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INNOVATION FOR THE UK WATER COMMUNITY: OPPORTUNITIES AND BARRIERS

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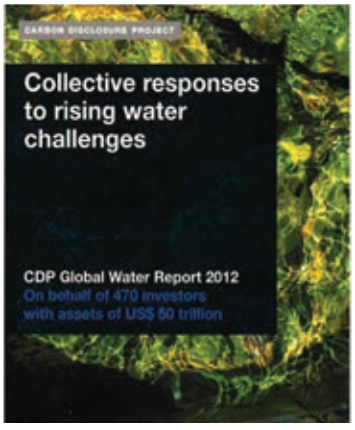
THE FOLLOWING ARE MY PERSONAL VIEWS after twenty years working at the interface between the water research community, government policymakers and industry, and more recently on the Natural Environment Research Council (NERC) three year, £1.8 million Water Security Knowledge Exchange Programme (WSKEP) *(http://www.wskep.net)*.

The state of UK water innovation is examined under four topics: Global context; UK barriers; UK opportunities; future directions. 'UK water community' is used to describe all water dependent sectors – from irrigation, hydro- and thermo-electric power, construction, manufacturing, recreation, etc, to the water utilities, government, civil society organisations as well as the research community. The 'research community' includes the funding bodies and researchers.

THE GLOBAL CONTEXT: WATER CRISIS AND OPPORTUNITY

Looking beyond the hype there is plenty of evidence of a real global water crisis. For multinational corporations water related risks are now designated as the highest probability, greatest impact risk to the survival of their businesses. Through their global network of operations they are experiencing the financial consequences of increasing water related risks *(http://reports.weforum.org/global-risks-2013/)* and *(http://www.wbcsd.org/work-program/sector-projects/water/truevalueofwater.aspx)*. With initiatives such as the Carbon Disclosure Project (CDP)-Water *(https://www.cdproject.net/water)* enabling fund managers to make investment decisions based on how companies manage their water risks, water is now a board-level issue. It is not just a social responsibility issue.



This reality is echoed by the OECD, UN agencies, national governments, professional institutions, academic think tanks, and NGOs.

Welcome to the autumn issue of the FWR Newsletter

In our lead article, Neil Runnalls of WSKEP (Water Security & Knowledge Exchange Programme) gives us his views on both the opportunities and barriers to innovation for the UK's water community.

FWR have recently been awarded a grant from Defra to continue as host of the South Chilterns catchment partnership, so we are busy working with the Environment Agency and our other partners to identify suitable environmental improvement projects in the three sub-catchments.

On the back page you will see details of the newly launched David Newsome award for postgraduates, which will be awarded for writing a 'Review of Current Knowledge'.

John Pinder provides us with a brief account of the recent annual meeting of the UK and Ireland Lakes Network which this year was held in Dublin.

Phosphate in wastewaters takes centre stage in 'Wastewater Matters', looking at a number of phosphate recovery technologies, and in-sewer processes are discussed in Tim Evans' article following the 7th International Conference on Sewer Processes and Networks.

For information on events and news highlights please go to our website *www.fwr.org*. You can also contact us via email *(office@fwr.org.uk)* or telephone (01628 891589).

Maxine Forshaw - Editor

THIS ISSUE

THREAT AND OPPORTUNITY

SIR JOHN BEDDINGTON, in his role as Government Chief Scientific Advisor, has highlighted both the threats and opportunities of this 'crisis' to the UK. Appreciating the threat, many multinationals have set ambitious targets to reduce their water related risks both in their own operations and through their supply chains. This has initially involved taking the low hanging fruit – improving in-house water use efficiency using existing technology. The second wave focuses on water risks throughout the supply chain. The emerging third wave involves rethinking basic assumptions, seeking radically better technologies and diverse types of collaborations.

National governments are also responding to these challenges and opportunities, with massive investments in research and innovation. These investments target either reducing national vulnerability (Israel, Singapore, Australia, Spain, Gulf States, the Netherlands), or attracting investment by guaranteeing abundant high quality water and expertise (Canada and Scotland).

