technology Platform for Sustainable Chemistry. It was created in 2004 as a joint initiative between Cefic (European chemical industry council), DECHEMA (Society for Chemical Engineering and Biotechnology – Germany), EuropaBio (European Association for Bioindustries), GDCh (German Chemists’ Society), ESAB (European Federation on Biotechnology - Applied Biocatalysts) and RSC (Royal Society of Chemistry (UK) and in May 2012 established an Alliance with the WssTP to provide a greater focus on water. SusChem highlights the key water related issues as:

- Scarcity of water as a resource - the water quantity and quality challenge.
- The water / energy nexus – we need water to produce energy and water uses large amounts of energy in its supply and transmission systems.
- Unsustainable waste water treatment systems.
- The extra demands for water in the development of the bio-based economy in Europe.

### 3.3.3 UKWRIF (UK)

The UK financial regulator, Ofwat, established a Water Sector Innovation Leadership Forum in 2010 and published a set of Innovation priorities for the water sector. These are (not in any particular order of priority):
Reducing Leakage.

Adapting infrastructure to a changing climate.

Economic regulatory reform to incentivise markets and innovation.

Environmental pollution prevention.

Increasing efficiencies in treatment processes and waste management.

Promote end user education – reducing water consumption and promoting sustainable disposal.

Reducing water supply interruptions.

Comprehensive underground asset mapping.

Smart metering.

Sustainable abstraction.

Strategic connections for water-stressed areas.

(http://www.ofwat.gov.uk/regulating/pap_pos1105innovpriorities.pdf)

The Water Research and Innovation Framework (UKWRIF) was set up by the UK Government to provide a focus for identifying, and delivering solutions, for the UK’s specific needs. A review was carried out for the UKWRIF by UKWIR (Research and Innovation Mapping Study for the UK Water Research and Innovation Framework 11/RG/10/6 (http://www.ukwir.org/ukwirlibrary/94138) to identify the key issues for the sector, based on a synthesis of recommendations from policy and research reports. It identified 6 priorities linked to achieving water security:

Valuing Water;

Resilient Infrastructure;

Hazard Risk Management;

Integrated Resource Management;

Safe Water and Sanitation for all;
Growing UK Water Economy.

3.4 Priorities for the European Innovation Partnership

It is clear that there are commonalities and differences between the issues and priorities defined by these different organisations; some reflecting country specific needs, some referring to global issues. Similar agendas can be found across other research organisations, including KWR (Kiwa Water Research, Netherlands), PUB (Singapore’s National Water Agency), WQRA (Water Quality Research Australia), TZW (Water Technology Centre, Germany), and other Global Water Research Coalition members (http://globalwaterresearchcoalition.net).

These agendas communicate the needs of the water sector to research and technology providers but, with some exceptions, tend to focus on the generation of new knowledge and concepts rather than the development and implementation of innovative solutions. Translating these into a single, simplistic list of challenges and key issues provides a snapshot of current thinking, but priorities change and new challenges emerge.

The following sections therefore provide a (non-exhaustive) overview of the challenges and key issues and stakeholders that the EIP will need to engage and interact with. A final section provides a summary of the priorities highlighted by the Steering Group and the Task Force shortly after the EIP was established.

3.4.1 Narrow, Focussed Issues

Key Issue – Effective Management of Water Resources

In order to ensure continuity of supply, water managers must identify new solutions. For example: utilisation of alternative water supplies (rainwater harvesting, desalination, re-use of treated water and re-use of grey water\(^3\)), improving efficiency and effectiveness of water treatment, requiring the efficient use of water through eco-design or other means and reducing losses due to leakage.

Key Issue – Sustainable Urban Drainage Systems

Many towns and cities rely on an ageing infrastructure that was designed for smaller populations, and in some cities across Europe, the sewage collection system has also been designed to collect runoff from streets, roofs and other impervious surfaces generated during rainstorms. Increased population and more frequent and intense storm events can lead to sewage overflow into streets and homes, or where systems are in place to prevent this, in an increase in discharges from combined sewer overflows (CSOs)\(^1\), which results in the pollution

of the aquatic environment. More than two thirds of European cities have to deal with flood risk on a regular basis and the occurrence of such incidents will increase with climate change².

**Key Issue – Resource Efficiency in the Water Industry**

Resource efficiency in water supply and sanitation (the water industry) is a key aspect in urban water management and can be approached from several perspectives. A combination of incentives to reduce carbon emissions and high energy costs push water services providers to identify more efficient processes. The urban environment generates a range of pollutants including metals, chemicals such as pharmaceutical products, nutrients, pesticides and pathogenic micro-organisms from a variety of sources including domestic premises, transport networks, industrial plants and atmospheric deposition within urban areas¹. While EU legislation requires increasingly stringent emission controls for many of these pollutants they often end up in waste water. However, there should be a move from end of pipe solutions to prevention of pollution at source. Moreover, there is need for a paradigm shift, to consider waste water as a source to recover resources, water in particular, and re-use them; this will become increasingly important as cities become the dominant habitation and opportunities for localised recovery and recycling increase.

**Key issue - Urban Water Management**

Urban water management is under increasing pressure as a result of increasing urbanization (over 70% of the population is expected to be living in urban areas in EU countries in 2030 and 70% of the world’s population is expected to live in cities by 2050), increased consumption and the effects of climate change. The analysis of the River Basin Management Plans indicates that a significant proportion of measures, and 20% of the opportunities for innovative solutions, are associated with the urban environment.

The EU has invested and will need to continue to invest significantly in urban water infrastructure: for new assets, for rehabilitation of old assets and for maintenance of all assets. These investments need to be sustainable and should include innovative solutions that both meet and go beyond the minimum requirements of EU legislation.

There is a large diversity in users of water resources in the urban environment, who all have their demands with regard to quality and quantity. Income is an important driver of public water use, and as GDP increases, the proportion of households connected to public supply increases. Higher household income is also linked to greater water use and increased capacity of water appliances³.

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² Urban Flood Website (http://www.urbanflood.eu)
The balance between water demand and availability is now reaching critical levels in some parts of Europe with increasing urbanisation climate change likely to exacerbate the current pressures on Europe’s water resources. Moreover, tourism can markedly increase the demand for water, particularly in coastal regions of Europe, making coastal regions a subset for specific innovative solutions.

**Key Issue – Water Quantity**

Water scarcity, due to over abstraction or drought, has detrimental impacts on water-related ecosystems resulting in reduced river flows, lake and groundwater levels, and the drying of wetlands. In addition, low groundwater levels may cause problems for the foundations of many buildings and underground assets due to ground movement. Water scarcity can also lead to increased incidence of forest fires, with water scarcity impacting on the ability to control them.

On the other hand, land-use practices and development planning have a major impact on flood risks. Throughout Europe, rivers have been straightened, wetlands and floodplains drained and large areas deforested to allow for farming, urban development and transport. The contribution the rural environment and green infrastructure can make to flood risk management is laid out in a Commission Note which highlights the role that managed realignment, saltmarshes, and wetlands can play in flood defence, and stresses the additional biodiversity benefits that this approach can bring.

**Key Issue – Rural Water Supply and Sanitation**

There are a number of water-related challenges affecting rural communities. One of these is their dependency on small water supplies, which are the backbone of water supply in rural areas in the entire pan-European region. Small water supplies can be more vulnerable to breakdown, risks to security of supply and contamination than larger utilities and the governance and management structures in place are often less structured than in the urban environment.

Small-scale rural sanitation is not currently directly addressed by European legislation and its inadequacy in some locations poses a threat to public health. The EEA has identified some

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4 EEA (2012) Towards efficient use of water resources in Europe.
7 WHO (2010) Small-scale water supplies in the pan-European region, Background, Challenges, Improvements.
cost-effective approaches as potential solutions. However, centralization of supply and sanitation can present greater overall consequences of failure and is not an innovative solution. There are significant opportunities for innovation to challenge the long-established approach of building large centralised facilities with subsequent dependence on distribution and collection infrastructure. The application of re-use and recycle technology and improved rainwater harvesting that is highlighted for urban areas has equal validity in rural areas.

**Key issue - Rural Water Management**

Rural areas cover 91% of the EU territory. Farming and forestry remain crucial for land use and the management of natural resources in rural areas. The strengthening of EU rural development policy, therefore, an overall EU priority. Rural areas play a key role in the management of the water cycle. In the rural area, biodiversity, agriculture, spatial planning and land use management influence each other and may compete with each other with regard to the available water resources. To achieve sustainable management of river basins, all these factors need to be taken into consideration in a holistic manner.

The analysis of the River Basin Management Plans indicates that a significant proportion of measures, and 53% of the opportunities for innovative solutions, are associated with the rural environment.

**Key Issue – Land Management**

Land management practices can have a substantial impact on the quality of the water in rivers and water bodies. This has implications for the treatment requirements of water abstracted for drinking and on the ecosystems they sustain. Land is used for agricultural, recreational and resource provision and there is scope for greater interaction between the land owners, farmers and managers to improve water quality. Forests make up a large proportion of the rural environment in Europe and sustainable forest management is of great importance both for local economies and for the supply of good quality fresh-water, protection against floods and soil erosion and for combatting desertification. Appropriate management of forests has therefore a key role to play in the protection of the water environment.

**Key issue – Water and Energy Production**

Water abstracted for energy production accounts for about 44% of the total freshwater abstracted across Europe. However, very little of the water abstracted for energy production is consumed as the majority is used for cooling and is ultimately discharged back to a receiving

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water body at higher temperatures that may affect biodiversity and water quality standards\(^3\). Decreasing precipitation and higher temperatures are expected to have an adverse impact, at times, on the ability of rivers to provide the electricity generation sector with sufficient cooling water. This is because power stations have to be shut down when the temperature of intake water or river levels fall outside certain thresholds\(^3\). The continued drive to replace older cooling systems and to innovate in more advanced cooling technology, including recirculation, dry and hybrid systems, can further reduce abstraction needs for energy production. In addition, there is potential for a greater use of alternative water sources for energy production, particularly as cooling and boiler feed water does not need to be of high quality\(^3\).

**Key Issue – Prevention of Pollution**

In spite of Europe’s comprehensive chemicals legislation, the ubiquity of chemicals in society is still a major risk to aquatic ecosystems. Emissions of hazardous substances in the environment can occur at all stages of the product life cycle. Demand for consumer goods is a fundamental driver of production and, therefore, of the potential release of hazardous substances to the environment. The prevention of pollution of source is therefore a key area where innovative solutions can bring significant advantages. The wider implementation of “green chemistry” (developing new processes and technologies that maintain a product’s quality but reduce or eliminate the use and generation of hazardous substances) is one approach to decrease such risks. In addition, innovations are required to improve the treatment and monitoring technologies for problematic and highly contaminated industrial waste.

**Key Issue - Industrial Water Management**

Water is used by manufacturing industries in a number of different ways: for cleaning, heating and cooling, to generate steam, to transport dissolved substances or particulates, as a raw material, as a solvent, and as a constituent part of the product itself. Overall, the manufacturing industry uses about 11% of the total freshwater abstracted across Europe. About half is used for processing and half used for cooling. Since the mid-1990s water abstraction by manufacturing industries has been falling despite continued expansion of industrial output, partly due to decline in water intensive heavy industries, but also due to efforts to reduce water costs and the introduction of more water efficient technology, but innovations can lead to further improvements\(^10\). New water-dependent industries, such as biotechnology, may also become constrained by water availability. The analysis of the River Basin Management Plans indicates that a large proportion of measures, and 27% of the opportunities for innovative solutions, is associated with industrial water management.

Over the past years, industry, including small and medium enterprises, has proven to be a great catalyst of innovation in sustainable water management, which is recognized as a priority for several industry sectors and associations. Industrial water management has important potential for innovative solutions, primarily with regard to overall objectives of resource efficiency and to increase the efficient use of water in industrial processes, which is strongly linked to energy needs. There is a drive to further develop and implement a symbiotic approach to industrial water management, including the treatment of waste water, water reuse, recycling and the recovery of materials. The result has been higher production yields and reduced waste.

**Key Issue – More Water Efficient Processes**

Water needs to be increasingly considered by manufacturers as a valued raw material, and for processes to continue to be developed that are more water efficient. This extends to the overall water efficiency of the processes stream, incorporating more recovery and reuse. The use of alternative sources of raw material, treated wastewater for example, can also contribute to the reduction of water as can co-location of symbiotic industries, where the waste product of one becomes the raw material of another. However the overall sustainability of re-use also in terms of energy use needs to be considered.

**Key Stakeholders**

These include water consumers (domestic and industrial), providers of water services (utilities, municipalities etc.), urban planners and managers, and local government authorities. The candidate Innovation Partnership on Smart Cities offers an opportunity to co-ordinate initiatives on for example climate change resilience, energy use and spatial planning to create synergies with water focussed initiatives.

Achieving innovation in rural water management depends on bringing together stakeholders such as (regional) water management and land use/planning authorities, nature conservation organizations and farmers to optimise the use of the rural area in the context of effective management of the water cycle. The EIP on Agricultural Production and Sustainability is focussing on farm level measures with regard to rural water management. The EIP on Water will need to complement it and address the interface between water management at the farm level and the allocation of water resources to agriculture at the catchment and water body level and the permissible pressures on water quality. To realize this, strong coordination must be ensured with the EIP on Agricultural Productivity and Sustainability.

Innovation in the industrial sector will be driven by the manufacturers’ need to constantly reduce costs and improve brand image. Extending innovation will require the improved dissemination and promotion of new innovations and the benefits that they bring. Key stakeholders will be trade associations and technology platforms such as SusChem, (regional) water management and land use/planning authorities, and wastewater utilities.
3.4.2 Horizontal themes

There are a number of challenges and issues that apply across all areas of water management. These can be considered as horizontal themes and can be best targeted for action by the EIP in an integrated way. There is room for debate on what these horizontal themes might be and this needs to be informed by further discussion as the EIP is established and develops. This section provides a view and divides the issues into generalised groups: “political themes” and “technical themes”.

