

ECOSYSTEM SERVICES AND THE WFD

Welcome to the spring issue of the FWR Newsletter



The terms 'Ecosystem Services' and 'Ecosystems Approach' are being used more frequently nowadays, but what do they actually mean? And how do they relate to legislation such as the Water Framework Directive? In our lead article Drs David Forrow and Mark Everard explain the thinking behind the terminology and how it can be applied to WFD.

Preliminary outcomes from the Environment Agency's 'Challenges and Choices' consultation are presented on page 4. This consultation provided a chance for people to feed into the river basin planning process.

There is a call for expressions of interest in the annual David Newsome award to postgraduates for the writing of a Review of Current Knowledge – please see the back page for details.

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

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Valuing the benefits we derive from nature

NATURE PROVIDES IMPORTANT BENEFITS FOR HUMAN health, wellbeing and economic prosperity, many of which are critical and irreplaceable. Natural processes play critical roles in the regulation of floods and droughts, as well as climate and disease.

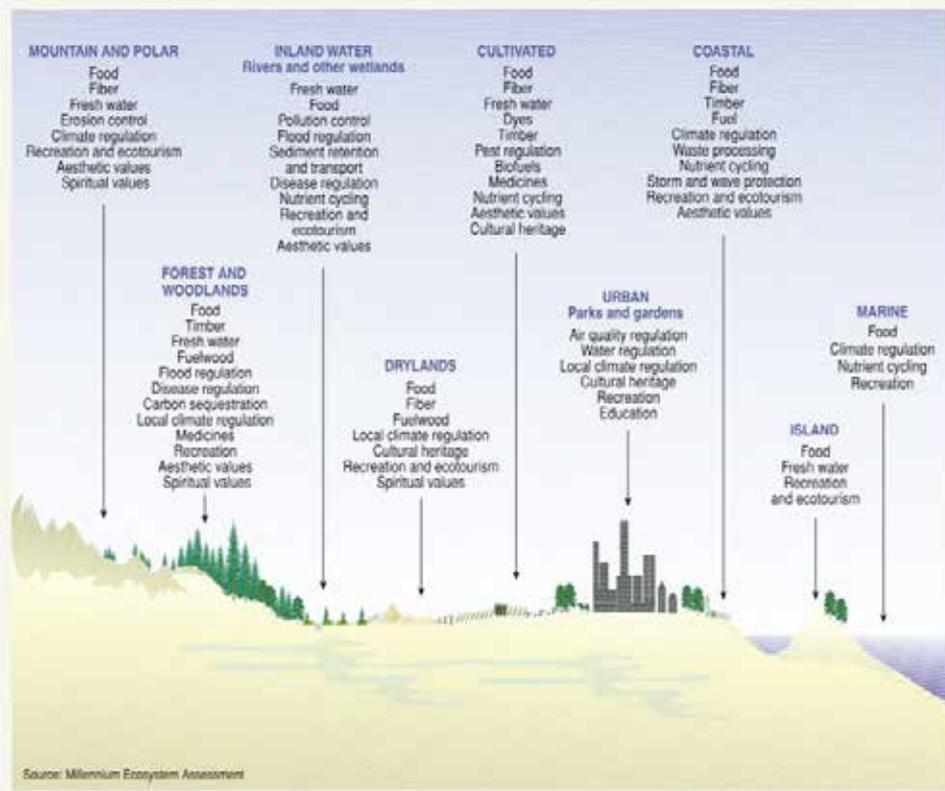
They also purify water, regenerate the air we breathe, dilute and break down wastes, ensure nutrients are available for growing food, and remove harmful substances that could be detrimental to human health and wildlife. The natural environment also produces raw materials such as water, wood, fibre and fuel which drive our economy. Not only that, it provides leisure, aesthetic, cultural and spiritual benefits essential for our wellbeing (including mental health) and for our tourism industries.

The term 'ecosystem services' has been coined to describe and define the multiple benefits that nature provides to people.