A common factor to these private and public sector actions is the demand for both **innovation and collaboration.** It is in this space that 'knowledge exchange' operates, and where WSKEP has sought to contribute.

THE UK SITUATION

THE LACK OF INNOVATION in the privatised English water utilities has been the subject of numerous government reviews, and studies by industry bodies, professional associations and academics. The disincentives to research and innovation are hard-wired into the regulatory framework that established the private sector-regulator relationships. The bottom line is predicated on securing private funding by guaranteeing low risk, 5-6% returns to investors for eternity. Change must not threaten those returns.

While it is generally agreed that UK water infrastructure is groaning under the weight of a century of incremental improvements to a Victorian foundation, the preservation of these assets is regarded as sacrosanct. A technology leap or a radical new approach that might leave assets stranded is considered as a threat, rather than an opportunity. Because of the influence of the English utilities upon the whole UK water community, their lack of an innovation culture has had a far-reaching negative impact upon innovation in other water dependent industries.

Will the new Water Act result in mere box ticking - or will it deliver a fundamental change in corporate culture? A TOTEX (total expenditure) approach will only tweak the edges. It is unlikely we will see the English water utilities doing cutting edge research and innovations necessary to drive their overseas businesses.

OTHER BARRIERS TO A WATER INNOVATION CULTURE IN THE UK

These include:

1. A lack of high-level political support for water and limited political awareness of the threats and opportunities that the global water crisis presents to the UK. Without strong leadership at national level there has been limited demand for better coordination across the UK water community.
2. There is no national water organisation that takes an overview across all the UK's water interests, both within the country and overseas in trade, aid and foreign policy.
3. There are over 100 trade and professional bodies with water interests, acting on behalf of different sectors. Some of these organisations are world leaders in 'knowledge exchange' – but there is a lack of communication, coordination or collaboration between these groups.
4. Managing the tension between curiosity driven research and applied research remains a challenge for Research Councils and academics, and is a source of frustration for industry. Strongly held basic philosophical barriers exist to effective collaboration with industry.
5. Academics rarely act on behalf of the water community as a whole, but focus on their own narrow interests.
6. The seven Research Councils have historically worked in almost hermetically sealed silos. While coordination of water research funding is slowly improving, the mechanisms to facilitate collaboration need to be strengthened. Other countries have set up 10 to 20 year, £500+ million water research programmes that are designed from the start to deliver integrated multi-disciplinary science.
7. The Technology Strategy Board and UKTI (UK Trade & Investment) put a low priority on water – and who can blame them?
8. Lack of national coordination has reduced the UK's ability to influence and benefit from the water research and innovation funded by European institutions such as the Water Supply & Sanitation Technology Platform (WssTP); ACQUEAU (one of the seven clusters of the EUREKA network); European Innovation Partnership on Water; and the Water Joint Programming Initiative (Water JPI). This contrasts with the better coordinated, long term national policies and actions of other European countries.

OPPORTUNITIES FOR THE UK WATER COMMUNITY

THERE ARE POSITIVE aspects in UK water research and innovation. Unique selling points (USPs) include:

1. World-leading universities that produce breakthroughs in fundamental understanding, and attract some of the best brains to learn and undertake research. The UK leads in research in areas of nano- and biotechnology, IT, and climate, environmental and social sciences.
2. Worldwide recognition of the UK's skills in project management.
3. A dynamic business environment that encourages entrepreneurship.
4. One of the world's largest financial centres.
5. Diverse expertise from managing water in the very different conditions found across the UK – from wet rural mountains to water stressed cities.
6. Water supply and wastewater treatment systems that provide reliable delivery of safe drinking water to >99% of the population.
7. Transparent social and political systems relatively free from corruption that support sound local and national decision-making.

Readers of this article will no doubt have additional or alternative UK USPs. Taken together, these provide a strong base from which to move forward.