Political themes

Political themes include: governance, financial management and instruments to encourage investment, application of standards and regulation, public awareness and the value of water, and exploitation of the global market. The mechanisms for the governance of water services vary significantly between, and within, Member States. The existing national regulatory frameworks provide for very different mechanisms to increase transparency, direct participation for consumers and access to justice. Within these differences, some likeness can be found among countries that employ similar approaches to set their water price and their service quality standards – a regulatory agency approach whereby a national independent body sets a price cap; a bilateral contract approach whereby price is agreed between the service provider and the local municipality or asset owner; and/or an internal approach, whereby the service provide has discretion on the price applied. However, there is no clear relationship with the approach adopted and the effectiveness of governance. The WFD requires all the basic elements for good water governance, however, its implementation has clearly identified many issues in EU27 including a fragmented institutional set-up, poor intra- and inter-institutional relationships evidenced by weak co-ordination, a lack of capacity in respect of numbers of personnel and their level of technical expertise and the rigidity of the concessional system. Innovation can be applied to the interpretation and implementation of regulations in local and national governance, which can in turn act as drivers of technology based innovations. The development and transfer of innovative governance and regulation across sectors and countries could be both enabled by emerging innovative technology and be a driver for such technology.

In respect of financial management, the current global economic crisis has resulted in cuts in public expenditures and increases in taxes and charges. From the perspective of the water service providers, investments in water infrastructure have been reduced resulting in a reduction in the levels of innovation and in shorter term goals being placed above long term investment needs. On the other hand, the focus on reducing costs can lead to some

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11 Quesada (2011) Water and Sanitation Services in Europe: Do Legal Frameworks provide for “Good Governance”? Executive Summary - IHP-HELP Centre for Water Law, Policy and Science, under the auspices of UNESCO, University of Dundee, Scotland, UK.

12 Presentation by Jorge Rodriguez-Romero to the 3rd European Water Conference, May 2012.
opportunities, in particular the drive for the identification of cost-effective solutions, presenting opportunities for innovation.

In terms of financing for innovation, shortage of funds is not generally seen as a barrier, but the multitude of schemes, application processes, rules and procedures are complex and burdensome, particularly for SMEs. Financial engineering, the use of innovative instruments and processes in preference to traditional dependence on non-repayable public support through grants, can be developed to support the commercialisation of innovations to attract investors. This could be done in close co-operation with the EIB group and other IFIs and link with the special support instruments of the EU Regional Development Fund\textsuperscript{13}.

The issue of the “value of water” is often treated in an economic perspective with debates revolving around “water pricing”, “full cost recovery”, “investment strategies”, “water markets” and the “polluter pays principle” etc. However, the “value of water” goes beyond economic arguments and encompasses the complex interactions between human beings and water as a natural resource. The “value of water” has different meanings for people in different societal and cultural backgrounds and will vary depending on the natural features and social, cultural and economic conditions of the catchment area\textsuperscript{14}. Achieving more sustainable use of water supplies will depend strongly upon raising public awareness of water conservation issues\textsuperscript{3} in order to change habits and lifestyles. In the manufacturing and processing industry there is recognition that water is a raw material and has a value beyond the simple direct abstraction cost. Understanding how this value, across sectors and countries, is reflected in the commercial value of water-related innovation will assist companies and organisations to better target and exploit markets where the value of water is high, both within and outside Europe, with appropriate innovations.

Commercialisation and exploitation of the international market, irrespective of the specific technology or innovation offers an opportunity for an integrated and co-ordinated approach. Links can be established to other innovation initiatives at the National and International level; there are, for example, innovation hubs in the Far East and Australasia that have a focus on particular issues and technologies (for example membrane desalination and water recycling). Such links could facilitate the sharing knowledge from these and, rather than compete with them, identify gaps for innovation that Europeans can take a lead on. These may relate to innovations that can support the achievement of the Millennium Development Goals that depend on good water supplies and sanitation (reducing child mortality; improving maternal health; combating HIV/AIDS, malaria and other diseases; ensuring environmental sustainability). Promotion and co-ordination of developing innovations would make them

\textsuperscript{13} http://ec.europa.eu/regional_policy/thefunds/instruments/index_en.cfm

visible and accessible to the international market, and their commercialisation could be supported by European Funding and innovative financing.

**Technical Themes**

Technical themes include: water efficiency, the water/energy interdependencies, mitigation of climate change, reuse and recovery of wastewater, monitoring and control (sensors and real-time capability).

Water efficiency cuts across all areas; techniques and technologies to achieve water savings, such as smarter metering, collection and treatment of alternative water sources, re-use, recovery and recycling, are likely to be transferable between rural, industrial and urban management.

The links between water and energy are important and complex and are highlighted under the industrial water priority area. However, the interdependency of water and energy production/use is common across sectors. Planning new activities and developments can take into account new technologies targeted at water efficiency, leading to reductions in water and power use. Energy can also be recovered from the water cycle using technologies based on hydro, heat exchange and bio-energy.

Climate change is projected to lead to major changes in yearly and seasonal precipitation and water flow, flooding and coastal erosion risks, water quality, and the distribution of species and ecosystems. Models indicate that at a general level the south of Europe will show a significant drying trend and the north of Europe one of wetting\(^{15}\). A number of European scale projects have been carried out which have greatly improved the quality of climate change predictions for the EU. However, quantitative projections of changes in precipitation and river flows at the river-basin scale remain uncertain\(^{15}\). The impacts of climate change will be felt across rural, urban and industrial water management.

Whilst it is unrealistic to believe that all uncertainty can be removed from climate change predictions, there are opportunities for the models to be further developed to remove more levels of uncertainty. Innovation in the development of models, their predictions and understanding of changing weather patterns would be used to target innovative adaptation systems and technologies for each of urban, rural or industrial area. For example the impact of rainfall events to deal with run-off, flooding, storage, or with extended periods of freezing, or drought will differ between areas, but predicting the duration and volume of rainfall is generic.

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Sensors and control systems are increasingly enabling more effective and efficient use and management of water and associated infrastructure across a range of sectors, from agriculture to food processing, from water production and supply to wastewater collection and treatment. They also represent a significant opportunity for European companies to enter a growing global market for these technologies.

### 3.4.3 Priorities set for the EIP on Water

The Steering Group of the EIP on Water has concluded that responding to the challenges and opportunities in the water sector requires a holistic approach and that the EIP needs to focus on those innovative actions which deliver the highest impact and provide the most opportunities. The Steering Group has therefore selected priority areas for the Strategic implementation Plan (December 2012) on the basis of six criteria: (1) Likely to make the greatest contribution to the objectives of the EIP Water; (2) Broad innovation potential; (3) Competitive advantage of European industry and Job creation potential; (4) Attractiveness for investors and entrepreneurs; (5) Likely to benefit particularly from the partnership approach; (6) Potential to impact public awareness/consumption patterns. The priority areas are:

- Water reuse and recycling;
- Water and wastewater treatment, including recovery of resources;
- Water-energy nexus;
- Flood and drought risk management;
- Ecosystem services.

In addition, cross-cutting priorities have been identified that address framework conditions, promote connections between the different priority areas of work, and are enablers for all other actions:

- Water governance;
- Decision support systems and monitoring;
- Financing for innovation.

Furthermore, "smart technology" has been identified to be of key relevance as an enabling factor within all other priorities.
4. Governance

4.1 Overview and Conclusions

This sub-task assessed different approaches to governance in a selected set of innovation platforms/initiatives, with the aim of identifying good and poor practice, and critical success factors in the governance structures of the assessed innovation platforms. The results of this survey were translated into concrete recommendations for the governance structure and working procedures of the EIP on Water.

The survey, which was performed using both a desktop study as well as conducting interviews with representatives of the platforms selected, covered five initiatives/platforms. These were selected in close communication with the EU COM, and with regard to their relevance for the EIP on Water and the availability of suitable interview partners.

The key conclusions derived from the interviews are as follows:

- For the work of the Steering Group (SG), members with decision-making power are absolutely crucial for the success of the EIP’s work.

- The SG and Task Force need to represent a broad selection of stakeholders and disciplines/sectors. The incorporation of the following interests or institutions into the governance structure are beneficial:
  - Representatives from other research and innovation initiatives or platforms.
  - SME representation, as many innovations are developed in SMEs, and as these provide important feedback regarding barriers for market access.
  - Venture capital companies or other financing institutions, to create awareness for investment opportunities.
  - Representatives of research projects analysing problems surrounding innovation and market access on a meta-level (such as WaterDiss2.0, STREAM, STEPWISE or PSIconnect), to shed light onto dissemination and innovation barriers across various research fields.
  - Additionally, including “thought leaders”, i.e. people in positions to influence other actors, provides added benefit to a governance structure.

- A governance structure that is flexible will allow adaptation over the course of the work of the EIP on Water and enable it to respond to the changing needs of the sector.
Continuity and engagement can be provided by a permanent staff position with the sole purpose of “keeping the network alive”.

An “e-market place” can be a valuable platform for sharing information within the group, and for offering a way to communicate important research gaps and needs - and therefore “innovation needs” – between research and practice. However, it needs to lead to more clarity and streamlining - just one more platform where information can be found is not useful, as users are overwhelmed already.

4.2 Approach

In parallel with creating an overview of the technical and policy drivers influencing innovation and performing an analysis of the main platforms and initiatives, covering purpose, outcomes, successes and failures (sections above), the approaches to governance and the structures of the governance systems of a selected set of platforms were examined.

The aim of this exercise was to identify good and poor practice and success factors in the governance structures with regard to fostering innovation and inter-sectoral exchange and identifying market barriers and innovation needs. The objective was to determine how the experience from other initiatives with related goals could be used to guide the establishment of a “good governance” structure for the EIP on Water.

Five initiatives/platforms were selected because of their orientation towards innovation and dissemination, the need to incorporate various interests from different economic and social sectors, and the importance of functioning stakeholder networks and networking activities in their work. The initiatives/platforms were examined first by desktop studies, and then in more detail by interviews with a representative of the respective organization/initiative.

The five selected initiatives/platforms are:

- The European Innovation Partnership on Active and Healthy Ageing (EIP AHA).
- The European Environmental Technology Action Plan (ETAP).
- The German Water Partnership (GWP).
- The Science-Policy Interface of the Common Implementation Strategy (CIS-SPI).
- The FP7 dissemination project WaterDiss2.0.
4.3 Review of selected Platforms

4.3.1 The European Innovation Partnership on Active and Healthy Ageing**16**

Goals, working organization and structure

The concept of “European Innovation Partnerships” (EIPs) was initially proposed in the EU COM communication on the Europe 2020 Strategy and on the Innovation Union flagship initiative. The underlying purpose of an EIP is to foster breakthrough innovations targeted at major societal challenges whilst seeking to reduce dissemination barriers, speed up market access, gain competitive advantages, and increase related economic growth in Europe. An EIP is formed around an identified societal challenge/sector, to bring together all relevant stakeholders – representing the whole research and innovation cycle, on all relevant levels.

“Active and Healthy Ageing” (AHA) has been identified as an important societal sector with great need and potential for breakthrough innovations, and was designated as a “test case” for setting up an EIP, in the form of a “pilot EIP on Active and Healthy Ageing”.

The pilot EIP AHA is structured around a Steering Group (SG), consisting of 33 members, which represent decision-making level in their respective organizations/agencies. The Steering Group’s members are mainly responsible for developing the strategic targets (through a Strategic Implementation Plan/SIP, adopted in November 2011), and guaranteeing commitment of the stakeholder groups they represent. To support the members of the SG, a SHERPA-Group was formed, in which each member of the SG is represented through one or more designated members of their organization/agency. A third level of organization, the Action Groups, are formed in the process of implementing the SIP; these groups will be self-organized and be connected to the SG through an annual conference, which can be seen as a kind of “shareholder assembly”.

The pilot EIP AHA also has institutionalized linkages to initiatives with similar goals: two members from the Joint Programming Initiative (on Neurodegenerative Diseases and More Years - Better Lives) and from the Ambient Assisted Living Joint Programme (AAL-JP) are holding seats in the SG. Their participation is crucial for the EIP’s work in creating a direct link to research and innovation.

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**16** The EIP AHA is well-covered in EC Commission documents, regarding targets, governance structure, and lessons to be learned (e.g. Commission communications of 3.3.2010: “Europe 2020. A strategy for smart, sustainable and inclusive growth” and of 6.10.2010: “Europe 2020 Flagship Initiative. Innovation Union”; and the Commission Staff Working Paper “The Pilot European Innovation Partnership on Active and Healthy Ageing (AHA) - First experiences on governance and processes”). A short description of the governance structure of the EIP AHA is nevertheless included here, for the sake of completeness. Likewise, the lessons to be learned from the analysis of the governance structure will focus on the results of the interview; there is no need to repeat what is already written by the EC COM.
Additional information of relevance for the EIP on Water

The pilot EIP AHA is at the moment entering the implementation phase, after finalizing the planning phase by adopting the SIP in November 2011. The SIP itself was partly based on an extensive participation process, gathering around 400 substantial responses regarding barriers to market access, innovation needs and challenges, and proposals for possible solutions.

The main task in the implementation phase will be the execution of six very concrete actions, which were identified during the consultation process and laid down in the SIP. The challenge here lies in extending the activities to stakeholders “on the ground”, i.e. to the ones that in the end actually implement them.

To create a network of participants around these actions, “invitations for commitment” will be issued to a broad selection of stakeholders. The invitations detail the six concrete actions, and ask for a clear commitment to participate in the action, through very concrete project proposals and strategies. Additionally, around the actors committing themselves, 5-6 “action groups” will be formed.

Conclusions and recommendations for the development of the EIP on Water

- To guarantee commitment from the participating stakeholders (especially the ones in the SG), it is necessary to obtain results – the stakeholders need to know that the work is not about theoretical discussions.