Most of these benefits have been taken for granted, and hence largely disregarded in the past. Consequently, despite their diversity and fundamental importance, many have been deteriorating, particularly over the last 60 years. However, the picture is not uniformly negative, neither in the UK nor

ECOSYSTEMS AND SOME SERVICES THEY PROVIDE

Different combinations of services are provided to human populations from the various types of ecosystems represented here. Their ability to deliver the services depends on complex biological, chemical, and physical interactions, which are in turn affected by human activities.



globally. A few services, such as food production, have increased and some have been recovering, or at least the pace of deterioration has slowed over the last 20 years as a result of targeted regulation and management. Nevertheless many, if not most, of nature's services are still deteriorating, leading to potentially calamitous consequences such as collapsing marine fisheries, nutrient enrichment, soil erosion, rising pollutant levels, a shifting climate and dramatic reductions in the inherent resilience of productive ecosystems.

AN INTERCONNECTED WORLD

A key reason for this decline is that, despite the importance and breadth of the social, cultural and economic benefits provided by nature and hence their high political relevance, much of the value provided by nature is still substantially overlooked by socio-political and economic systems. Indeed, the attitude adopted by some politicians and business leaders, that environmental protection is at best altruistic and at worst superfluous 'green tape' hindering economic development, is evidence of the current entrenchment of this anachronistic world view. In reality, the evidence is now overwhelming that safeguarding ecosystems and their processes is vital as they are a core resource underpinning future security.

For all the recent advances in specialist scientific knowledge, there remains a lack of basic understanding across society about the interdependencies within and between

human and ecological systems: their systemic properties. This has resulted in decisions or actions which deliver narrowly framed benefits, yet often inadvertently produce negative consequences elsewhere across the system, and undermine the integrity and function of the system as a whole. One example of this is how energy-hungry and chemically intensive wastewater treatment technologies might improve a local stretch of river, yet at the same time increase emissions of climate-active gases, create environmental and ethical pressures along chemical supply chains, increase the need to landfill solid waste generated by treatment, and result in greater civil disruption due to vehicle movements.

The interdependent nature of different 'systems' is illustrated below.



Dependencies between environmental, social and economic systems. Reproduced from Barton, H. and Grant, M. (2006)

It is becoming clear to many that we need to fully recognise the multiple benefits we get from nature in our socio-political and economic systems; identify and, where possible, innovate means to avoid wider negative ramifications; and manage ecosystems and their services to ensure their long-term security and supply.

Sustainable development – itself a systemic model reflecting the interdependencies of natural, social and economic elements – is necessary precisely because our resource use and governance arrangements have, to date, largely ignored systemic impacts arising from the pursuit of narrowly framed outcomes.

Systemic context matters, whether our perspectives are environmental, economic or indeed social, as all services support different stakeholders who either become beneficiaries or victims of ecosystem change.

Ecosystem services, and the broader 'Ecosystem Approach' (addressed below) are inherently and explicitly systemic. Consequently these have become an important and useful approach to engage people around the sustainable development agenda.

APPLICATION OF THE ECOSYSTEM APPROACH INTO POLICY AND PRACTICE

The concept of ecosystem services has been with us since the late 1980s as a conceptual and development tool. There is growing recognition amongst some policy makers, business leaders, health leaders and NGOs that we cannot continue to ignore the value of nature. Since 1995 the UK has been one of many signatories to the Ecosystem Approach, defined by the Convention on Biological Diversity, which sets implementation of ecosystem services within wider geographical and socio-economic contexts. Momentum has led to the embedding of this approach into other international protocols (including the Ramsar Convention and EU Biodiversity 2020), and into national strategies including the UK's 2011 Natural Environment White Paper *The Natural Choice*. A growing number of examples demonstrate how these novel approaches are being implemented (see <http://ecosystemsknowledge.net/> for a range of interesting case studies).

However, whilst we are making progress with defining ecosystem services and the 'carrying capacity' of the natural world to provide them, there has been perhaps less appreciation of its application into mainstream policy and practice.