FWR Water Supply
the information centre for water, wastewater and related environmental issues

MOVING FORWARD: THE SCOTTISH HYDRO-NATION

THE HYDROLOGY AND POLITICS of Scotland have combined to produce the Hydro-Nation policy *(http://www.scotland.gov.uk/Topics/Business-Industry/waterindustryscot/ScotlandtheHydroNation)*. This policy mobilises government bodies, the private sector and the research community to drive water research and innovation, attract investment in Scotland, and to promote Scottish businesses on global markets. Actions to improve the coordination between Scottish government, industry and the research community are underway – and Scotland is being promoted on the world stage *(http://www.worldwatercongress.com/)*. While it is still early days, this policy will cast a long shadow over the less coherent water situation south of the border. The Hydro-Nation policy will probably provide clear proof of what can be achieved if there is high-level political support for water.

MOVING FORWARD: OTHER OPPORTUNITIES?

If change were to happen, it may emerge from the following:

1. New legislation can drive innovation. The recent Climate Act has encouraged novel thinking on reducing energy use. The forthcoming revisions to the WFD (Blueprint for Safeguarding Europe's Water Resources) *(http://ec.europa.eu/environment/water/blueprint/)* will also provide additional impetus to innovation. These and other pieces of legislation should nudge forward any culture change that might result from the new Water Act.
2. The UK Water Research and Innovation Partnership (UKWRIP) *(http://www.ukwrip.org)* is now looking increasingly fragile. To deliver on its vision, UKWRIP will need to secure high-level political support, and increase buy-in by government departments and from across the Research Councils. The future of UKWRIP now rests with the private sector – and must deliver benefits not available from existing structures.
3. The new Joint Water Evidence Group (JWEG) for Defra, EA, Natural England and the Forestry Commission is starting to improve coordination of evidence needs across these organisations. *(https://www.innovateuk.org/c/document_library/get_file?groupId=3058188&folderId=3918930&title=Joint+Water+Evidence+Group+Plan+to+Enhance+Collaborative+Working.pdf)*. There is, however, scope for stronger cross-departmental coordination on other water issues, eg flooding.
4. The increasing strength of Research Councils UK (RCUK) or Council restructuring may lead to the funding of more integrated water research and knowledge exchange.
5. The Department for Business, Innovation & Skills (BIS) is rolling out new criteria to assess the performance of university academics based on the 'impact' of their research to the UK economy and society. This will drive university managers to increase support for industry-research collaboration and the pull-through from basic research to applications.
6. A promising development in the university sector is the emergence of cross-disciplinary water groups. Examples include Water@Leeds, the SWIRL group at Surrey (Surrey Water Innovation, Research & Learning), and Oxford Water, among others. Water@Leeds now boasts to be the largest water research group in Europe. Hopefully these groups will work together to provide a strong voice for UK water research.
7. The increased concern about water risks by the private sector - multinationals, the insurance sector and fund managers – will drive more innovation. But the UK could be easily bypassed as these groups will acquire their water innovations from anywhere in the world.
8. The UK has many companies that have the bravery, skills and vision to grow their overseas businesses using their own initiative, without a supportive home market, or the research, innovation, trade or political support enjoyed by their competitors.

IN CONCLUSION

There are major opportunities for innovation in an increasingly water stressed world – but there are also barriers to the UK exploiting these opportunities.

Success will require greater collaboration and commitment to innovation. The Scottish Hydro-Nation initiative could show the way forward - but the English water utilities will probably hold back these efforts. Working with these realities, we need to leverage whatever support presents itself in order to exploit the USPs of the UK and meet global demand.