- Furthermore, it is key to maintain the presence of decision makers or people with decision making powers in the SG (in fact, the work would be impossible without these powers). Very important in case of the EIP AHA were the following participants: SME representatives; people from other research/innovation initiatives/organizations; and representatives from venture capital companies, to create awareness for investing opportunities.

- The work in the SG should focus on making decisions – no theoretical discussions should be done here (these should be done in advance, through the Task Force and appropriate sub-groups); the work of the SG should be result- and commitment-oriented.

- To incorporate new ideas or stakeholders during the process, the initiated “actions” need to be flexible (in the pilot EIP AHA, this is guaranteed through the annual conference, where actions can be reviewed/amended).

- An SG needs to be fully representative, it is very important is to have all the key stakeholders on board, but it is best restricted to a manageable number.
4.3.2 The European Environmental Technologies Action Plan

Goals, working organization and structure

Similar to the EIPs, the Environmental Technologies Action Plan (ETAP) was proposed under the Europe 2020 Strategy, to complement other flagship initiatives. It focuses on achieving environmental objectives – reducing the pressure on the environment - through innovation, and aims at overcoming the challenges and utilizing opportunities for environmental technologies to access markets. The specific goals are:

- Getting from research to EU and global markets with activities that target both the EU and Member State levels.
- Improving market conditions with environmental policy driving development and dissemination of new environmental technologies.
- Enhancing governance of research policies and actions of EU and Member States through close coordination.

To reach these goals, the ETAP serves as a tool to identify policy measures needed on the European, national or sub-national level to support research into key environmental technologies, through strengthening coordination and cooperation between EU and Member States´ actors, and through creating awareness of the problem-solving potential of new technologies.

The ETAP is structured around a High-Level Working Group, consisting of representatives of the EU COM and the Member States with decision making power. The main task of the High-Level Working Group is the mutual information on relevant developments in the Member States and the EU, respectively, and to feed policy recommendations from EU level to Member States, and vice versa.

The communication with stakeholders and the coordination of specific actions is organized through the biannual ETAP Forum on Clean Innovation. The forum mobilizes and facilitates networking between sectoral stakeholders, joining the policy level (represented through the members of the High-Level Working Group) with stakeholders along the whole value chain, to
develop targeted and reachable recommendations that can be integrated into EU and national policies.

There are no other permanent bodies installed, e.g. regarding institutionalized linkages with other platforms or initiatives sharing similar goals.

Additional information of relevance for the EIP on Water

The communication organized through the ETAP Forum and the High-Level Working Group is based on voluntary participation of the members. Therefore, dedication and interest in the work and results of the ETAP is a crucial criterion for participation and active involvement. Insufficient networking and weak links across different sectoral fields thusly represent main obstacles to the work of the ETAP.

On the other hand, the participation of several organizations/institutions has proven crucial for the effective work of the ETAP. These are people that represent standardization organizations and financing institutions, as well as experts who can provide an overall view/assessment of the respective environmental sector, also regarding possible negative impacts of new technologies/innovations.

Additionally, information regarding innovation needs and market barriers has at times to be analyzed by experts, independently of the Member States’ views on the topic. Therefore, necessary policy measures to foster the development of innovative solutions, or to overcome barriers to market access, are mostly identified and analyzed by in-house studies, performed by the Commission. The results are then communicated to the Member States.

Conclusions and recommendations for the development of the EIP on Water

- Recommendations/discussion resulting from the EIP’s initiative/platform will be most effectively transposed into national policies by a steering committee that includes people with decision making power.

- Additionally there is benefit in having institutions in the governance model that represent:
  - standardization issues and
  - financing organizations.

- Furthermore, people/organizations which have an overview of all sections of the water sector/of the water value chain and regarding environmental impacts/issues will bring added value to the governance structure.
It is important to link with other relevant initiatives and this is best achieved through a permanent staff position, whose only task is to maintain the network and follow the developments in such initiatives (e.g. through participation in meetings); this is a full-time job.

Finally, it should not be the goal of the EIP on Water to invite everyone; it is better to work only with the interested parties.

4.3.3 The German Water Partnership

Goals, working organization and structure

The German Water Partnership (GWP) is a joint initiative of German private and public actors from several water-related sectors, established in 2008. It links commercial enterprises, governmental and non-governmental organisations, scientific institutions and water-related associations. It is supported by five federal ministries and their respective associated agencies. The GWP is set up as a registered association, requiring members to pay membership fees, a fact that distinguishes the organization from the other four selected platforms/initiatives covered here, which are voluntary.

The underlying goal of the GWP is to support German water-related industries and know-how accessing European and global markets, through creating a network platform for water-sector stakeholders representing the whole value chain, including research and policy makers. Part of the networking activities is the bottom-up communication regarding innovation needs and existing barriers to dissemination of innovative technologies or processes. Such information reaches the involved ministries through the GWP network, and can thus be incorporated into national research and dissemination projects.

The governance structure of the GWP incorporates both horizontal and vertical elements. As a registered association, the members themselves form the highest decision making level, the General Meeting, which primarily legitimates the association’s work, through the election of a board and executive board, and the approval of their actions. The GWP is supported by an Advisory Council, consisting of the representatives of the ministries, associations or other public initiatives whose goals/targets are most relevant for the GWP’s aims. An annual conference, coinciding with the General Meeting, represents the main networking platform for GWP members and also non-members.

The horizontal element of the GWP’s structure is represented by country- or region-specific “regional sections” and thematic “task forces”, which themselves establish working groups. In these specialized fora, stakeholders from all levels gather expertise and information around a specific topic, communicating the special needs and recommendations to other regional sections/task forces and the associated ministries and public initiatives, to support policy making. These groups meet between 2-4 times a year and interact mainly on the annual conference. The persons responsible (on a voluntary basis) for coordinating the work and
interactions of the various groups are the heads and deputy heads; they are assisted by the GWP’s head office in Berlin.

There is no permanent/institutionalized connection with similar initiatives or platforms.

Additional information of relevance for the EIP on Water

The networking activities of the GWP are extensive, and organized via the annual meeting and the fora/groups themselves. However, there is no person at the head office whose position is completely dedicated to keeping the network alive, which would be “desirable”.

The GWP’s set-up as a registered organization requiring membership fees represents a different basis for the work done by the head office, whose staff essentially is paid by the members. Therefore, the delivery of concrete results is an important element of the GWP’s work, and consists of:

- Regarding innovation needs: through the GWP networking activities and internal communication involving the whole water-related value chain, the development of technologies which are not suitable for the market does actually not happen.

- Regarding research gaps and funding needs: these get communicated through the GWP to the five involved partner ministries and their respective agencies, and provide important and well-respected input to national research programmes (e.g. the need for specific pilot projects to demonstrate a certain technology or process).

Nevertheless, in other thematic fields, the influence of the GWP is limited, especially regarding barriers to market access in other countries.

Conclusions and recommendations for the development of the EIP on Water

To ensure a long-lasting communication and networking between the GWP regional sections and task forces requires:

- A designated person at head office responsible solely for this.

- Regular meetings; at least twice a year, more often is better.

- The persons responsible at group level for the exchange with the other groups/fora (in the case of the GWP the heads/deputy heads) should represent different interests or sectors (in the case of GWP: various elements of the value chain in the water sector).

- The structure of the GWP regarding task forces and regional sections is internally not regarded as permanently fixed; instead, the structure is flexible and will be adapted if
4.3.4 The Science-Policy Interface of the Common Implementation Strategy

The Common Implementation Strategy (CIS) Science-Policy Interface (SPI) is an ad-hoc activity in the CIS process of the Water Framework Directive, created and mandated by the water directors. It supports reaching milestones of the European water policies and river basin management planning processes. To achieve this, CIS-SPI is acting as an interface between researchers on the one hand, and the water policy makers on the other hand, with the aim of linking the research needs of the end-users (i.e. the policy makers who need to implement a certain water legislature/regulation) with scientific research output (that, in turn, can possibly support policy makers in implementing water regulations). More specifically, CIS-SPI facilitates:

- the provision of relevant tools and methods to end-users of research results;
- the provision of existing solutions (methodological/technical) to implementation problems;
- the translation of operational problems into research questions to alert the adequate funding organisms and research partners;
- the dissemination of research results through strong linkages with sectoral associations/user groups.

The CIS-SPI does not have a formal governance body; instead, it is co-led by the DG Research (one person) and the French public water agency ONEMA (one person). Both persons are not working full-time on the SPI activities. Beside the lead, there is an informal core group of participating people/organizations, and a larger network of interested parties.

The SPI is, however, linked to all other CIS Working and Expert Groups, through a SPI correspondent, who reports back to the SPI network, on a voluntary basis. Also, linkages with other platforms or initiatives sharing similar goals are organized formally, in the form of official memberships or chairs held by SPI representatives. For example, the SPI holds a seat in the Joint Programming Initiative on Water Challenges.

Additional information of relevance for the EIP on Water

The main input regarding research and innovation needs reaches the SPI network via the SPI correspondents, which are in close contact with policy makers through the CIS Working and Expert Groups. It is then analysed – by ONEMA and through the network – whether a solution in the form of a completed research project is already existing, or not. If yes, the respective partner/end-user is provided with the information needed to proceed. If not, the problem is
communicated as research gap to the EU and national research agencies as an input for formulating research programmes.

The dissemination of solutions/research results is also done via the CIS-SPI network, through a form of newsletter called "Policy Briefs", and a conference held annually at a minimum. Additionally, CIS-SPI also encourages other CIS Working or Expert Groups to organize conferences and workshops on their specific topics and herein include research needs/innovation needs in the agenda.

This process, however, requires long-term support from both the political as well as the scientific side, and collective commitment of the participants, which needs to be fostered, as most activities of the CIS-SPI network are voluntary.

Conclusions and recommendations for the development of the EIP on Water

- The EIP should incorporate national initiatives (such as ONEMA) into the Task Force.

- To cultivate and maintain the network is a very important activity ("to keep the network alive"); to reach this end, it should be organized so:
  - that the people participating in the network get feedback for the work they are investing (in the form of concrete results: e.g. the hint to a certain solution for their specific problem; or the inclusion of unresolved problem as research gap into recommendations for EU/national programmes).
  - that the network is kept alive through regular input that fosters discussion and communication (newsletters/policy briefs, meetings, etc.).

- Furthermore, it is very important to gather various scientific disciplines connected to innovations in the water sector, and make them cooperate; to facilitate the latter point (which is not easy to accomplish), it is very important that the different disciplines are involved from the very beginning.
4.3.5 **WaterDiss2.0**

**Goals, working organization and structure**

WaterDiss2.0 is a FP7 research project\(^{17}\), initiated in February 2011. It aims at analysing around 60 FP6/FP7 research projects over the course of three years, to answer the following research questions:

- What are the concrete outcomes of the various projects, in the form of “marketable products”?

- How marketable are such product(s), i.e. how advanced are the project’s results?

- How does the dissemination of research results work? How are project results communicated?

- What are the strengths and weaknesses of the communication strategies in terms of disseminating the project’s results?

- What other barriers to uptake arose and how were these dealt with?

- What steps are still necessary to achieve uptake of results?

In the (finished) first phase of the project (the first year), the project outcomes and dissemination strategies of 16 selected projects (all completed) were closely examined, of which most were technology-related projects (partly selected according to needs identified in the CIS-SPI ad-hoc process). First results indicate that project leads of completed projects are, generally, not engaging in any dissemination activities, whereas in running projects, project participants have great interest in such activities, and even concrete problems to be helped with.

Most projects analysed were not connected via inter-disciplinary platforms such as CIS-SPI; instead, most projects are well-connected via specialized technology platforms.

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\(^{17}\) As a research project, WaterDiss2.0 differs from the other analysed initiatives/platforms in several ways. First of all, it does not have a governance structure such as the other platforms. Second, it is not directly aiming at fostering innovation and dissemination (through networking activities etc.). Instead, it analyses the processes in research dissemination to get insight into success strategies and failures. Thus, the information extracted from the interview differs from the other interviews. It is regarded, nevertheless, as being possibly helpful. Unfortunately, as WaterDiss2.0 is just entering the second project phase, it is not possible at the moment to draw conclusions regarding general dissemination problems in Europe.
Additional information of relevance for the EIP on Water

Relevant information from the first project phase of WaterDiss2.0 includes:

- Well-established channels for top-down and bottom-up communication of new policies and legislation (such as the CIS Working and Expert Groups) are not utilized to the same effectiveness regarding research results.

- There was a general lack of knowledge of the media channels suitable for communicating results - academic journals are often not suitable for getting information on results to end-users. In Germany, for example, there are some specialized media channels that are free to use, and which are always utilized to publish results (e.g. KA Wasser/Abwasser, EUWID Wasser und Abwasser); such knowledge needs to be aggregated (country wise), and provided to research projects.

- End-users of research results (e.g. public agencies/utilities) generally do not know where to look for research results, and WISE-RTD or similar platforms are not utilized, as the number of existing platforms is far too large.

Conclusions and recommendations for the development of the EIP on Water

- Integration of representatives of research projects analysing problems surrounding innovation and dissemination on a meta-level (such as WaterDiss2.0, STREAM, STEPWISE or PSIconnect) into the SG/the Task Force, would help to shed light onto dissemination and innovation barriers across various research fields.

- The EIP on Water should also function as a nexus for water-related information, which is very much needed for both end-users (regarding results) and researchers (regarding dissemination channels).

- An “e-market place” could be a platform where information on these topics could be provided (even in the form of a comprehensive list of links). However, it needs to lead to more clarity and streamlining - just one more platform where information can be found would not be useful, as users are overwhelmed already.

- Also, a staff position (on the secretariat) responsible for dealing with proper dissemination channels regarding innovations (i.e. non-scientific, national/ regional water journals) would be useful.