Although attitudes may be changing, policy and legislation are slow to evolve to reflect this change 'on the ground'. Nevertheless, there are some examples of regulatory instruments that are seeking to embrace more of the principles of the Ecosystem Approach. In this regard, the Water Framework Directive (WFD) provides an interesting case study, not merely in terms of how systemic principles are included, to some extent, but also how they can be lost through legislative prescription and transposition, through measures of compliance, through interpretation and con-

sequently through implementation. The consequences of this are that, although the WFD is undoubtedly a major policy progression and is delivering environmental improvements, it could do considerably more in terms of playing a major role in delivering coherent and sustainable water management.

The WFD itself is systemic in intent, as articulated in the fifty-three paragraphs of the Preamble, which sets out the purpose of the Directive and in Article 1 which describes its multiple aims. These identify the value of water, its sustainable management and the need to link ecological quality with economic context and human needs. Many have described this as the 'spirit of the Directive'.

However, some of the intent and aims are not well translated through to the objectives, their detailed definition, nor to the measures of success and compliance (Vlachopoulou *et al.*, 2014). Consequently, in most European countries, early implementation of the WFD has focused largely on meeting a range of standards and on the single 'structural' objective of 'good status' (Natural Capital Committee, 2013) applied at individual water body level within catchments, driven by European compliance and reporting requirements. Implementation of the 'spirit of the Directive', for long term sustainable management, has been lost to implementation of fragmented and prescriptive clauses of the WFD through compliance with narrowly framed standards and objectives. This has more in common with historic practices than the strategic and systemic intent of the Directive.

WHY DOES THIS MATTER?

If compliance is seen as merely obeying rules imposed by Europe, the vitality of our ecosystems will be seen simply as a constraint on legitimate economic progress and societal freedoms. The River Basin Management (RBM) planning process will consequently be perceived largely as a means to persuade society to spend money on environmental protection and improvement, with no clearly articulated wider benefits.

It is therefore necessary to turn this paradigm around to reflect the true spirit both of the Ecosystem Approach and of the Directive, framing management requirements in terms of the benefits to which they will contribute in securing resources essential for the continuing wellbeing of society. Ultimately, RBM for the WFD only matters in this context, and will only be achieved with the support of stakeholders, when the WFD is applied on a genuinely systemic basis (Everard, 2011). From this perspective, ecological and chemical quality indicators reflect the value of natural resources for: protecting public health; reducing the costs of treatment of abstracted water and also wastewater due to improved dilution; achieving greater water and other resource security in addition to protection of related economic goods and services; realizing greater resilience to address the mounting pressures arising from population growth and the changing climate; and achieving improved quality of life for all.

That is a far more compelling vision than one that merely highlights costs and constraints to achieve compliance.

HOW CAN RIVER BASIN MANAGEMENT HELP IMPLEMENT SYSTEMIC INTENT?

Implementation of the WFD through the RBM process can be interpreted in the context of many aspects of the Ecosystem Approach, including for example clarification of multiple forms of knowledge, based on public participation, taking account of both long-term and wider spatial impacts and economic context such that ecosystem management becomes a matter of societal choice.

The good news is that things are starting to change. The European Union is developing guidance for embedding ecosystem services into both the WFD and the Floods Directive (<http://www.watereco.info/>).



The River Sow, providing a range of beneficial services to the centre of Stafford. (Courtesy Mark Everard)

In England, the Environment Agency and its partners are increasingly aware of, and are seeking to progress, the evolution of RBM from a target- and compliance-led approach towards a benefits-led approach reflecting outcomes for people and ecosystems. For example, the Environment Agency is now beginning to base economic appraisal of management options, Environmental Impact Assessment and regulatory Impact Assessment for the second round of RBM on ecosystem service assessment, and is seeking to quantify and value a wider range of benefits.

One key piece of work in this respect has been the National Water Environment Benefits Survey (Metcalf *et al.*, 2012), which is providing information for valuing non-market benefits such as aesthetic, recreational and existence values. The catchment based approach (FWR Newsletter, August 2013) provides an excellent opportunity to bring statutory and top-down processes together with bottom-up, local stakeholder-led processes. Groups working in a number of these catchments are also adopting ecosystem service assessment into their thinking and planning.