Some of the outputs from WSKEP are available through the programme website, and from:

- *http://www.ukwaterresearch.net/ and http://waterr2b.net/.*

Further sources of information for 'The Global Context: Water Crisis and Opportunity'

- *http://www.oecd.org/env/resources/Water%20Security%20for%20Better%20Lives-%20brochure.pdf*
- *http://www.oecd.org/env/resources/Water%20and%20Climate%20Change%20Adaptation-%20brochure.pdf*
- *http://www.unwater.org/downloads/Final9Aug2013_WATER_THEMATIC_CONSULTATION_REPORT.pdf*
- *http://www.ice.org.uk/topics/water/Policy/State-of-the-Nation*
- *http://www.gwsp.org/fileadmin/documents_news/Bonn_Water_Declaration_final.pdf*

Websites of some of the European institutions that fund water research and innovation:

- *http://www.wsstp.eu/; http://www.acqueau.eu/*
- *http://ec.europa.eu/environment/water/innovationpartnership/*
- *http://www.waterjpi.eu*

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Wastewater Matters

Focus on Phosphate

Tim Evans,
FWR Wastewater Section Co-ordinator

SEVERAL EARLY ADOPTERS in different countries are recovering (as distinct from removing) phosphate during wastewater management. Currently we only think about removing P from wastewater to prevent eutrophication when the recovered water is returned to the water environment. The Urban Wastewater Treatment Directive requires (for discharge to 'sensitive waters') removal to 2 mgP/L for 10k–100k population equivalents, to 1 mgP/L for >100k p.e., or 75% reduction of the influent phosphorous. Consents of 0.1 mgP/L are being applied in some places even though the link between water quality and P concentration is somewhat ambiguous.

The planet's phosphate is being mined at an alarmingly rapid rate. Phosphate is essential and it cannot be substituted by any other element. It is found in DNA, cells' energy cycles, bones, etc, and it is the least abundant of the major plant nutrients. At the current rate of extraction, today's mines will be exhausted by the end of this century. Estimates of future reserves range from 200 to 400 years. In the future, might there be an obligation to recover P as part of the strategy to steward the planet's phosphate?

The equivalent of about one-third of the phosphate imported by the EU ends up in its urban wastewater (there is virtually no indigenous phosphorous in the EU). Adults excrete 98% of their dietary intake of phosphate because cells are being turned over rather than new ones being laid down.

About half the P in wastewater ends up in the biosolids (sewage sludge). The UK has a good record on using biosolids on farmland to complete nutrient cycles and contribute to conserving soil organic matter. The UK recycles 80% of its biosolids but the average for the EU as a whole is only 37% (by dry weight). So, overall, the EU recycles about 20% of the P in wastewater and squanders 80% in effluent, landfill, ash, etc.

Sweden has a target that 'by 2015 at least 60% of phosphorus compounds present in wastewater will be recovered for use on productive land. At least half this amount should be returned to arable land'. Germany is considering a P recovery obligation. Most Member States are still focussed on the hazards of wastewater and have yet to wake up to wastewater as a potential resource.
The UK is unusual in dosing phosphate into the public water supply to reduce plumbosolvency (dissolution of lead from old pipework). Most water is dosed because it is not practicable to target only the properties with lead supply or internal lead plumbing. Taking 1 mg P/L as an average dose this equates to about 15,000 t P_2O_5/y. To put this in context, the total phosphate fertiliser use in the UK is [only] about 200,000 t P_2O_5/y. More than 80% of phosphate is used as fertiliser. Lining pipes with blown-in-place epoxy lining (half the cost of replacement) or replacing lead pipes would be more protective of consumer health, eliminate a significant use of phosphates, seal leaks, have a better whole-life cost and reduce the cost of removing phosphate at wastewater treatment works (WwTWs).

Technologies for recovering phosphate in WwTWs, as distinct from removing it, are available and new ones are being developed. It is tried and tested. In Japan, Fukuoka City WwTW has captured phosphate from sludge dewatering liquor as struvite (magnesium ammonium phosphate) since 1997, and Shimane Prefecture Lake Shinji East Clean Centre commissioned its first struvite recovery plant in 1998 with the objective of reducing the cycling of P within the works (P in dewatering liquors represented 70% of the load on the WwTW). The crystallisation process excludes contaminants so the struvite is more than 99% pure $MgNH_4PO_4.6H_2O$. The struvite is sold as fertiliser that is widely used for paddy rice, vegetables and flowers. About 10 years later, companies in the West started selling struvite recovery plants. The first struvite plant was commissioned in the UK in 2013. Engineers rush to be second; we should be cherished early adopters.