4.4 Key points regarding governance structure of EIP

With regard to the governance structure of the EIP on Water, the following main conclusions have been extracted from the desktop study and the interviews:
For the work of the Steering Group (SG), members with decision-making power are absolutely crucial for the success of the EIP’s work (for transposition of decisions made, and for guaranteeing commitment of the respective actor’s organization).

The SG should be maintained with as small a number of members as possible. This, however, is strongly dependent on how the thematic focus of the EIP develops in coming years, and has to be weighed against the necessity of involving as many stakeholders as possible. A size of around 30 members was regarded as “still manageable”.

The SG and Task Force should to represent a broad selection of stakeholders and disciplines/sectors. The incorporation of the following interests or institutions into the governance structure are regarded as important success factors and should be considered as the EIP develops:

- Representatives from other research and innovation initiatives or platforms, such as JPI, WssTP, SusChem etc., or, alternatively, a representative from the EIP on Water holding seats/memberships in these other initiatives/platforms (see below).
- SME representation, as many innovations are developed in SMEs, and as these provide important feedback regarding barriers for market access.
- Venture capital companies or other financing institutions, to create awareness for investment opportunities.
- National initiatives sharing similar targets, such as ONEMA.
- Representatives from institutions responsible for standardization issues.
- People or organizations that can provide an overall view of the water sector, especially regarding possible environmental impacts of new technologies/processes.
- Representatives of research projects analysing problems surrounding innovation and market access on a meta-level (such as WaterDiss2.0, STREAM, STEPWISE or PSIconnect), to shed light onto dissemination and innovation barriers across various research fields.

Including “thought leaders”, i.e. people in positions to influence other actors, would provide added benefit to the governance structure.

The governance structure, especially with regard to setting priorities, transversal themes and networks, should be flexible enough to be able to incorporate new ideas and new stakeholders at a later stage. Having an agreed schedule to evaluate the progress and to adapt as appropriate, the governance structure is beneficial.

With regard to the working procedures of the EIP on Water, the following main recommendations have been extracted from the desktop study and the interviews:
The network of stakeholders is a crucial element, as is to “keep the network alive”, i.e. to guarantee constant and enduring participation of and communication between the participating stakeholders. To facilitate a functioning network, the following recommendations have been identified:

- The people/organizations participating need to get feedback for the work they are investing in the network, in the form of concrete results. This could be pointing out an existing solution to a problem (and thus additionally connecting the demand with the supply side), or feeding research gaps and funding needs into EU, national or sub-national research programmes.

- To guarantee on-going commitment of the participants, a strict result-oriented modus operandi is recommended. Therefore, the work in the SG should be limited to decisions, and not about theoretical discussion. It is important, in this context, that the preparation of SG meetings needs to be carried out through the Task Force.

- The network also needs regular input, in the form of policy briefs/newsletters, or regular meetings (of the three “networks”, or of groups representing the transversal themes; twice a year at a minimum, more often is favourable).

- The interconnection of the networks with the transversal themes should be organized through the heads and deputy heads of the respective groups. At best, these people represent different stakeholder interests, or different elements of the water value chain.

- To effectively cover these tasks, it is strongly recommended to create a staff position (full time) in either the Task Force or the Secretariat with the sole responsibility of “keeping the network alive”. This person could also be responsible for linking with similar initiatives and platforms, and feed the network with developments there (see above).

- The EIP on Water should also function as a nexus for water-related information, which is very much needed for both end-users (regarding results) and researchers (regarding dissemination channels).

- An “e-market place” could be a platform where information on these topics could be provided (even in the form of a comprehensive list of links). However, it needs to lead to more clarity and streamlining - just one more platform where information can be found would not be useful, as users are overwhelmed already.
Also, a staff position (on the secretariat) responsible for dealing with proper dissemination channels regarding innovations (i.e. non-scientific, national/regional water journals) would be useful.
5. Innovation Case Studies

5.1 Overview and conclusions

Innovation generally results from a need; the larger proportion of examples identified in the study relate to water scarcity and chemical pollution, which aligns with the principal opportunities for innovation identified in the RBMP assessment (Section 2 Table 2.2.).

These examples of innovation have, in the majority of cases, been developed to enable end-users (water companies, municipalities and industrial companies) to respond to regulatory pressures, including consents to discharge to the environment, targets to reduce leakage and requirements to reduce abstraction. They have also been developed in response to a need to reduce costs, mitigate the impact of changing climate and to create better engagement with the community to make more effective use of water.

There are examples of ideas that have been developed within academic institutions, within the manufacturing/consulting sector and those that have been transferred from other sectors. Commercial success, measured in terms of widespread application or global market penetration is not great and a number of the examples that are hailed as innovations (through promotional material and the technical press) have not moved much beyond an initial demonstration.

Innovation can only be considered to have occurred if there is a recognisable beneficial change that has resulted from the implementation of a new system/process/technology. Some examples are best described as innovative technology, but as they have not been adopted then innovation has not resulted. One example, a leak repair system, was hailed by press releases, articles and presentations as highly innovative; however it has not been implemented because of uncertainties and costs.

Solution developers and early end users may be attracted by the leading edge nature of the technology and not fully address the business case early in the programme; this is a feature of some technologies which, whilst effective, fail to convert into financial savings for the end-user. This can be a blind spot in some development programmes and it is important to assess the direct and indirect benefits during any development and demonstrations in addition to measuring the performance of the technology or solutions.

Difficulties of gaining entry to the market can lead suppliers to overstate performance and go to market too early. Problems in early deployment are then seen as failures rather than developmental issues and it can take some time for a product to recover credibility.

Commitment is needed from the top of an organisation attempting to introduce innovative solutions. There needs to be a recognition that innovation is not just about the technology, the
business processes and people may need to adapt to new systems and ways of working. Sometimes courage and risk taking is needed to accrue full benefit from transformational innovation.

The conservative, risk-averse nature of the water sector makes breakthrough of new systems difficult. Few water suppliers or wastewater treatment operators wish to be early adopters. Innovative solutions can stall because even “fast followers” are reluctant to commit without their own trials and demonstrations, which adds unsustainable costs to the suppliers.

End-users, particularly municipal based operators can be parochial in their approach to innovation, both in terms of not seeking to encourage exploitation of systems developed for them and operating successfully on their sites, and in not actively seeking solutions from other countries. Success often requires a holistic approach and will require the early involvement of a number of stakeholders that might be affected or benefit from its implementation. This engagement can be more important than the technology or system itself and needs to be part of the solution.

Innovations that have been developed within an academic environment appear to stall because of a lack of a commercial partner to properly exploit the opportunity; success is sometimes measured in gaining further support for additional research.

Technology transfer from outside the water sector is made difficult by the low value of the product (water) and the significant regulatory requirements. Successful commercialisation of a new innovation can depend to a large extent on the determination of the supplier to establish the service or product in less conservative markets outside of Europe.

An EIP would provide greater visibility of innovative technologies and services, enable easier penetration of the market and, through links with the existing Technology platforms, provide a steer on needs and requirements. An EIP can also provide a single point through which innovative solutions can be fully and professionally demonstrated through pilot demonstrations; this would reduce the costs to suppliers of emerging solutions by reducing the need for repeat pilots with each new customer.

An EIP might also provide opportunities for academic organisations to better link with commercial partners to take innovations to market. Innovations such as regulatory or financial incentives are not readily marketable as they are linked to the local institutional and political structures, but could be promoted through an EIP for adoption or adaption by other regions or countries.

5.2 Approach

A survey was undertaken to identify examples of recent innovation. The objective was to find examples that would be relevant to the priority areas of the emerging EIP and that could be identified with the measures and actions drawn out from the RBMPs. Each example is
categorised according to the pressure and whether is it applicable to rural, urban or industrial management of water. The route from concept to commercialisation was also explored, where possible, and any barriers or success factors that impacted on this reviewed. A view has also been taken on how an EIP might have influenced or interacted with their development.

Examples were located from a variety of sources that included internet searches, using European Union websites as a starting point, and discussion among experts within the project consortium who were asked to nominate examples. The majority of the examples came from the internet searches, a key aspect was to identify innovations that had been implemented or commercialised, even if to a limited extent; those still at concept or development stages were excluded. We also sought to obtain examples that covered the main environmental drivers: water scarcity, chemical pollution, hydromorphology, flood management and biological/ecological disruption, and the Urban, Industrial and Rural sectors.

An initial set of possibilities were followed up with more detailed research through investigations on the websites of the organisations supplying or having developed the innovation and, where possible, discussions were held. Figure 5.1 shows the distribution of the initial set of 40 innovations across the drivers. Whilst this set was specifically selected, the distribution does generally reflect the innovative activity relating to each driver, with more examples relating to water scarcity than any other driver.

Sixteen individual examples are presented, each described in terms of its drivers; the benefits realised; how it has been deployed, and; what factors led to, or are barriers to, its successful conversion into innovation. Each example is also categorised by: type of innovation; the key objective; and whether there are any regional constraints.

**Figure 5.1  Distribution of innovations associated with different measures**
5.3 **Examples of innovations**

5.3.1 **Energy and Water smart meter roll out - Malta**

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Water Scarcity, Demand Management</th>
<th>Sector</th>
<th>Urban Water/energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Technological, Educational, Business Systems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Reduce energy and water demand, increase use efficiency.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Integrating smart energy and water metering with new business systems and customer interaction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None in principal, but needs political buy-in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Installation and integration achieved, some IT problems, too early to indicate impact on demand.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Promotion as case study, learning from others, technology transfer.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description**

In February 2009 Malta’s national electricity and water utilities, Enemalta Corporation (EMC) and Water Services Corporation (WSC), entered into a €70 million, five-year agreement for the design and delivery of a nationwide AMI and smart grid implementation. Advanced Metering Infrastructure (AMI) is a “two-way” communication that creates a network between the meters/devices and the utilities’ information systems. Data flows both directions providing not only remote meter reading but ability to remotely activate meters/devices and the use of variable pricing. The programme “Integrated Utilities Business Systems (IUBS)” is the first step in establishing an end-to-end electricity and water smart utility system. When complete, the multi-phased engagement is expected to completely transform the relationship between Maltese consumers and utilities suppliers, while enabling more efficient consumption of energy and water. The project will replace a quarter-million conventional electric meters with smart meters and upgrading the water system where it can be monitored and managed remotely. In addition, water meters will be integrated with advanced IT applications, enabling remote monitoring, management, meter readings and meter suspensions. The project will also involve the implementation of SAP’s ERP-based system and its billing application. Customers will be able to use the Internet to track their utility usage in real-time. They will also be able to choose the best plan and can pre-pay for their services. This project is expected to optimize operation costs for Enemalta Corp. and also enable WSC to better improve its water management programme. The system is expected to be completed by the end of 2012.

**Drivers**

Malta is facing a dual challenge of delivering affordable, secure energy and sufficient water supply to meet demand while protecting the environment. These challenges are even more evident because Malta is an island isolated from the continental electricity grid and with no
natural water resources. Most water comes from desalination, while groundwater resources are overexploited. Specific additional issues are technical and commercial losses in the grid that affect the profitability of system operation. This is a major driver that brought Enemalta and the Maltese Water Services Corporation to IBM to implement what is believed to be the first large-scale multi-utility smart metering programme.

**Benefit**

The solution, which is provided by IBM, is designed to improve operational efficiency and customer service levels by introducing smart meters that allow clients to better manage consumption. The direct benefits will include: an end to estimated bills; flexible tariffs to sustain new policies on energy and water consumption; the ability to allow customers to switch to a prepayment service, similar to mobile phone prepayment; reduced commercial losses and technical losses through monitoring of electricity and water grids; remote activation, reduction, increase and termination of supply, thereby reducing connection time; improved energy efficiency through sophisticated analysis of real-time consumption patterns to identify opportunities for reduction; and internet customer portal to track consumption and choose the most appropriate agreements. In addition, smart metering presents a unique opportunity to collect data on electricity and water consumption and build advanced analytics on their correlation, because water is produced by desalination, a heavy electricity consumption process.

The IUBS program will deploy a new IT infrastructure that will bring clear benefits to all stakeholders:

**Deployment**

A pilot project with 5,000 installations was launched in 2009, followed by 2 massive roll-out installations of 100,000 meters each in 2010 and 2011 respectively, and a 50,000 meters installation planned for 2012. There are two dimensions to the technology employed. The first comprises field devices connected to the central IT system. Here IBM is planning to deploy the Enel metering technology for electricity that includes proprietary solid state meters and communications protocol through power line carrier and mobile phone connections. For water, the plan is to reach existing installed meters through a radio frequency communication network. On top of operational efficiency and better customer service, the real value for Malta will be the amount of data that it will be possible to collect and analyze. By comparing the amount of water being read by individual meters with the amount of water flowing into each zone, the utility will discover discrepancies that will help them track down slow leaks. Additionally, electricity and water consumption patterns could be correlated based on different weather conditions or pricing policies. Critical to the deployment of the programme was educating and even convincing the public to use the smart meter. Malta launched advertising campaigns that spoke of the societal benefit these meters could bring.
Success factors, barriers and future developments

A key success factor was the political will and drive to undertake a transformational and integrated approach to managing energy and water; the integration being a key aspect of the innovation. Malta took the decision to transform its processes with regards to energy and water to respond to global and local changes considering the customer service, efficiency, environmental sustainability as the key criteria for the design of the new processes with the challenge of building the Maltese utilities of the future, based on a customer operations transformation, intelligent network and internal processes transformation approach. As such, Malta will be the first EU country with total smart metering coverage. An important innovative and success factor is that the IUBS programme provides an integrated utility technology, a strategic partnership between two separate utilities, thus an integrated solution for both electricity and water in Malta. The frequency of data collection has yet to be established. Day-to-day life will teach utilities when and how extensive data collection makes business sense. The technology is able to gather data every five minutes, but this needs to respond to real business needs. While the installation of electronic meters is moving according to plan, there were serious problems with electricity bills that were issued by ARMS Ltd. Instead of receiving electricity bills of their actual consumption, many customers still receive estimated bills or no bills at all. In November 2010, the government of Malta has approved an investigation into alleged mismanaged handling of water and electricity bills by ARMS Ltd. Minister for Transport, Communications and Infrastructure, Austin Gatt, explained in parliament that software, and not employee bungling, was the reason behind the billing problems. Out of 889,117 bills which the company issued, 47,841 were incorrectly billed, which translates into a failure rate of 5.3%.