AN EVOLUTIONARY JOURNEY

We undoubtedly have a long way to go to realise the systemic intent of the WFD in practice, and it is clear that full transition to a new paradigm will be an evolutionary journey. However, given the conflict between fast-dwindling natural capacity, rising populations and resource demands, we have to seriously accelerate this transformative process. RBM may provide a particularly useful mechanism for the 'mainstreaming' of an Ecosystem Approach.

To accelerate practical progress, we need to think beyond (or around) compliance with the prescriptive elements of the Directive, referring back instead to its intent and aims. Vlachopoulou *et al.* (2014) concluded that the Ecosystem Approach could support future implementation of the Directive, principally via its potential to encourage more systemic thinking, thereby providing a consistent framework for identifying shared aims and evaluating alternative water

management scenarios and options in decision-making. As identified above, in England (and quite probably elsewhere) we are starting to go in the right direction on this.

Alternatively, or additionally, we need to encourage the European Commission to take the opportunity of WFD review and revision to remove some of the prescriptive definition of particular targets, and to reframe the Directive to deliver its systemic intent and recognition of benefits of good river basin management, as well as to establish greater cohesion with the outcomes of reform to the Common Agricultural Policy and related land and resource use instruments.

As we seek to understand the world better, including the many formerly overlooked values that nature provides, the legislative base is evolving and so too is our understanding about how to implement it. Given the central importance of water ecosystems, the WFD and the RBM process will have a strategic role to play in helping provide more secure and sustainable delivery of the many benefits provided by the water environment, and more resilient water ecosystems to deliver them.

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Disclaimer: The views expressed are those of the authors only. They do not necessarily represent those of their host organisations.

Ecosystem services and the WFD - further reading list overleaf:

Challenges and Choices

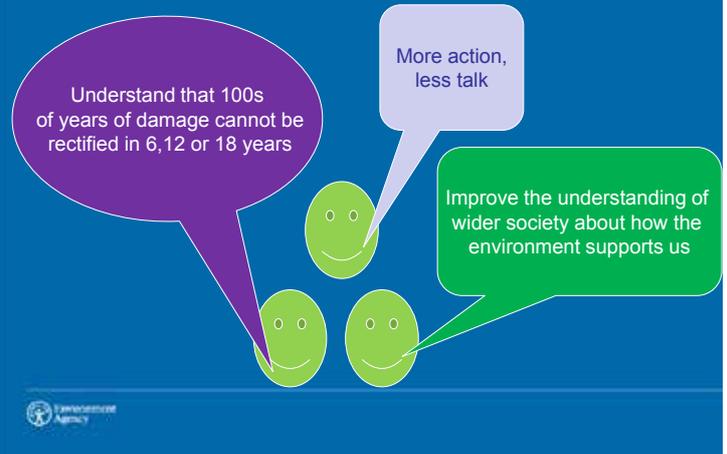
Effective stakeholder engagement in the development of River Basin Plans

Alison Futter

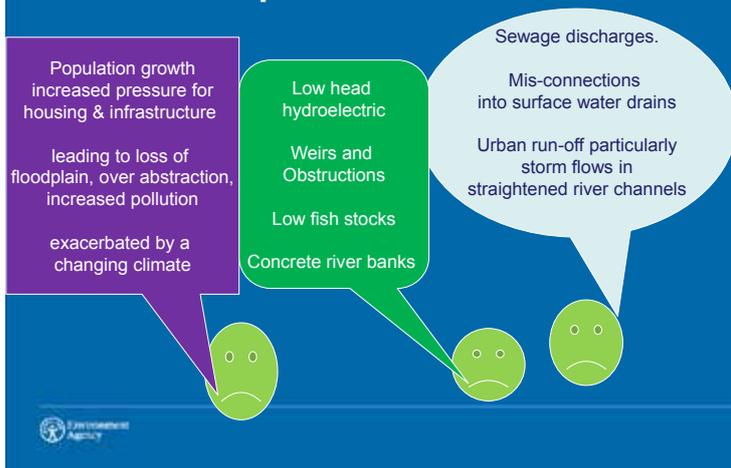
River Basin Planning, Environment Agency

This Environment Agency consultation on the significant water management issues ran from June to December 2013. Encouraging the 'active involvement of interested parties' is a core principle of the river basin planning process. The consultation aimed to stimulate debate about the challenges we face in managing the competing demands on our aquatic ecosystems and gather opinions about what we, as a society, would do about this and what we would consider a priority. The Environment Agency response document is available at: <https://consult.environment-agency.gov.uk/portal/ho/wfd/water/choices>. High-level feed back is illustrated here.