Berlin Water and Thames Water both developed struvite recovery in the early 2000s using equipment built in-house. This was mainly to prevent uncontrolled and problematic struvite precipitation in pipes and pumps; the idea being to make the precipitation occur where it was not going to be a problem rather than let it crystallise where it would be a problem. Berlin Water has continued with its Airprex process and has developed a market for its fertiliser. It is the lead registrant of struvite under REACH (Registration, Evaluation, Authorisation and restriction of CHemicals) (EC 232-075-2; CAS 7785-21-9). Rachel Green of REACH Facilitation Company (ReFaC) advises that each producer of struvite is required to register under REACH but that if it can co-register under Berlin Water's registration, the cost of producing the dossier should only be of the order of £5000 including ReFaC's fees to negotiate the process. An additional cost for the European CHemicals Agency's (ECHA) administration, based on the company's [initial] annual tonnage of struvite produced, will also be applicable (ranging from €24,901 for >1,000 tpa to €450 for 1–10 tpa). It is probable that subsequent production facilities would come under the initial registration with no extra fee.

Struvite recovery from dewatering liquor after anaerobic digestion would make sense on a whole-life cost basis for many WwTWs (especially those operating biological

Struvite Granules – Courtsy of Tim Evans.

phosphate removal) rather than recycling it back through the treatment works. Even more phosphate can be recovered by blending some primary sludge with the waste activated sludge (WAS) to render it anoxic (which causes phosphate-accumulating bacteria to release their luxury phosphate) prior to thickening and then sending the thickener liquor to the struvite plant. This stripping from WAS predigestion has the added benefit that reducing the P concentration in liquid digested sludge improves dewatering and reduces polyelectrolyte demand. Recovering P reduces the cost of wastewater treatment, reduces the cost of dewatering, improves cake dryness, reduces the cost of cake haulage and eliminates struvite scaling from pipes and other places; it is a quintuple win. Small & Medium-sized Enterprise (SME) fertiliser companies are keen to enter into contracts to buy the struvite. Why have we waited so long?

Struvite has good fertiliser properties and it is far from new. Sir James Murray patented the use of struvite as fertiliser in 1857, the same time as superphosphate was developed. In fertiliser terms, struvite is 5.7% N : 29% P_2O_5 : 0% K_2O : 16% MgO. Typically, crops take up nutrients from soil in the ratio of approximately 2 : 1 : 1 (N : P_2O_5 : K_2O). Clearly, it is not a complete fertiliser; blending with other ingredients to make compound fertilisers is agronomically sensible.

European Sustainable Phosphorus Platform: regulatory issues concerning the use of recycled phosphates in agriculture (September 2013) – Courtesy of Julian Hilton

The second generation of P recovery technologies is in development. Several act on the wastewater and can reduce the P concentration to the Urban Wastewater Treatment Directive requirement, or less.

The following are examples:

- Electrochemical recovery of struvite from wastewater using sacrificial magnesium anodes. Adding magnetite doped with a P absorbent to the wastewater, the magnetite is a carrier that can be retrieved magnetically and the doped absorbents recharged, releasing the phosphorous.
- Zirconium ferrite has also proved useful as a magnetically retrievable, rechargeable P-absorber.
- Selective electrodialysis methods using membranes have been tested to concentrate the P so that it can be converted to struvite.
- Calcium phosphate reaction has been offered but it does not appear to have been a commercial success.
- Bacterial mineralisation, which has contributed to the formation of minerals (including phosphates) since the beginnings of life on earth, is another area of investigation.
- Finally, there is P recovery from incinerator ash. Cranfield University, in collaboration with Severn Trent Water and other water companies, is testing several of these technologies at a WwTW in the UK; results are expected early/mid 2014.

Recovering P from urban wastewater is a major opportunity for reducing the rate at which we are exhausting the reserves of this vital non-substitutable element. It need not cost more in money or carbon. On a global scale I think it is certainly more important than removing nanoparticles, endocrine active substances, pharmaceutical and personal care product residues, etc.