An EIP could have supported the pilot stage of the scheme, created greater awareness across Europe and enabled others to learn from Malta’s experience, providing a template for others to exploit. It might also have enabled experience from other intelligent metering schemes to have been brought into the development of the Maltese scheme.

References


5.3.2 Platelet Technology for water pipes leak sealing – Brinker Technology applied in Yorkshire, UK

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Water Scarcity, Demand Management</th>
<th>Sector</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Technological, Technology transfer from oil sector.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Leakage reduction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Repair leaks without excavation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>Regulatory aspects may restrict widespread use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Technology has not been adopted by water sector despite early promise.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Assist in technology transfer, identify regional regulatory barriers, and enable more widespread trials and problem resolution.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description

Yorkshire Water, a private water company in the UK that manages more than 40,000 miles of water and sewer mains, is testing a new technology that works like blood platelets sealing a wound to reduce leakages in the water distribution and supply network. The material is injected into a pipe and collects around leaks as large as 50 millimeters in diameter. Platelet Technology® is a pipeline leak sealing solution without the need to locate or dig and involves the remote injection of discrete particles known as “Platelets™” into a pipeline which are carried to the leak site by the flow. When they reach the vicinity of the leak fluid forces entrain them into the leak and hold them against the pipe wall thus facilitating a seal, this can also mark the position of the leak for subsequent detection since each Platelet™ can carry a traceable tagging device. This is a repair technology used in the oil and gas industry, which sought to be transferred into the water network with potential application for Trunk Mains, Distribution Mains, Communication Pipes and Customer Supply Lines.
Drivers
Leakage reduction, increase water efficiency, secure uninterrupted water supply.

Benefit
- No interruptions to customers’ water supplies, assurance of flow through pipes.
- No road excavations to fix pipes and therefore no traffic congestion.
- Reduced cost of leakage repair.
- Extension the life of the infrastructure.

Deployment
The technology was developed by Brinker Technology (Brinker is a University of Aberdeen spin-out company creating, developing and implementing technical solutions to promote integrity management to the pipeline industry worldwide, http://www.brinker-technology.com/) and has been used successfully on a number of offshore operations since the first field deployment in September 2004, when Platelets® were used to seal a subsea water injection line leak on BP's Foinaven field. As a result of the operation the line pressure increased by 20 bar which resulted in a significant increase in production. Yorkshire Water in UK, has been testing this technology on the water supply systems in Yorkshire and Lincolnshire and to fix leaks on water pipes. Trials proved successful but despite significant promotion of the trials Yorkshire Water has not yet implemented the system across its supplies. There are concerns on long term stability, ensuring that all deployed platelets are either entrained in the leak or are collected downstream before reaching the customer, and the deployment in water distributions is more complex than in oil or gas pipelines.

Success factors, barriers and future developments
The Platelet Technology® was developed for the oil/energy sector and sought to transfer to the water sector. It is a promising newcomer with great potential in the industry but has yet to succeed commercially in the water sector. A key aspect of the pull from Yorkshire Water was a need to substantially decrease leaks coupled with a desire to avoid interruptions to supply. Barriers to its full implementation appear to be uncertainty on customer reaction and potential regulatory issues if all of the unused platelets are not removed; however the detailed results of the trials and subsequent decisions are not public. An EIP could have supported a more open demonstration and had wider engagement with the sector, including regulators, and supported more effective technology transfer to a wider market.

References
5.3.3 Advanced natural wastewater treatment system with soil filters — The waste water treatment plant of the ZEGG community

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Chemical pollution (wastewater)</th>
<th>Sector</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water scarcity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovation type</td>
<td>Technological, low energy natural processes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Treat wastewater with minimal energy use, achieve standard for water re-use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Combination of natural processes and flow controls, with a planted soil filter for municipal waste water treatment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None of significance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Technology has not had widespread adoption despite promise for small communities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Enable more widespread dissemination, additional trials and market research/penetration.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description

ZEGG is an ecovillage located on the outskirts of Bad Belzig, Germany, about 80 km southwest of Berlin. Since 1992 all waste water from ZEGG is purified in a treatment plant which uses natural processes. Minimal technical effort is needed. It uses 900 m² of space to treat the waste water produced by 300 inhabitants. The ÖKOTEC system an innovative combination of features:

- a composter for the direct composting of solids,
- a pumping chamber, which applies the water onto the surface of the soil filter,
- vertical flow in both treatment steps,
- partial recirculation of the treated water of the first step into the pump chamber,
- Use of willows and poplars to produce biomass, which can be harvested regularly.

The generalised layout and flow path is illustrated in Figure 5.2. Purification takes place in the planted soil filter, which is vertically permeated. Part of the water flows back into the duct and goes through the plant again. This improves the purification performance and makes the inclusion of a buffer tank redundant. The pollutants in the water are broken down by microorganisms living in the soil filter. During the entire process, the waste water is rich in oxygen (4-6 mg/lO2). This aerobic environment enhances the cleaning power of the plant and assures nearly odourless functioning.

**Figure 5.2   Schematic of the ÖKOTEC system**

### Drivers
Sanitation for small communities, increasing discharge standards, need for low energy systems.

### Benefit
- High operating stability through the combined effect of soil, plants and microorganisms.
- Minimal use of electricity.
- Minimal need for maintenance.
- Efficient removal of nitrogen possible already in the standard version.
- Removal of persistent substances through adsorption and decomposition in the humus layer.
- No waste; but valuable resources.

### Deployment
ÖKOTEC’s first facility for 300 population equivalents (PE) at a residential area with a seminar centre in Belzig, Brandenburg, has been in operation since 1993 and has ever since continuously produced good effluent values:
### Performance of the ZEGG waste water treatment plant

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Inflow</th>
<th>Outflow [mg/l]</th>
<th>Govt.standards [mg/l]</th>
</tr>
</thead>
<tbody>
<tr>
<td>COD*</td>
<td>300-700</td>
<td>15-25</td>
<td>45</td>
</tr>
<tr>
<td>BOD **</td>
<td>200-400</td>
<td>1-2</td>
<td>10</td>
</tr>
<tr>
<td>NH4-N</td>
<td>40-85</td>
<td>0-1</td>
<td>10</td>
</tr>
</tbody>
</table>

* Chemical Oxygen Demand, includes easily slowly degradable organic compounds, like humic acids

** Biochemical Oxygen Demand, includes easily degradable organic compounds

Treatment efficiency has remained constant, even during longer strong frost periods of –20 degrees. The tight standards set by the water authorities have always been met, with the exception of 'total nitrogen', whose levels have sometimes been slightly above the standards for the state of Brandenburg, which are among the highest in Germany. New improvements in the system now keep the 'total nitrogen' levels consistently below the required levels.

### Success factors, barriers and future developments

The unit at ZEGG is a model for small communities and for households which are not connected to a centralised sanitation and treatment system. It demonstrates a process for waste water purification which utilizes well the regenerative powers of nature. These units also enrich and beautify the environment by adding a wetland biotope, offering valuable living space to many species of plants and animals. The system has not had widespread adoption and has largely remained the subject of observation and research.

Since November 2000 the purification plant has been subject of a three year research project. The aim is to optimize its output levels and reach a quality which would allow widespread reuse of the water. The water can be used to water forest gardens and landscapes. The research project is part of a combined effort of German and Mexican research facilities and companies. The project includes different climatic regions and different research questions. It is hoped that the results will be applicable to a wide range of climates and regions.

An EIP would provide a wider perspective on the applicability of the process to small communities across Europe, given wider dissemination and an opportunity for greater integration with other initiatives aimed at supporting small communities.

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Achim Ecker, 2004, Sustainability and Ecology at the ZEGG Community

(http://stellungnahme.zegg.de/oekobroschuere_en.pdf) accessed 29 February 2012
5.3.4 Centralized rainwater harvesting in Germany

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Water scarcity, Demand management, urban drainage, chemical pollution</th>
<th>Sector</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Technological, Rainwater harvesting and treatment within a city environment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Use urban run-off for treatment for toilet flushing and gardens by small, urban communities, reduce hydraulic load on sewers, prevent pollution by urban run-off.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Combination of collection and treatment system integrated with urban community water supplies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None of significance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Technology has not been commercialised and remains as successful pilot.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Enable exposure to investors and commercial organisations, create greater links between researchers and manufacturers, wider exposure across Europe.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description**

Rainwater utilization in Germany is widespread since the 1980s (Nolde, 2007). Typically, the water is collected from the roof and is filtered, stored and primarily used for toilet flushing, garden watering and household laundry. Nolde presents an innovative approach: instead of using only the water from the roofs, he suggests that that rainwater draining from the streets and courtyard surfaces could also be reused. This could be a viable option for densely populated urban areas and reduces drinking water consumption and wastewater production. It also minimizes the entry of pollutants into the surface waters, without the need for a sewer connection. He found that 70% of the toilet-flush demand can be replaced by treated stormwater without any comfort loss.

**Drivers**

Sustainable urban drainage, greater resource efficiency and risk management.

**Benefit**

- Reducing demand for potable water.
- Reducing energy for transport and treatment of water.
- Reducing urban (pluvial) flood risk.
Deployment

In one pilot application about 11,770 m\(^2\) of sealed surface area are connected to a rainwater reservoir situated in the cellar of the pilot building. 63% of the collected surfaces originate from the roof, 35% from courtyards and sidewalks and 12% from traffic surfaces. Rainwater is first discharged into the existing rainwater sewer of the Berlin water company, and from there it drains into the rainwater reservoir until the reservoir reaches its full capacity. The 190 m\(^3\) rainwater reservoir is filled with rainwater until the water level in the reservoir reaches the sewer level. Excess water is discharged into surface water. Biological treatment of the rainwater takes place in a “planted” substrate filter which has been installed in the building.

About 10 m\(^3\) of rainwater are treated daily followed by disinfection with UV (28 Watt). The service water reservoir (6 m\(^3\)) serves as a storage tank for the treated rainwater and acts as a system buffer during consumption peaks. The rainwater harvesting plant supplies 80 apartments and 6 small trade units (a total of 200 persons) with high-quality service water for toilet flushing and garden watering. The selected substrate filter consists of two layers each is 2.2 m long, 1.1 m wide and 0.7 m deep. The above layer consists of expanded clay particles (8–16 mm grain size) while the lower layer is filled with gravel (4–8 mm). The two layers are placed 1 m apart. Rainwater percolates from above continuously and uniformly over the whole substrate bed. The rainwater plant has been operating since 2000 without clogging or other technical problems.

Success factors, barriers and future developments

This low tech innovation is an example of a simple and inexpensive rainwater harvesting and treatment, allowing the collection and use of rainwater from more polluted surfaces, such as traffic areas, for use in households for toilet flushing and laundry activities without hygienic risk and comfort loss for the user. Energy requirements for cleaning the stormwater and distributing it for toilet flushing appear to be low. Under certain conditions, rainwater harvesting may be realised as the only measure applicable to areas with a high specific requirement for service water, resulting in reduced drinking water consumption and
wastewater discharges. This is particularly applicable where soil conditions are unfavourable for rainwater infiltration or costs are too big. Positive side effects include improved water quality, since pollutants will be retained in the treatment system rather than accumulate in the soil or infiltrate in the groundwater, with positive effects for urban water bodies. The system is not commercialised and is largely driven by university based activity. An EIP could provide a focus for activities on rainwater harvesting to build on existing knowledge and practice and create greater links with developers and commercial partners. It would enable the technology to fully realise its commercial potential.

References

Nolde, E. (2007), Possibilities of rainwater utilisation in densely populated areas including precipitation runoffs from traffic surfaces, Desalination 215, pp. 1–11.

5.3.5 Precision irrigation - Pinios River Basin, Greece

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Water scarcity</th>
<th>Sector</th>
<th>Rural /Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Technological, educational.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Improve land and water productivity for crop growth.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>More efficient and precise application of water to crops Use of sensors to monitor crop condition and link to precise distribution of irrigation water.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None of significance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Technology is still in development and may be constrained by costs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Indirect as this would sit with the Agriculture EIP, opportunity to co-ordinate activities and promote dissemination.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description

A scientific innovation on testing precision agriculture technologies in selected agricultural areas in Greece is currently conducted by the National Agricultural Research Foundation (NAGREF), Institute of Soil Map and Classification (www.ismc.gr), situated in the city of Larisa, central Greece. The project is coordinated by the Goulandris Natural History Museum, and is conducted with additional cooperation with the Benaki Phytopathological Institute, Benaki Phytopathological Organization, the University of Thessaly and the Agricultural University of Athens. The NAGREF Institute’s general mission is to carry out research focused on the maintenance and improvement of soil quality so that they may fulfil their functions especially those related to the agricultural production and environmental quality. Precision Agriculture technologies are tested in the framework of the Hydrosense project (title: “Innovative precision technologies for optimized irrigation and integrated crop management in a water-limited agrosystem”, LIFE08 ENV/GR/0000570, http://www.hydrosense.org/). The
project aims ultimately to improve the water, fertilizer and pesticide use efficiency of a major Mediterranean agricultural crop (cotton) by employing principles of site-specific management (or precision agriculture) and advanced technologies in proximal remote sensing.