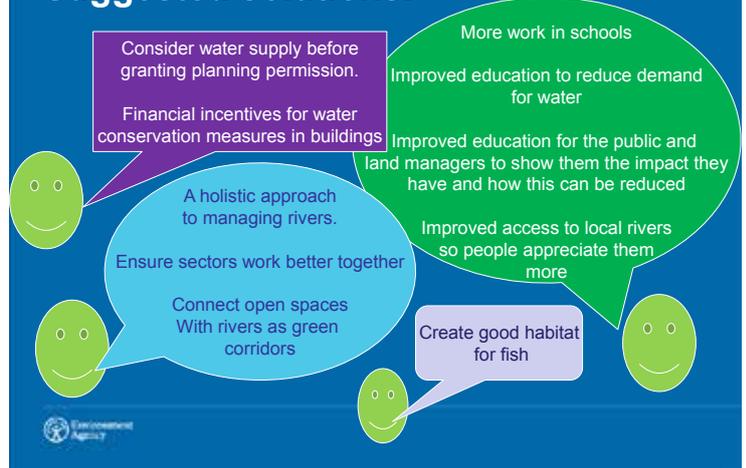
Three main messages:



Concerns expressed:



Suggested solutions:



Ecosystem services and the WFD

Further reading

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A health map for the local human habitat.
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Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy.
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 DOI:10.1111/j.1747-6593.2011.00273.x.

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Water Resources Research 48 (3).

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 A report from the Natural Capital Committee April 2013;
<http://www.defra.gov.uk/naturalcapitalcommittee/>.

UKNEA (2011)
The UK national ecosystem assessment: synthesis of key findings.
 Cambridge: UNEP-WCMC; 2011.

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The potential of using the ecosystem approach in the implementation of the EU Water Framework Directive.
Science of the Total Environment V 470-471:684-694.
www.gov.uk/ecosystems-services

WATER SAFETY PLANS – WHAT NEXT?

Mike Waite,
FWR Water Supply Co-ordinator



CIWEM held its first technical seminar in its new headquarters at Saffron Hill, Farringdon in March. A Water Safety Plan (WSP) is a plan to ensure the safety of drinking water through the use of a comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchment to consumer. WSPs are considered by the World Health Organisation (WHO) to be the most effective means of maintaining a safe supply of drinking water to the public.

A regulatory view of the background to, and current situation of, WSPs in England and Wales

WSPs were introduced in the 2004 WHO Guidelines and subsequently DWI successfully established that regulations could be issued under the Water Industry Act requiring risk assessments (RAs) which form the foundation of WSPs. Regulation 27 of the public water supply regulations and Regulation 6 of the private supplies regulations now impose legal requirements for WSPs. These regulations empower DWI or the Local Authority to serve enforceable notices to ensure that actions are taken. In England and Wales 22 methodologies are applied to public supplies, all of which are consistent in principle but vary in detail; 884 supply systems have been assessed with 917 required actions identified. Only 19% of private water supplies (PWS) requiring risk assessment had been assessed three years after the regulation came into force. WSPs are under continuous review and DWI can enforce if RAs are out of date, if it disagrees with a supplier's assessment or if events are not acted upon. In future DWI will require RAs to be based on actual data not 'general knowledge' or 'best available information', and to be subject to self-audit by assessors with demonstrable knowledge and competence. RA is to be included in both the updated EC Drinking Water Directive and AMP6. For PWS there are proposals for 'mystery shoppers' to check on Local Authority (LA) service to PWS users.

The Irish EPA perspective

The 24 LAs responsible for the 928 public water supplies in Eire have been superseded by the new Irish Water (IW).