100 Years of Activated Sludge

The Point, Lancashire Cricket Club, Manchester

2 – 3 April 2014

To commemorate the achievements of Ardern, Lockett and Fowler at Davyhulme, the CIWEM Wastewater Mangement Panel and Aqua Enviro are organising a centenary event. United Utilities are the lead sponsor for the event, and will be hosting a site visit to Davyhulme.

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In-sewer Processes

7th International Conference on Sewer Processes and Networks

28-30 August 2013 Sheffield University

Tim Evans, *FWR Wastewater Section Co-ordinator*

FOR MOST OF THE PUBLIC, sewers are out of sight and out of mind. Even most wastewater professionals think of sewers only as conduits moving wastewater from source to treatment, but there is a whole complex and changing microbial ecosystem in the biofilms on the sewer walls that only a minority of people think about.

Sampling biofilm from a sewer wall in Nantes, France. *Courtesy of Catherine Biggs.*

We all know that in a flooded sewer, when there is no headspace air to replenish the dissolved oxygen in the wastewater, it becomes septic due to biodegradation of organic matter. As the redox potential drops, first nitrate is reduced to nitrogen gas and then sulphate is reduced to sulphide. Hydrogen sulphide (H_2S) smells of rotten eggs, has a very low odour threshold (0.00047 ppm) and is poisonous (the toxicity is comparable with that of hydrogen cyanide or carbon monoxide).

When it enters an aerobic environment (eg a pumping station, gravity sewer, drop-shaft or manhole), H_2S is converted to H_2SO_4 (sulphuric acid) that corrodes steel, electrical equipment and concrete. Interesting information was presented on the greater resistance of calcium aluminate cement compared with conventional Portland cement. Most of this biotransformation is effected by bacteria in biofilms, rather than bacteria dispersed in the flowing wastewater. Many of the papers considered this sulphur cycle because, although the principle is established, the techniques for modelling (and the necessary measurement techniques) have only become available recently. This raised a question of whether H_2S release and H_2SO_4 production is going to be an unanticipated phenomenon at drop-shafts connecting combined sewer overflows into stormwater tunnels.

Traditionally, H_2S production has been prevented by dosing nitrate at the inlet to flooded sewers (rising or forced mains); this is expensive but less costly than infrastructure corrosion. A novel approach from Brisbane, Australia involves intermittent dosing with nitrous acid and hydrogen peroxide. The process, called 'Clovis', proved effective in a six-month trial dosing a rising main. A regime of dosing with $HNO_2+H_2O_2$ for 8 hours followed by 10 days' recovery kills the biofilms and then allows regrowth, but since the sulphur bacteria grow more slowly than beneficial bacteria, no unintended detrimental effects have been observed. Prof. Jiang said that the cost of 'Clovis' was less than one-tenth the cost of calcium nitrate and dismissed Ecolyse Inc's approach of killing S-reducing bacteria specifically using selected, cultured bacteriophages, but then, biocontrol using bacteriophages is a competitor for chemical control.

Another unanticipated phenomenon, that is obvious with the benefit of hindsight, is a consequence of campaigns to reduce water usage and to encourage greywater reuse. Wastewater flows, especially at the top ends of sewer networks in those cities that have been most successful in driving down domestic consumption, are becoming insufficient to flush the sewers. Consequently, sediment build-ups are occurring; these deposits can be anaerobic at depth and generate H_2S. Sewer flushing was recorded by Pliney the Elder as long ago as 77 BC and installed extensively into the 20th century. Public health engineering luminaries Bazalgette, Belgrand, Chadwick and Lindley all recommended planned sewer flushing. For some reason its popularity decreased after WWII. Severn Trent installed automatic sewer flushing in the late 20th century and it was very effective but was abandoned after a change of staffing. With decreasing water use, sewer separation and the availability of modern materials and controls, the time seems to be ripe to develop and deploy equipment to flush at-risk sewers in a planned and proactive manner rather than simply relying on the serendipity of wastewater discharges (or storms in combined sewers) which is what we do today.