Remote monitoring and mapping of spectral canopy reflectance in each zone leads to the timing of irrigation and fertilization events, while sensors monitor crop water stress and soil nutrient status. Specifically, the precision irrigation system works as follows: infrared sensors are components of a wireless thermal monitoring system (Smart Crop) and identify the timing of application; soil moisture sensors back up the information for the timing while they evaluate the effectiveness of irrigation application, while an evapotranspiration sensor calculates the exact volume of water that has to be applied. Finally, crop yields are also calculated and mapped for the purpose of estimating productivity and environmental performance indicators.

Drivers

The Pinios River Basin, covers almost entirely the River Basin District (RBD) of Thessaly in Central Greece. The issue of desertification of the Pinios River is of crucial importance to the Greek economy and environment. The catchment (with an area of 10500 km$^2$) is the most important agricultural producer in Greece, with fertile soils but a very dry climate during summer. Agriculture is by far the main water consumer (appr. 1.5×10$^9$ m$^3$/y representing the 90-95% of the annual water demand of the area) with irrigated land (200.000 ha) covering half of the cultivated area (400.000 ha). Cotton is the main crop cultivated in Pinios (appr. 150.000 ha), with high water demands (600 mm water per growth cycle). Water is abstracted mostly from groundwater sources with few notable exceptions. Unfortunately, a significant percent of abstractions (more than 50%) is believed to be illegal and existing irrigation practices have low efficiency (incl. high runoff, canal conveyance losses due to seepage, leakage, evapotranspiration and sub-optimal management of the irrigation water). Overexploitation leads to low river flow (negligible in the summer), low groundwater water tables, the drying up of lakes as well as significant water quality degradation (nutrients – pesticides) and even saline water intrusion in coastal areas. The increased groundwater pumping has drastically decreased groundwater levels making water more expensive to obtain (deep pumping). Therefore, precision agriculture seems to be a promising technology to face the aforementioned environmental problems, even some of the economic problems arising in the area.

Benefit

The principal benefit that accrues from this application is the reduction in water/chemicals consumption in agriculture demonstrating the economic effectiveness of the system by reducing inputs while maintaining productivity. Moreover, tools are under development for adjusting agricultural policy by upscaling in-field data to regional scale and by constructing a new design of water pricing, also diffuse the innovative technologies to farmers by training on the use of an interactive website. More specifically, clear benefits are expected from the Hydrosense project for both farmers and the environment:
Benefits for the Environment

- Better exploitation of surface (rivers, reservoirs) and groundwater resources
- Reduce the risk of saltwater intrusion in the coastal aquifers
- Reduce the risk of nutrient (especially nitrate-nitrogen) losses to surface waters and groundwater – reducing the risk of eutrophication

Benefits for the Farmers

- Stop pumping from high groundwater depths – less expenses
- Save money (increase the net income) by reducing the use of chemicals
- Sustaining crop productivity
- Training on cultivation schemes that are friendly to the environment and in some cases more productive

Deployment

The installation and testing of the precision agriculture technologies are taking place in selected pilot areas (further divided in zones), representative of the diverse soil types, topographic features, evapotranspiration potential and farming community interests prevailing in the Pinios watershed.

Success factors, barriers and future developments

Precision equipment and related accessories are commercialized by industries in several countries around the world, especially the USA and countries with arid and semi-arid climates such as Israel. On the other hand the innovation as exactly lunched in the Hydrosense project (with the combined use of three different kinds of sensors) is still under research testing and has not been commercialized yet. Key aspects being assessed are reliability and costs. Successful trials, and potential simplification and cost reduction would facilitate the expansion of the technology in the Thessaly plain as well as in other areas across Greece and possibly other neighbouring countries with arid climates and economic constraints. An EIP on water could promote dissemination and co-ordinate with other water efficiency measures to create a holistic solution to water shortages.

References


5.3.6 Innovative and efficient irrigation techniques to enhance water productivity – REDSIM EU-DGV ENV pilot, Spain

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Water scarcity</th>
<th>Sector</th>
<th>Rural /Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Technological, educational.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Improve land and water productivity for crop growth.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>More efficient and precise application of water to crops, linked to understanding of crop growth patterns, use of sensors to monitor crop condition and link to precise distribution of irrigation water.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None of significance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Technology is still in development and may be constrained by costs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Indirect as this would sit with the Agriculture EIP, opportunity to coordinate activities, seek commercialisation of research and promote dissemination.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description**

A common perception in arid agricultural areas of Spain is that increasing water productivity of irrigated agriculture is among the most efficient water policies to fight desertification. In the frame of the EU-DG ENV ‘Pilot project on development of prevention activities to halt desertification in Europe’, the REDSIM pilot project ([http://www.redsim.net/](http://www.redsim.net/)) addresses the topics ‘Water savings/water efficiency measures’ and ‘alternative forms of irrigation’. More precisely, REDSIM deals with the development of management technologies and tools to improve land and water productivity in arid agricultural lands, at farm and watershed levels. The overall objective is to improve Irrigation Water Productivity (IWP) in water-stressed watersheds, by developing and validating an Information-Decision Support System (REDSIM-IS) based on Remote sensing (RS) information and simplified water balance and crop models to assist growers in implementing and managing efficiently deficit irrigation (DI) techniques.

**Drivers**

Increasing the productivity of water in agriculture holds a key to mitigating the impact of water scarcity due to natural (*drought events*) or human over-consumption. The Segura River Basin (SRB) is a semiarid basin, which has the lowest amount of renewable water resources among all the Spanish river basins. With an extension of 18.870 km² (*3.7% of Spain area*), renewable resources amount to 803 hm³ per year (*0.7% of total national resources*). Accounting for external resources (*Tajo-Segura water transfer*), return flows and desalination water, the total water resources are close to 1600 hm³ per year while water demand is 1850 hm³ per year. There is a chronic structural deficit in the SRB, mainly due to the high water demand for irrigated agriculture, an important socio-economic sector of the Murcia Region. Improvement of irrigation operations by using management tools to harmonize resource exploitation could
be an efficient way to reduce groundwater withdrawals and desertification trend in both SRB and UGRB.

**Benefit**

The principal benefit that accrues from the application of innovative and efficient irrigation techniques is the reduction in water consumption in agriculture by maintaining productivity. This means that a better water productivity (WP) is achieved. An increase of WP by for instance 40% implies that the same food production can be maintained with 40% less crop water consumption. This is a great opportunity for the irrigation sector that needs to get more attention by water resources planners, agronomists and irrigation engineers. Another important benefit is that by increasing the water productivity in irrigated agriculture, water can be allocated for other users in the river basins.

**Deployment**

Since this project and all these technologies are tested for first time in Spanish areas, critical for their wider adaptation would be the first results associating water consumption with crop yield production. Moreover, the cost of the equipment installation and operation should be accurately calculated in order to make reliable upscaling estimations of the cost-effectiveness of this innovative technology.

**Success factors, barriers and future developments**

The strength and originality of REDSIM stays in (a) the integration/fusion of remote sensing and ground sensors spatio-temporal information to retrieve a set of land surface variables and fluxes that are of prominent interest to irrigation management and (b) the elaboration of a web-based information tool accessible to users and containing the pertinent information and recommendations allowing a day-to-day decision on when, where and how much water should be applied when using a DI-based strategy. However, the practice of DI is not so straightforward to apply as is Full Irrigation because it requires both precise knowledge and pertinent information of the crop yield response to soil water deficit and agricultural drought. That is why farmers who are not familiar and well-trained in DI practices are rather reluctant to apply DI strategies. Another practical obstacle to dissemination of DI practices is related to the relatively high number and cost of soil/plant sensors that are required to supply the pertinent information on crop and plant status (e.g., dendrometers, sap flow meters, radiothermometer, TDR or capacitance soil humidity sensors). To cope with the inherently large spatial variability of soil and crop attributes, this large sensor network has to be suitably distributed in the field to provide a representative spatially-averaged value of the soil/crop water status, which is far to be a trivial problem. The identification of all constraints and gaps of this innovation technology is a major scope of REDSIM, responsible for its future continuation and expansion in arid areas of Spain and other countries.
5.3.7 “Collaborative modelling” as a way of managing flood risk: the cases of Alster (DE) and Cranbrook (UK)

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Flood management</th>
<th>Sector</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Socio-Technical – educational/administrative.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Improve engagement of property owners with the option for flood management and mitigation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Involvement of a large number of stakeholders through on-line “collaborative modelling” to reach a consensus approach to decision making to improve flood planning and management.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None of significance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>The innovative approach is finding use in other scenarios.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Linking a range of stakeholders, promoting the methodology to a wider community, developing commercial partners for wider exploitation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description

The Alster drains a natural upper catchment (Northern Hamburg and Schleswig-Holstein) and a canalized lower catchment (Hamburg) and is a tributary to (tidal influenced) river Elbe. The lower part is densely populated with high damage potential. Several flood events have occurred during the last 10 years (with the last flood event occurring on the 6th February 2011). As Alster and its tributaries are highly affected by flood events, several flood protection measures have recently been implemented (including stricter planning permissions). Still, several additional measures and a more integrative approach to stakeholder communication and collaboration were thought to be important. The Cranbrook catchment in the UK is a predominantly urbanised catchment and has a drainage area of approximately 865 hectares. Several flood events have been reported since 1926 with the most recent one being the event of February 2009, where coincidental fluvial and pluvial flooding occurred due to heavy rainfall that caused rapid snowmelt that was still lingering in large quantities following snowfall the week before. The amount of water in the river exceeded the capacity of the channel and surface water overwhelmed the local drainage systems (especially in the highly urbanized areas, which are more susceptible to surface water flooding). Over 200 calls were received at the emergency control centre during the event. After the event, new drainage work was carried out and a new flood warning scheme was put in place. The need for more collaboration between stakeholders was identified as a means to improve resilience (Ochoa et al., 2011). Stakeholders and researchers in both cases deployed a form of online...
collaboration, supported by common definitions, models and datasets and a formal online mode of negotiating priorities to explore what if scenarios for a series of interventions and measures. The innovative set of tools and methods, termed here “collaborative modeling” is applicable to a wide range of situations and centered around the stakeholders and their interactions. Some elements of the approach are described in the deployment section below.

**Drivers**

Flood risk management, public engagement.

**Benefit**

- Engagement of stakeholders.
- Analysis of multiple risks.
- Improved understanding of interaction between stakeholders.
- Improved understanding of risk perspectives.
- Better (more realistic and acceptable) flood risk management plans.
- Improved resilience.

**Deployment**

A team of researchers working within the EU funded DIANE-CM project (Cortés et al., 2011) developed an online collaborative platform (Figure 5.3) that allowed stakeholders to interact with hydraulic models of both cases and test alternatives and measures to reach a common understanding of the situation and potential solutions.

![Figure 5.3 An online collaborative platform – screen dump](image)

In both cases, this collaborative modeling exercise was preceded by a formal stakeholder identification approach (Figure 5.4) to map the links between stakeholders that would take part in a collaborative modeling exercise.
The process of identifying stakeholders and their links resulted in a much improved understanding of the social-administrative system and its critical points for improvement. The stakeholders were presented with alternatives including “Do nothing”, Rainwater harvesting, Improved and targeted maintenance regimes for the sewer system, Improved resistance for preventing water from entering properties and Improved rainfall and flood forecasting and warning and explored their effects using online simulation tools.

**Success factors, barriers and future developments**

This engagement of a wide variety of stakeholders in the decision-making process for flood risk management proved to make them more aware of the situation and increased their personal responsibility towards this issue and their understanding of each other’s attitudes and perspectives on risk. The cases of Alster and Cranbrook, support the notion that structural measures alone are insufficient to protect population and infrastructure from flooding and suggest that what is important is to improve the resilience of communities and cities to flooding. Further examples of this new approach are recent regulations and guidelines, such as “Making Space for Water” (Defra, 2005) and “Room for the River” (Programme Directorate Room for the River - Netherlands, 2007). In this approach, the importance of involving stakeholders from all aspects of flood risk management is paramount, as it enhances the acceptance of flood management measures and empowers the stakeholders to take an active role in protecting themselves from flooding (Jonoski, 2002; Evers, 2008; White et al., 2010).
An EIP would enable the methodologies of engagement to be transferred to other situations where there is a need to involve, and gain agreement and support from, a range of stakeholders. It would also provide a route for wider dissemination and for developing commercial partners for wider exploitation.

References


### 5.3.8 Voluntary intersectoral water transfer – Llobregat River Basin, Spain

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Water Scarcity</th>
<th>Sector</th>
<th>Rural /Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Legal/administrative Economic Policy Instrument (EPI), technological.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Ensure water availability for both agriculture and drinking water supply.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Voluntary inter-sectorial water transfer providing flexible negotiation between the two main parties. Use of reclaimed water for irrigation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None of significance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Apparent success in guaranteeing supply to farmers whilst making more available for drinking water.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Linking a range of stakeholders, promoting the methodology to a wider community, highlighting the innovative mix of technology and legislation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description**

This specific economic policy instrument (EPI) of Voluntary Intersectoral Water Transfer has been implemented in the Llobregat Delta which is located in the NE of Spain. It is an area with endemic water shortages and includes the Barcelona metropolitan area, the second largest city in Spain. The need to improve the availability of water was highlighted during the severe drought of 2007-2008. Voluntary intersectoral water transfers was considered as the cheapest alternative to guarantee the water availability for irrigation and domestic purposes and also to improve the water quality of the Llobregat aquifer. The main objectives can be described as economic, environmental and social. Taking into account the capacity of the two main WWTPs in the area it was decided that the total volume of water to be reused would be around 44 hm$^3$/yr. Farmers need to be convinced of the value of the exchange for themselves, the benefits of more reliable water supply, the savings of groundwater pumping, and that the nutrients in the effluent are sufficiently firm to offset the possible health hazard, the impact on local amenities, and the risk of produce restrictions. By considering the irrigation needs and the financial constraints, the administration decided that the total volume of regenerated water for irrigation purposes should be around 20.5 hm$^3$/yr. Hence, it prevents a deflection of river water which can then be used for domestic water supply. To achieve the environmental objectives, 10.4 hm$^3$/yr of treated water is released to maintain the river stream flow, 6.3 hm$^3$/yr for the restoration of wetlands, and 0.9 hm$^3$/yr to improve the quality of the Llobregat aquifer as the regenerated water is used as a barrier to the seawater.