The LAs still operate the supplies but answer to IW. A WSP tool has been made available online which has a database with 164 possible hazards categorised and all have a default of 'applicable' which users have to remove on assessment. The tool went live nationally in March but there is no legal requirement to use WSPs.

Implementation of WSP in a large water company

Lucy Quick is supported by a team of four and the original Excel spreadsheet system has now been replaced by an improved IT system which is more visible and accessible. The system is ready for the changed reporting requirements coming into force after 2014. The system links in with OMS (Operations Management Systems) and investment plans.

Implementation from the view of a smaller, water-only company

WSPs initially were not understood within the company and there was a lack of resources and expertise to implement them. The risks to supplies are the same for all companies but small companies may not have large IT systems - Excel spreadsheets have to suffice! The DWSP (Drinking Water Safety Plans) forum which meets quarterly with DWI is invaluable.

The changed role of Local Authorities in respect of PWS

Under the 1991 Regulations LAs were only required to sample, but under the 2009 Regulations they have to carry out RA. Although there was a five year period for carrying out RA, after four years some LAs haven't even started. Simon Moon (Taunton Deane BC) outlined the practical difficulties in determining what is or isn't an exempted single supply, and where a supply actually comes from. He prefers to work informally with PWS users and uses notices only as a last resort.

Delegate notes and presentations can be viewed online via:
<http://www.ciwem.org/events/conference-outputs>

Contributors included:

Professor Jeni Colbourne (Chief Inspector DWI), Niall Dunne (Irish EPA), Lucy Quick (Severn Trent), Jonty Stead (Portsmouth Water), Simon Moon (Taunton Deane BC).



ACTIVATED SLUDGE: PAST, PRESENT AND FUTURE

2-3 April 2014, Manchester

Tim Evans, FWR Wastewater Section Co-ordinator



Splendid formal dinner in the Great Hall of Manchester Town Hall (courtesy Tim Evans)

THIS CONFERENCE CELEBRATED THE CENTENARY of the process. It was well attended and well supported by sponsors, especially United Utilities (UU).

Submitted papers were printed in an attractive hard-cover book, a rare occurrence these days! UU operates Davyhulme Wastewater Treatment Works (WwTW) where the activated sludge process was developed by Arden and Lockett with guidance from Fowler. Arden and Lockett coined the term 'activated sludge' and announced the process to the world at a meeting of the Manchester branch of the Society of Chemical Industry on 3rd April 1914. Fowler had already passed the intellectual property to Jones and Attwood Ltd., who filed four patent applications dealing with 'Improvements in Apparatus for the Purification of Sewage or other Impure Waters' (British patents 19915 and 22952 in October 1913; and 729 and 19916 in January 1914). This had an interesting resonance with Gerald Noone's observation that he ensured all the research he was associated with at Severn Trent was published so that "they would not have to buy it back from anybody". You cannot patent something that is 'prior knowledge', i.e., already published.

Notable speakers had been invited to prepare papers covering the breadth of the title in a single stream conference. We moved through historic developments of activated sludge to nitrogen and phosphorus removal and then to efficiency improvements using granular biomass and supported biomass.

Stephen Smith observed that a search of the Web-Of-Science database for 'Activated AND Sludge AND Resource' showed that since 1950 the UK (where the process had been invented) had only published around 110 papers whereas Japan had published around 230, the USA 500 and China 920. This apparent underperformance might partly reflect that neither WRC nor UKWIR has encouraged publication in journals that the Web-Of-Science would access.

Recent innovations can enable a much greater density of biomass, eliminate the problem of bulking sludge, and exploit

compound biochemistry with aerobic organisms at the surface and anaerobic organisms in the core. Membrane bioreactors did not get much coverage but Stephen Palmer explained that the net energy used for a 250,000 p.e. works would be 0.185 kWh/m³ for an energy efficient activated sludge plant (ASP) with enhanced energy recovery, but only 0.10 kWh/m³ for an anaerobic membrane bioreactor. Andreas Giesen considered an energy efficient municipal WwTW with full biological nutrient removal (BNR) serving 100,000 p.e. and estimated that conventional ASP would use 5,800 kWh/day



Contrasting settlement rates of conventional and granular biomass (courtesy Andreas Giesen)

whereas NEREDA would use 2,670 kWh/day. NEREDA is a biological wastewater treatment technology that uses compound granular biomass to accomplish full BNR; the method of inducing the formation of this interesting biomass is a commercial secret.