There is a strong team at Sheffield studying the complex microbial ecology in sewer biofilms. Fewer than 10% of species are culturable so methods based on DNA fingerprinting have been used. Research shows that microbial population profiles differ from place to place within a sewer and from town to town, presumably reflecting the characteristics of the wastewater flowing through the sewers and the conditions at different depths, intermittent drying, aeration, etc. However, we do not yet know the functionalities of the components of these ecosystems and whether it will be possible to harness them for enhanced in-sewer treatment.

I presented a paper applying a mass balance to the data from systematic influent monitoring in Surahammar, Sweden. The flow and load into the wastewater treatment works did not change significantly despite food waste disposer use increasing from 0 - 50% of households; biogas increased by 46%. Biofilms appear to have removed 103 gCOD/capita.day, 44 gBOD/cap.d and 3.1 gN/cap.d for people using food waste disposers. It would be interesting to see how the biofilm ecology has changed. There is much more to discover about the dark world of sewers.

To remove the 'Somebody Else's Problem field'[1] from sewers it will be important to apply a multidisciplinary approach, including social sciences, which is part of the motivation and thinking for consolidating and growing the Pennine Water Group at Sheffield. I am sure we shall be hearing more about these important matters at SPN8, scheduled for 31 August - 2 September 2014 in Rotterdam.

Hungry delegates arriving for conference dinner at Sheffield Town Hall.

1 In Life, the Universe and Everything, Douglas Adams wrote 'the "Somebody Else's Problem field" is much simpler, more effective, and can be run for over a hundred years on a single torch battery. This is because it relies on people's natural predisposition not to see anything they don't want to, weren't expecting, or can't explain.'

FWR Water Framework Directive
the information centre for water, wastewater and related environmental issues

4th ANNUAL UKILN CONFERENCE IN THE 'ISLAND OF LAKES'

3-4 October 2013

John Pinder, *UKILN Secretary and Global Nature Fund advisory board member.*

Well, in Ireland of course it should be loughs.

This year's UK & Ireland Lakes Network conference, following the formula of one day of presentations followed by a day's field trip, took place in Dublin and the Wicklow Mountains.

The theme **'Lakes - protecting a multi-user resource'** served to emphasise that lakes are not just stand-alone bodies of water with an overriding 'purpose' to comply with legislative criteria, but are an integral part of our living and commercial environments, and our communities.

Glendalough, County Wicklow

The Water Framework Directive (WFD), whilst not appearing to protect every lake across the UK and Ireland, does one important thing. It elevates the importance of these water bodies. Hitherto, UK and Irish lakes had no standards to comply with at all and were 'left out' of protective initiatives, certainly at national level. Although the major 'lakes, lochs, loughs and lynns' across our islands now have tailored water quality criteria to meet depending on their 'lake type', thousands do not. The latter, being too small or having little strategic or environmental importance, largely fail to attract attention from a national perspective.

Left to right: John Pinder (UKILN secretary), Deirdre Tierney EPA Ireland (host organisation), Linda May (UKILN trustee), Tony Dean (UKILN Chairman), Greta Link (Global Nature Fund), Lewis Jones (UKILN trustee and SW Water), Gerry Darby (UKILN trustee and Lough Neagh Partnership)

This year's suite of papers (see the UKILN web site *(www.ukandirelandlakes.org)* convince us only too well how important and indeed how different these water bodies really are. For example, our lakes have served us well in preserving the evidence of historic settlements associated with lakes, with remnants of crannogs dating back to Stonehenge and before. It's perhaps not surprising therefore that all of us appreciate the image of standing water and its reflections. They are part of our cultural roots. At Glendalough in the Wicklow Mountains I was promised an unforgettable place with a history to match. Indeed, it was. A thousand years ago this was an important location for Christian pilgrimage and is still important for its significance in conveying key messages about our loughs today.