**Drivers**

Water scarcity and competition for resources between urban, rural and agricultural demands was limiting economic activity. Improving river flow, together with the creation of a hydraulic barrier against seawater intrusion and maintenance and restoration of wetlands improves the ecological status of the water bodies and associated landscape.
Benefit

The implementation of the voluntary intersectoral water transfer has enabled users to become aware of water scarcity problems. Significant water savings have been reached as a consequence of their behavior. The EPI was designed to provide benefits for both farmers and municipalities and was one of the key aspects for the success of the instrument.

Voluntary intersectoral water transfer is a flexible instrument because it enables negotiation between the parties involved in the agreement and adaptation to local circumstances including ex post adaptations.

The ex-ante transaction costs are the costs associated with the negotiation between the parties. The ex-post costs are associated with the monitoring of the quality of the reclaimed water. Both types of transaction costs are insignificant in relation to the overall benefits.

Deployment

The implementation of the EPI started in 2009 after the adoption of the Catalanian Water Reuse Program. Voluntary intersectoral water transfers was considered as the cheapest alternative to guarantee the water availability for irrigation and domestic purposes and also to improve the water quality of the Llobregat aquifer. The main stakeholders of the project were farmers, the water company of the metropolitan area of Barcelona, the water administration (at regional and local level), and the environmental administration. Because the intersectoral water transfer was made between farmers and the city, the cooperation and negotiation process between farmers and the water supply company was essential. As part of the regenerated water is used for environmental purposes the environmental administration was also involved in the project. The EPI has been introduced in the context of an economic crisis. Hence, it was essential to ensure cost recovery. The cost of regenerating the water is paid by and to domestic users in application of the polluter pays principle. However, the cost of distributing the regenerated water is paid by farmers since they profit from its use. In this way, the cost recovery of the process is ensured. The farmers affected by the instrument do not obtain agricultural subsidies; therefore, there are no economic distortions in the implementation of the EPI and no vested interests.

Success factors, barriers and future developments

After the implementation of the instrument and as a consequence of the important environmental education campaign carried out, farmers have started to use reclaimed water and thus freshwater has been released for urban use. Hence, the availability of water for the Barcelona metropolitan area has improved and the availability of irrigation water has been guaranteed, even in summer. Furthermore, domestic water consumption in the city of Barcelona in the period 2000-2010 has decreased from 133 to 107 liters per capita per day and the seawater intrusion in Llobregat aquifer has decreased noticeably. As regards economic impacts, the income of farmers has increased as a consequence of the abandonment of rain-fed agriculture and the use of reclaimed water for irrigation.
supply company has saved costs since it has been able to avoid water transfer from remote sources.

Voluntary intersectoral water transfer is affected significantly by institutional constraints. The careful definition of regenerated water uses and quality criteria has eased the design and implementation of the EPI. National and regional legislation relative to wastewater reuse imposes the quality criteria that regenerated water must meet. Hence, the cost of reclaimed water, and therefore the economic assessment of the instrument are indirectly determined by legislation. Information also plays an important role since to increase the willingness of farmers to use reclaimed water; they had to be made aware of the advantages and disadvantages of its use.

Voluntary intersectoral water transfer is a flexible instrument because it allows negotiation between the parties involved and can be adapted to local circumstances, including ex-post adaptations. The quantity of water transferred is adjusted depending on the water requirements of both farmers and city. This flexibility can facilitated the implementation of the instrument which can be considered relevant for other areas with water scarcity problems, because it is adaptable to local circumstances and can be modified ex-post implementation. The uncertainty is mainly associated with the environmental outcomes derived from the implementation of the EPI.

The EIP on water would be able to promote the methodology, an economic instrument, which is not always recognized as innovation, and create a focus for the development of further instruments across Europe. Additionally, the skills required to create and implement this type of innovation are exportable and an EIP could assist in the wider promotion of these.

References

5.3.9 Subsidies for ecologically friendly hydropower plants through favourable electricity remuneration in Germany

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Hydromorphology ecological status</th>
<th>Sector</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key objective</td>
<td>Improve the ecological status of water bodies affected by hydropower plants.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Financial incentives linked to renewable energy that minimises/improves impact on ecological/hydromorphological status of rivers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>Dependent on legislative framework.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Resulted in improved and modernised hydropower plant but lacks clarity on the nature of the ecological improvements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Promoting the approach in the context of differing legislative environments, providing greater integration with ecological benefit realisation through broader expertise.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description

The German Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG), which regulates the remuneration of electricity produced from renewable energy sources and fed into the public electricity grid, has been amended in July 2004 (and further in 2009) in order to provide economic incentives for hydropower plant operators to take ecological considerations into account. In particular, the amendment links the amount of payments for electricity to the amelioration of the ecological status of the water body part which is affected by hydropower use. In the case of hydropower plants up to 500 kW (the category which encompasses the highest number of plants operating in Germany) remuneration could increase by 2 cents/kWh to 9.67 cents/kWh according to the EEG 2004. The WFD requirement to reach good ecological status until 2015 on one side, and the existing, long lasting user rights for hydropower plants which provide them with legal security on the other side, made it necessary to give economic incentives to power plant operators in order to accelerate the ecological improvement process of the plants. In this context, the favorable electricity remuneration guaranteed for hydropower plants which implement ecological improvements is the main instrument chosen in Germany to handle these conflicting objectives between energy and water policy in the short term.

Drivers

Germany’s river water bodies are to a large extent subject to hydromorphological degradation. At present, only 10% of the watercourses have a high or good ecological status. Next to uses like agriculture, navigation and flood protection this is due to hydropower use. Taking into account Germany’s ambition to significantly increase the share of renewable energy in the
future electricity production, an important challenge consists in reconciling the extension of hydropower use and its impact on nature conservation needs.

**Benefit**

- Ecological improvement of affected water bodies through the modernisation of the hydropower plants.
- Possibilities upstream fish migration, protection measures for downstream fish migration.
- Provision of minimum water flows.
- Financial incentives for the small hydropower plants to implement improvements.
- The EEG apportionment constitutes only a minor part of the electricity bill of households, thus disproportionally high burden for electricity consumers has not occurred.
- Alleviate conflicts between water and energy policy targets.

**Deployment**

The EEG has been amended in July 2004 in order to provide economic incentives for hydropower plant operators to take ecological considerations into account. In particular, the amendment links the amount of payments for electricity to the amelioration of the ecological status of the water body part which is affected by hydropower use. More precisely, in its § 6, the EEG 2004 defines the conditions for remuneration which are either linked to reaching the GES or to substantially improving it compared to the previous status. The requirements depend on the capacity of the hydropower plants as well as on the year in which the permission to construct or to operate the plant has been obtained. The conditions which have to be fulfilled are twofold. Hydropower plants up to and including 500 kW for example, which were licensed since 2008, have to be in accordance with some location bound requirements; The second criterion is the improvement of the GES, in which the evaluation considers in particular the following aspects: biological continuity, minimum water flows, management of solids and reservoir management. For existing hydropower plants, these requirements can be met through a modernization of the plant, whereas the decisive aspect lies in the improvement of the state of the water ecology and of the accompanying floodplain. The EEG amendment has been accompanied with an operational guideline, in order to guarantee a nationwide consistent and transparent implementation. The evaluation of whether a substantial improvement in the ecological status has been reached is in the hand of the responsible water agency and has to be decided case by case. It has been recognized from the outset that this decision cannot be judicially controlled to the full extent. The evaluation takes place in the context of the mandatory approval procedure according to German water law. It has also been admitted in the beginning that the additional gain due to the EEG will often not be enough to finance all ecological improvement measures on existing hydropower plants. Therefore, the local conditions, the cost-benefit ratio of a measure from an ecological and an economic point of view as well as the depreciation period of the plant have to be
considered during the identification and determination of adequate ecological measures. As a mechanism of revision of the instrument, the German ministry of the environment (BMU) has to report regularly on the experiences made with the EEG. This includes in particular the ecological significance and the operational capability of the measures. In addition to those reports on experiences, research projects have been launched recently to evaluate the impact of the instrument.

In the year 2009, a relatively high number of plants has been modernized or new constructed. This can be explained by the fact that operators waited for the more attractive remuneration conditions of the EEG 2009 to come into effect. It can furthermore be expected that the predominant majority of the 78 new constructions of hydropower plants in 2009 took place on already existing hydropower sites. Most of those works are probably modernizations, which have been classified as new constructions due to the high investments. In those cases, the EPI gave an incentive to accelerate the adaptation of the plants to recent regulations – which ask to comply with the WFD requirements – by making new approvals necessary.

**Success factors, barriers and future developments**

Linking favorable remuneration of electricity generated by hydropower plants to ecological modernization works as done through the German EEG can be considered overall as a successful economic policy instrument, which promotes both the use of renewable energy sources and nature conservation efforts.

The analysis of this EPI showed that its choice and design details very strongly depended on existing institutions. The EEG from the year 2000, which guarantees a certain remuneration level for the renewable energy produced, provided the suitable framework for introducing ecological conditions. Using the already existing system (including the remuneration procedure, reporting rules etc.) significantly helped to keep the transaction costs of the EPI low. The most important criticism refers certainly to the lacking possibility to control the actual ecological improvements on site. Thus, it is important to ensure that the ecological improvements required target the most important environmental needs. Furthermore, it is useful to specify in the types of measures which could be implemented to be eligible for the increased remuneration. At the same time, the missing control of the actual ecological functionality limits the measurability of the environmental outcomes.

At the time of introduction of the instrument, it had been subject to significant data deficits, concerning for example a missing centralized inventory of all existing hydropower plants. Whereas this has changed in the meantime, information lags persist regarding the reporting of the types of measures implemented following the introduction of the EPI as well as regarding their environmental effectiveness.

With regards to the potential transferability of the instrument, it is evident that in contexts, where no harmonized remuneration system of hydropower plants exist, much more effort would be needed to create the necessary system, increasing significantly the transaction
costs of the EPI. Where such a system already exists, on the contrary, ecological requirements could potentially be introduced quite easily as it has been the case in Germany. An EIP on water would enable greater promotion of innovative economic instruments and may be able to determine how they might be more readily transferred to other countries, and activities other than hydropower.

References


5.3.10 Innovative public participation methods for the WFD implementation – Sweden, Estonia and the Netherlands

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Innovation type</th>
<th>Sector</th>
<th>Regional Constraints</th>
<th>Degree of success</th>
<th>Potential role for EIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>All aspects of WFD</td>
<td>Educational, Public Participation, Consultation.</td>
<td>Rural/Urban</td>
<td>None of significance.</td>
<td>Project itself was successful in demonstrating the approach but it is unclear whether it has been further exploited.</td>
<td>Promoting the approach for other communities and other water related decision making processes, dissemination to public bodies and customer management companies.</td>
</tr>
</tbody>
</table>

Description

River Dialogue is an international research project carried out from 2003 to 2004 and supported by the European Commission under the Fifth Framework Programme. It was aimed at identifying the best approaches to increasing public participation in the implementation of the EU Water Framework Directive, which includes preparation and implementation of river basin management plans. The project tested two innovative participatory methods of citizens’ involvement; focus groups and citizens’ juries.

- A Focus Group is a planned discussion among a small group of people on a specific topic. Obtained information is asked on social interaction, and the group setting allows individuals to use the ideas of others as cues to more fully elicit their own views.

- A Citizen’s Jury is a randomly selected panel of citizens, which meets for a few days to carefully examine an issue of public significance through discussions, examinations of
information, and questioning of witnesses. The members of the jury are given the chance to hear views and receive information from a variety of expert witnesses. Finally, the jury presents their recommendations to the problem issue.

These were organized in three European regions: in Sweden, in the Netherlands and in Estonia. The selected river basin case studies in these countries - the Motala Ström in Sweden, the Emajõgi River in Estonia, and IJsselmeer basin in the Netherlands - represent a diversity of cultural and socio-economic contexts in the new Europe in which the proposed approach should be implemented.

Drivers

Public participation in water management issues and decision making relevant to the implementation of the EU Water Framework Directive, including the development and implementation of river basin management plans.

Benefit

Project results indicate that, carefully planned and in the presence of a favourable atmosphere, the Focus Groups and Citizens' Juries are successful approaches for increasing public empowerment and also involving the public in the implementation of the EU Water Framework Directive and river basin management plans. Furthermore, they are proved to be useful instruments towards improving the communication of scientific information from scientists to water management practitioners and the public and increasing the experts' and scientists' ability to learn local knowledge from the public.

Deployment

The River Dialogue pilot project was prepared by Linköping University, Free University Amsterdam and Peipsi Center for Transboundary Cooperation in order to study and test new innovative public participation methods in environmental decision-making. The pilot project was implemented in 2003-2004 with the funding form European Union 5th Framework Programme.

Success factors, barriers and future developments

It is evident that there is still a lot of hesitation and uncertainties among the local people and the politicians about new and innovative public participation methods. The selection of the proper method is of key importance, in order to achieve the high commitment of stakeholders and to achieve the best results. Focus groups and citizens' juries have been proved to be effective participatory methods, suitable to use in different socio-economic, cultural and political backgrounds, in order to achieve higher public involvement in water management planning and collect opinions of stakeholders about major issues in a river basin.
The Citizens’ jury is definitely a more direct method for public participation in water management than the focus group is. Moreover, focus groups are very time consuming activities as they demand detailed planning from the beginning and a flexible time schedule during the process. The main advantage of the focus group over the in-depth interview is the fact that it is possible to obtain information more quickly because there are fewer meetings to plan. In addition, information obtained is asked on social interaction and the group work enables people to use the ideas of others to express their own opinion more clearly. Focus groups also help to increase water issues awareness among participants and secondly participants had an opportunity to voice their opinions.