This was a memorable conference which reviewed the journey that has been travelled in the field of activated sludge since 1914, and pointed to some of the exciting developments of the near future. Secondary wastewater treatment and biological nutrient removal will almost certainly look rather different in 2114 and by then we will no doubt have given much more regard to energy and climate change emission reduction and to resource exploitation, but the processes will still be keeping our rivers clean.

Surface Water Flood Forum

February 2014

Tim Evans, FWR Wastewater Section Co-ordinator

THE TIMING OF THIS CONFERENCE IN BIRMINGHAM was impeccable. Flooding was top of the news agenda, the Somerset Levels had been flooded since December, water was standing in the Severn Valley, and the day before the forum the Thames overtopped its banks flooding more than 1000 homes. Eighty-five delegates were listed: 20 from water companies but only ten (three of who were presenting) were from local authorities. It would have been good to have had more delegates from local authorities because in future they will be responsible for co-ordinating and delivering flood risk management strategies when all the dither and delay has passed and the Flood and Water Management Act 2010 is implemented fully. In contrast, all but one of the water and sewerage companies in the UK was represented.



The Thames overtops its banks causing flooding at Staines (courtesy Surrey Mirror)

Visit to Thames Water's Lee Tunnel Construction Site

Neil Tytler

FWR HAD A CHANCE TO VISIT Thames Water's Lee Tunnel construction site in March, organised by SE Region of the Institute of Water. Site induction took place at Beckton STW reception. We then relocated to MVB Consortia's visitors centre, adjacent to the tunnel construction site. A presentation on the project was followed by a tour to a viewing grandstand overlooking the site.



Above ground construction site (courtesy Neil Tytler)

The £635m Lee Tunnel is designed to prevent more than 16m tonnes of sewage from overflowing into the River Lee (a tributary of the River Thames) every year. In 2012, Busy Lizzie (the 120m-long tunnel boring machine, named by a local primary school for good luck), at 80m below the capital, began constructing the 7m diameter tunnel, the width of three London buses.

She finished tunnelling in January 2014. The tunnel runs for over four miles under east London, from Abbey Mills pumping station to Beckton STW. The work being undertaken to build London's deepest tunnel is the water industry's biggest ever construction project. It is the first of the two London Tideway Tunnels that will together capture an estimated 32m tonnes of sewage overflows (40%) each year.

Three informative documents on the project can be found on the MVB website:

http://www.waterprojectsonline.com/civil_engineering/mvb/piling_contractors.htm



Tunnel Boring Machine (TBM) lowering close to base overflow (courtesy Thames Water)



TBM at pit bottom (courtesy Thames Water)

Several speakers discussed the need for partnership working and engaging with everybody who has an interest and can play a part in ameliorating flood risk. Delegates were reminded about the reality of flooding: "To you we are a column in a newspaper, to us we have lost our lives as we knew them"; devices (not sandbags) and strategies for improving the flood resilience of properties can be seen at <http://thefpa.org.uk/>.

The number of people accepting that retrofitting SuDS (green streets, rain gardens, green roofs, etc.) is essential and cost-effective is growing, but they remain a minority in the UK. It still seems to be a case of 'it might work in Germany/Sweden/USA/etc. but it is not being done here' except for some 'early adopters' who are embracing it. Water and sewerage companies are obliged to reduce the number of properties at risk of flooding; they would like to reduce the rapidity and amount of run-off but to do this they need data to demonstrate cost-effectiveness to Ofwat. The Counters Creek SuDS retrofit in London is important in this context. There are three 'treatment' streets and three 'control' streets. Loggers have been in place in the sewers since May 2012 to obtain baseline data. Calibrations have been checked, and verified hydraulic models have been produced. Construction will commence in summer 2014. These are 'new' retrofits, i.e. not reinstatements following streetworks. The individual SuDS' features may be monitored to see how their effectiveness compare. It will be good to see results in a UK context. Comparative data such as these will enable water companies to evaluate the cost/benefit of retrofitting SuDS.