The symposium started with an introduction to the WFD, covered the latest discoveries in fish behaviour through new genetic fingerprinting techniques, the latest developments in catchment management, as well as portraying the more ephemeral value of lakes. This eclectic mix of presentations provided an excellent platform for all those whose specialised roles play such an important part in protecting our lakes: lakes which are of huge value not only to local communities, but municipalities and the international network of lake users and managers.

SOUTH CHILTERNS CATCHMENT BASED APPROACH PROJECT – LATEST NEWS

WE ARE PLEASED TO TELL YOU that FWR was successful in bidding for a grant from Defra to continue with our hosting role for this catchment. The funding covers the period October 2013 to March 2014. In addition, FWR are more than match-funding the catchment partnership grant.

The third meeting of the steering group was held in Wallingford on 10 September. Action points from the meetings can be seen at: *http://www.fwr.org/Catchment/index.htm*. From now on, the full steering group meetings will be held once every 6 months (the next is on 4 March 2014). We will hold more frequent sub-catchment 'working group' meetings, so that each can focus on their patch. At the meeting we agreed that we should aim, in the short-term, to start one project per sub-catchment for which we will need to secure funding. Factors to be taken into consideration are cost, priority and opportunities as they appear.

The Environment Agency (EA) is presently putting together their 'Options Appraisal' data for each of the sub-catchments. These documents specify problems that the EA have identified, the source of the problem and the options available for dealing with it. As host, we will be sending out this information to the steering group and asking them (and other interested parties) to comment on the information and add any additional problems and options. We will then hold meetings of the sub-catchment working groups to review the responses. One project from each sub-catchment will then be chosen to start work on. The updated 'Options Appraisal' documents will eventually become the EA's catchment management plan.

Hambleden Lock

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An update on the activities of the FWR

Caryll Stephen
Chief Executive of the Foundation for Water Research

The lovely summer has now well and truly gone and we are now into the autumn/winter months. Our visits to the usual summer river festivals and exhibitions have drawn to a close after a busy schedule and we are already beginning to consider our 2014 timetable.

Our work on the South Chilterns catchment partnership is continuing – we got the go-ahead from Defra in September, together with a modest grant. We are also working collaboratively on the production of a handbook on regulation for water quality management. In addition, there are a number of Reviews of Current Knowledge in preparation, some of which we are hoping to produce before the end of the year.

Meantime, I should like to thank all those who have contributed articles to our newsletter – this is so much appreciated. We are already preparing for our next newsletter, due in early spring. All that remains is for me to wish all our readers a Happy Christmas and a good New Year.

David Newsome Annual Award for Postgraduates

FWR'S MISSION is to advance the education of the public in the water sciences. One way of achieving this is by the production of 'Reviews of Current Knowledge' (ROCKs) which aim to explain the current knowledge of a specific field, in a format which can be understood by the intelligent layperson.

FWR is making an annual award of £5000 to commemorate the contribution made to FWR by the late David Newsome. The award is granted, for one year, to an appropriate postgraduate student and their supervisor to write a booklet suitable for publication in the FWR ROCK series. Examples of current ROCKs can be found at *(http://www.fwr.org/rocks.htm).*

Applications for an award are welcome in any of the following fields:

- water resources;
- water supply, water treatment, wastewater;
- surface water issues in rivers, estuaries and coastal areas;
- the management of the water environment.

Initial enquiries please to Debbie Ruck at *debbieruck@fwr.org.uk*

FWR attended the following over the summer

The National Waterways Festival at Watford; Water, Sewerage & Waste exhibitions at Reading and Exeter.

Cassiobury Park, Grand Union Canal, Watford

WSW Exeter

Kennet & Avon Canal at Reading
Courtesy of Don Cload

Forthcoming FWR publications

WE HAVE A COUPLE of ROCKs (Reviews of Current Knowledge) in the pipeline which cover the topics of measurement of open channel flow, and water for food security.

FWR are also contributing to the production of a handbook on regulation for water quality management. This publication was originally produced for China, sponsored by the EU, and is now being updated and produced for the UK and international market.

Design Agency - http://www.connellmarketing.com

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