An EIP might help to determine whether these tools can be used more widely and promote an innovative approach to public consultation.

References


5.3.11 Integrated management of all urban water components in Melbourne

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Water Scarcity, Demand Management</th>
<th>Sector</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Educational, technological, legal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Integrated Water Demand Management through involvement of all stakeholders and implementation of technology.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Innovative mix of management and legislative instruments linked to use of existing technological solutions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None of significance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Substantial reduction in water use across the city.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Example of a pilot to promote range of solutions. Link to international activities, sharing experience and transfer of practice.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description

The City of Melbourne has practised total water-cycle management since 2002, supported by its adoption of the Total Watermark policy in 2004 and the Water Sensitive Urban Design (WSUD) Guidelines in 2005 (City of Melbourne, 2005). Total water-cycle management is the integrated management of all components of the hydrological cycle within urban areas and landscapes – including water consumption, stormwater, wastewater and groundwater to secure a range of benefits for the wider catchment. The city has recently revised Total Watermark to place it within a ‘city as a catchment’ context.
Drivers
Drought management, resource efficiency, water demand management.

Benefit
Reducing demand for potable water; reducing energy for transport and treatment of water; increased efficiency of water use; increased public engagement and awareness.

Deployment
The City as a Catchment strategy deployed in Melbourne includes the following initiatives:

- Implementing Water Sensitive Urban Design (WSUD) including wetlands, rain gardens, storage tanks and permeable surfaces.
- Assisting other metropolitan municipalities to apply the City as a Catchment approach
  Introducing changes to road maintenance, building and construction practices for conserving water, water harvesting, improving water quality, and improving the health of waterways.
- Assisting large non-Council sites to implement WSUD.
- Undertaking a climate adaptation analysis and works to feed into storm water harvesting and microclimates.
- Rolling out a sustainable building program with the private sector to reduce energy and water use (1,200 Buildings Program).
- Supporting continued research into urban advancement towards water sensitive cities using the City of Melbourne as a pilot.

Melbourne implemented the following interventions across the public and private sectors (City of Melbourne, 2009).

<table>
<thead>
<tr>
<th>Actions</th>
<th>Reduction in water demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parks</td>
<td>40%</td>
</tr>
<tr>
<td>- Irrigation efficiencies (subsurface, soil moisture sensitive, technological improvements, limited time).</td>
<td></td>
</tr>
<tr>
<td>- Understanding of soil types and subsequent soil moisture needs.</td>
<td></td>
</tr>
<tr>
<td>- Mulching to prevent evaporation.</td>
<td></td>
</tr>
<tr>
<td>- Planting climate responsive, drought tolerant species.</td>
<td></td>
</tr>
<tr>
<td>- Staff training programs and contract provisions.</td>
<td></td>
</tr>
<tr>
<td>Council buildings</td>
<td>40%</td>
</tr>
<tr>
<td>- Efficient fittings – flow restrictors on taps, showerheads.</td>
<td></td>
</tr>
<tr>
<td>- Efficient toilets – dual flush, reduced header tank flow.</td>
<td></td>
</tr>
<tr>
<td>- Fire-sprinkler testing (reduced from weekly to monthly, or recirculating)</td>
<td></td>
</tr>
<tr>
<td>- Cooling tower efficiencies.</td>
<td></td>
</tr>
<tr>
<td>- Staff training, contract provisions, education and behaviour change programs.</td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
</tr>
<tr>
<td>Fire sprinkler testing (reduced from weekly to monthly, or recirculating).</td>
<td></td>
</tr>
<tr>
<td>Cooling tower efficiencies.</td>
<td></td>
</tr>
<tr>
<td>Appliances – efficient washing machines and dishwashers.</td>
<td></td>
</tr>
<tr>
<td>Reduction in water use up to 50% per employee achieved through alternate water sourcing.</td>
<td></td>
</tr>
<tr>
<td>Efficient fittings – flow restrictors on taps, showerheads.</td>
<td></td>
</tr>
<tr>
<td>Gardens – efficient species, layout and irrigation (to be maintained when water restrictions are not in place).</td>
<td></td>
</tr>
<tr>
<td>Property management and tenant behaviour change programs.</td>
<td></td>
</tr>
<tr>
<td>Proceed with the rollout of water conservation projects currently being trialled including installation of waterless woks, cooling tower program, fire sprinkler testing program, green hotels and sustainable office building program.</td>
<td></td>
</tr>
<tr>
<td>Residences</td>
<td></td>
</tr>
<tr>
<td>Efficient fittings – flow restrictors on taps, showerheads.</td>
<td></td>
</tr>
<tr>
<td>Appliances – efficient washing machines and dishwashers.</td>
<td></td>
</tr>
<tr>
<td>Gardens – efficient species, layout and irrigation (to be maintained when water restrictions are not in place).</td>
<td></td>
</tr>
<tr>
<td>Swimming pools – pool covers, re-use of backwash.</td>
<td></td>
</tr>
<tr>
<td>Householder behaviour change through education.</td>
<td></td>
</tr>
<tr>
<td>Balance ring mains, fire sprinkler and cooling tower efficiencies.</td>
<td></td>
</tr>
<tr>
<td>Efficient fittings and appliances.</td>
<td></td>
</tr>
<tr>
<td>Householder behaviour change through education.</td>
<td></td>
</tr>
</tbody>
</table>

Based on activities to date, the City of Melbourne has achieved:

- 70% reduction in council water use
- 44.7% reduction in water use per resident
- 41.5% reduction in water use per employee
- 16% reduction in water pollution entering Melbourne’s waterways.

**Success factors, barriers and future developments**

The success and innovation of Melbourne’s approach stems not from the individual interventions which in themselves are new but not novel, but rather from their deployment as a bundle of measures, focusing on distributed solutions and interventions, within a coherent long term strategy and vision. The fact that the strategy spans traditional stakeholder boundaries and cuts across the public and private sector implies that part of the innovation and value is in how different parties were brought together, solutions implemented and correction were made as the program progressed. An EIP on water would highlight experience elsewhere and enable appropriate transfer into Europe, and would provide a focus for international co-operation on shared problems.

**References**

5.3.12 Greywater recycling – Pontos Aqua Cycle

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Water Scarcity, Demand Management</th>
<th>Sector</th>
<th>Urban/Industrial</th>
</tr>
</thead>
</table>

| Innovation type       | Technological.                    |              |                 |
| Key objective         | Reduce energy and water demand, increase use efficiency. |              |                 |
| Innovative element    | Integrating multistage filtration with low energy UV disinfection. |              |                 |
| Regional Constraints  | None.                             |              |                 |
| Degree of success     | Fully commercialised and in use across Europe. |              |                 |
| Potential role for EIP| Links to energy/water use, provide greater exposure and support for global marketing. |              |                 |

Description

Pontos Aqua Cycle is a grey water recycling system, developed and currently supplied by Hansgrohe International of Germany. As well as providing high quality processed grey water, which meets the hygiene requirements of the EU Bathing Water Directive, the systems have the added benefit of having the option to incorporate heat recovery. The Pontos treatment includes a patented biological/mechanical process with no chemical additives. The grey water is cleaned in multiple stages and disinfected by an energy saving UV-radiation system. The Pontos Aqua Cycle Systems require little maintenance. (Hansgrohe International, no date).

Drivers

Water scarcity and energy reduction.

Benefit

The key benefit of the Pontos Aqua Cycle systems is the reduction in water demand. As water is treated and reused on site, the demand for mains water decreases, as does the volume of water discharged to sewer. The Pontos Aqua Cycle systems have the added benefit of the option of heat recovery. The heat recovery systems help to heat the building it is located within, reducing heating costs and in many cases reduction of fuel use to heat the building.

Deployment

Pontos Aqua Cycle systems are installed across Germany, France and Spain in large scale residential, commercial and recreational facilities (detailed in 5 example installations on the Hansgrohe International website). These examples include hotels, apartment buildings and swimming pools (Hansgrohe, no date).
Success factors/barriers and future developments

The ability of the Pontos Aqua Cycle system to offer both water and energy saving in one installation makes it appeal to customers. Retrofitting the product will reduce business overheads, or conversely developers may be attracted to the product as a result of its ability to aid in compliance with environmental building standards, or simply because it will increase the desirability of their development.

An EIP on water would provide more integration between water and energy efficiency, provide a formal link to other sector initiatives and provide support for wider exploitation and commercialisation.

Reference


5.3.13 PP-EKO ROVAPO process

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Water Scarcity, Chemical pollution</th>
<th>Sector</th>
<th>Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Technological.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Reduced water use, zero discharge factories.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Evaporation technology that recovers water and dry solids.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Commercialised, one of number of technology products from a Poland based company.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Support for new technology development, link into integrated programmes, exposure to global markets.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description

PPenko of Poland has developed a range of original “zero-discharge” technologies, called ROVAPO. The ROVAPO range allows for full recovery of water from industrial effluent. Concentrated sludge from chemical treatment and salt concentrate from an evaporator, which contain around 50% dry matter, are the only types of waste left after the treatment process. The systems can produce water for a range of production processes including partially desalinated water (possibly used for heating), deionised water (for use in pharmaceutical processes) and demineralised water (for use in galvanic industry processes) (ppeko, 2011).
Drivers
Sustainable use of water.

Benefit
The treatment allows for recovery of water and minimises solid waste from industrial effluent.

Deployment
The technology is currently being used by Polish, as well as other companies. The company names many manufacturing, processing as well as municipalities as past clients, mostly in Poland (ppeko, 2011).

Success factors/barriers and future developments
Recovery of water from industrial effluent makes possible the sustainable use of water in industrial situations as well as reducing water cost for industrial users.

An EIP on water would provide more integration between water and energy efficiency, provide a formal link to other sector initiatives and provide support for wider exploitation and commercialisation.

Reference

5.3.14 i²O Pressure Management System

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Water Scarcity, Demand Management</th>
<th>Sector</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Technological, Business Systems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Reduce leakage and bursts in water supply networks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Real time monitoring linked to intelligent pressure control valves managed by pattern recognition software.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>Developed in UK, commercialised in Malaysia, now entering European Market.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Could have accelerated commercialisation in Europe to establish base market prior to global exploitation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Description

i2O provide a pressure management system. Pressure in the supply system is remotely monitored, when pressure is unnecessarily high for demand, the system automatically adjusts input supply/pressure in order to reduce leakage and burst rates. The system automatically increases supply pressure again when the system is loaded with greater demand.

Drivers

Water scarcity, demand management, infrastructure protection.

Benefit

Reduction in leakage rates can be achieved without actually physically repairing leaks. The i2O system reduces leakage from all leaks, big or small. As a result the system will reduce leakage from smaller leaks which the water companies have difficulty in finding. The lower and more consistent pressure regime reduces the frequency of burst and extends asset life.

Deployment

i2O has installations in the U.K., Spain, Italy, Turkey, Cyprus, Romania, Saudi Arabia, South Africa, Mexico, Colombia, Chile, Malaysia, Philippines and Thailand.

Success factors/barriers and future developments

i2O developed the system in the UK but found it very difficult to penetrate the UK water companies, partly because of a lack of track record but largely because of the conservative, risk-aversion nature of the sector. The company established itself first in eastern Asia and is has more recently established a European customer base. An EIP on water would have been able to provide a base for establishing the market in Europe, and then assisted in developing an export market, accelerating development and commercialization.

5.3.15 HYBACS

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Chemical pollution, biological/ecological</th>
<th>Sector</th>
<th>Urban/Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Technological, construction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Improved quality of water bodies receiving wastewater treatment discharges, with reduced construction costs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Increases capacity and capability of existing treatment works by addition of modular biological treatment units. Energy use is minimised.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>After substantial period of demonstration the technology is now installed globally.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Could have accelerated commercialisation in Europe to establish base market prior to global exploitation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description**

The HYBACS treatment system developed by Bluewater Bio is a biological process that is retrofitted to existing wastewater treatment process to enable greater removal of nitrogen and phosphorus from wastewaters as well as carbonaceous matter with minimal increase in energy use and need for large capital build.

**Drivers**

Increased treatment requirements to achieve improved ecological status.

**Benefit**

Low capital and energy requirements to achieve increased capacity to remove nitrogen and phosphorous. Improved quality of treated wastewater discharged to the environment.

**Deployment**

HYBACS has been installed in over 35 applications globally.

**Success factors/barriers and future developments**

Entry of a very novel process to the market was difficult and required extended proving trials with a number of separate end-users. An EIP on water would have been able to provide a base for establishing the market in Europe, and then assisted in developing an export market, accelerating development and commercialization.

**Reference**

5.3.16 Pearl Process

<table>
<thead>
<tr>
<th>Pressure/Driver</th>
<th>Chemical pollution, biological/ecological</th>
<th>Sector</th>
<th>Urban/Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation type</td>
<td>Technological.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key objective</td>
<td>Improved quality of water bodies receiving wastewater treatment discharges, with reduced construction costs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative element</td>
<td>Use of a targeted precipitation process within the standard biological treatment process to remove phosphate as a usable end-product.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Constraints</td>
<td>None.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of success</td>
<td>After substantial period of demonstration the technology is now installed globally.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential role for EIP</td>
<td>Could assist in technology transfer to improve European capacity in wastewater treatment and established links with international company for technology exchange.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description

The Canadian organisation, Ostara, offers the Pearl Process as an extra component in waste water treatment. The process recovers phosphorus and ammonia from waste water through precipitation of the mineral struvite.

Drivers

Increased treatment requirements to achieve improved ecological status, in particular increasing requirements to remove phosphorous.

Benefit

Relatively low capital costs and produces a by-product (struvite) that has value as a marketable product.

Deployment

Developed in the US but struggling to find market in Europe.

Success factors/barriers and future developments

Acceptance of the by-product and the use of a non-traditional method of wastewater treatment.in a conservative sector is a delaying factor.
Reference