Thames Water had to engage in a substantial amount of public outreach, because initially there was little enthusiasm for rain gardens, etc. The sustainable stormwater team at Portland, Oregon told me their citizens were also underwhelmed until they saw some in place. People became much more enthusiastic when they saw retrofitted, street-side, planted SuDS (with interpretive boards) and saw how they beautified the neighbourhood and enhanced property values.



Greenstreets @ Counters Creek - proposed scheme for Arundel Gardens, London (courtesy Thames Water)

Retrofitting SuDS into urban areas is still regarded as 'new technology' and like any new technology it needs early adopters

who others will follow eventually. Hopefully we shall get to the point where every streetworks is regarded as a potential opportunity for SuDS retrofit, and the public will question instances where it is not done. Reinstating to include a green street is no more expensive than hard paving and far more attractive and useful, but all the reinstatements I see have a hard kerb that keeps run-off on the road surface and direct it to a gully. Where there are street trees, they are left to find water where they can.

The Surface Water Flood Forum was interesting but the participants were 'the choir', i.e. people who already understand the issues. There is a huge job to be done reaching out to others with interests in urban landscapes and surface water management so that flood resilience of properties and infrastructure, and green infrastructure for moderating surface water run-off, is 'business as usual'. Officers, elected officials and universities, as well as members of the public - all need to come onboard with these concepts; they are not difficult.



An update on the activities of the FWR

Caryll Stephen

Chief Executive of the Foundation for Water Research



The first five months of 2014 have continued to be busy for FWR. As you will see in this Newsletter a further ROCK has been produced and two further ones are due shortly including the first one to be awarded through the David Newsome Award. On this subject you will note from below that we are currently inviting ideas for the second of these Award ROCKS.

Our work on the Water Framework Directive Information Centre continues well and the web-site is currently undergoing an up-date. On the Catchment Planning side FWR is pleased to announce that it has just received a further grant from the Environment Agency on behalf of Defra to help to continue this work. Publication of our 'Regulation for Water Quality' book is proceeding and it is hoped to be able to publish this during the Summer.

As usual FWR is due to maintain a presence at a number of Summer 'watery' activities where new friends are always made.

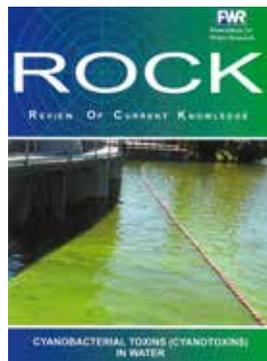
As always we are very grateful to all who support FWR and to those who contribute to our newsletters – a big 'thank-you' is due to you all.

FWR Publications

Cyanobacterial Toxins (Cyanotoxins) in Water

FR/R0009

Revised January 2014



Cyanobacteria (blue-green algae) are natural inhabitants of fresh, brackish and marine waters and are of worldwide distribution. They produce a diverse range of small molecules (cyanobacterial toxins: cyanotoxins) which are hazardous to human and animal health.

The sources and properties of these toxins are briefly reviewed. Their harmful effects range from mild to serious, and include gastrointestinal upsets, skin irritations, liver and neurological damage. Examples of the adverse effects on human health, domestic animals and wildlife are given.

Risk assessments for health protection against some of the most common and potent cyanotoxins have been made and included in emerging schemes for the risk management of cyanotoxin problems which can occur in potable and recreational waters. Reactive and proactive measures and further needs in this context are presented. The reduction of cyanotoxin problems in natural and controlled waters as a potential benefit of eutrophication control is also discussed.

Copies of this report are available from the Foundation, price £15.00, less 20% for FWR members.



DAVID NEWSOME ANNUAL AWARD FOR POSTGRADUATES

FWR's MISSION is to advance the education of the public in the water sciences.

One way of doing 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 makes an annual award of £5000 to commemorate the contribution made to FWR by the late David Newsome. The award is granted, once a 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.

Applications are invited for the 2014 award, to be submitted by end of July.

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

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