

CATCHMENT MANAGEMENT

Benefiting from catchment management

UKWIR News 62 highlighted catchment management as a vital component in attaining sustainable water management.

In the last round of water company business plans, Ofwat had agreed over 100 catchment management initiatives. As this number increases, it is essential to discover how successful they have been and what are the barriers to better application.

To address this, UKWIR carried out *Quantifying the Benefits of Water Quality Catchment Management Initiatives*, managed by **Roger Trengove**, which was the subject of an UKWIR Technology Transfer workshop in February.

Client Manager, Severn Trent's **Frank Grimshaw**, complemented the work of the contractor, WRc, as it was a complex project and difficult to organise. The outputs had to be workable and robust but not over complicated. The study concluded that the benefits could be substantial in helping to meet Drinking Water Inspectorate, Water Framework Directive and Water White Paper aspirations.

WRc's **Ian Codling** said, given this complexity, how important it was to have Defra, Environment Agency, Ofwat, Drinking Water Inspectorate, SEPA, Natural England and the USA's Water Research Foundation 'on board' as collaborators.

Figure 1. Catchment management schemes stages - number of schemes

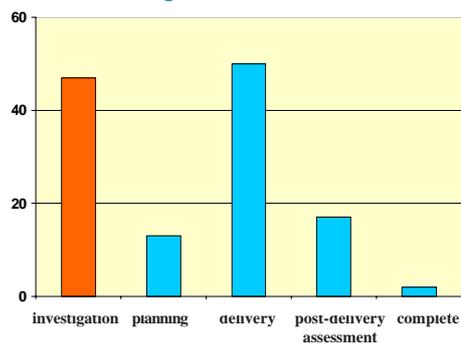
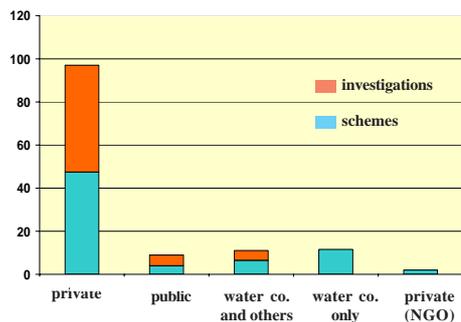


Figure 2. Catchment land ownership - number of schemes



Among the graphs presented, figure 1 shows the distribution of the industry studies and their progress. An important factor in establishing and delivering such initiatives is land ownership, illustrated in figure 2.

The main benefit from catchment management is improved water quality, with pesticides, nitrates, phosphates and the colour and turbidity of the water as the prime aspects.

A survey of water company schemes also identified wider benefits. A range of stakeholders can benefit from improvements such as biodiversity, reducing greenhouse gas emissions, flood control, and landscape enhancement.

Shared funding

Schemes usually involved shared funding with potential contributions from water companies, government, environmental regulators, the Forestry Commission, national parks and organisations such as River Trusts, the National Trust and Wildlife Trusts.

Ian Codling also highlighted the role of ongoing non-water company related work such as Nitrate Vulnerable Zones, Natural England Agri-Environment Schemes, Environmental Stewardship and River Trusts' initiatives.

The project also evaluated the effectiveness of schemes examining a combination of measurement/monitoring, budgeting, risk assessment and modelling. This highlighted the potential of using 'key performance indices' to monitor delivery.

However, information turned out to be quite sparse on both the capital and the operating costs of schemes, but Ian Codling added that this should improve over time.

He went on to show the evidence from schemes at Pumlumon in Mid-Wales and Keighley in Yorkshire as well as Wessex Water's scheme concentrating on reducing nitrates in catchments.

Andrew Davey, of WRc, then went on to demonstrate a *Benefit Assessment Framework*, using an 'EcoSystem' approach, that facilitates the testing of the effectiveness of catchment management schemes on an agreed and transparent basis.

This framework had been applied to five case studies looking at the scoping, planning, measuring, valuing and reporting aspects:

- Chelmer & Blackwater Catchment Partnership (Essex & Suffolk Water)
- Eagle Lodge (Wessex Water)

Toxicity and Microbiological Advisory Service

UKWIR News tends to concentrate on the dissemination of the results of the latest collaborative projects.

However, the renewal of the contract with WRc for *Toxicity and Health: Information and Advice on Chemical and Microbial Contaminants* over the next three years is a timely reminder of an ongoing service that is of huge benefit to UKWIR members.

The service consists of a number of elements including preparation and circulation of current awareness reports, maintenance and development of 2 databases, *Toxicity Datasheets and Microsheets* and provision of a rapid response, 24 hours a day, seven days a week resource for advice on chemical contaminants.

Toxicity Datasheets and Microsheets

These are now an established independent source of information regarding sources, fate, risks and treatment of chemicals and microorganisms associated with drinking water and, increasingly, wastewater.

They were developed to assist water companies to respond quickly and effectively in the event of water contamination and to aid discussion of relevant information with health professionals and environmental officers and regulators during the management of contamination incidents.

Rapid response

The National Centre for Environmental Toxicology maintains a rapid response service to provide advice to water companies on the risks posed by chemical contamination of drinking water and waste water.

The response required is dependent on the chemical and event, but could relate to toxicity, health effects or removal of the contaminant through drinking water or waste water treatment.

If the enquiry is considered urgent, advice will be provided within the hour. This resource is free to UKWIR members and can be accessed by contacting WRc's UKWIR Toxicity Advisory Service on: 0800 3897668.

- Exmoor Mires Project (South West Water)
- Keighley & Watersheddles (Natural England, Yorkshire Water)
- North Pickenham (Anglian Water).

He advised that a proportionate approach should be applied that balances the extremes of a simple, rapid, inexpensive and less certain approach with a detailed, more time consuming and expensive but more certain approach.

Mogden revision?

The *Mogden Formula* was devised in 1976 by the National Water Council, in conjunction with the CBI, to recover the treatment costs of accepting trade effluent. It became widely accepted and a familiar feature on the wastewater treatment landscape.

At an UKWIR workshop to disseminate the findings of the project, *A Review of the Effectiveness of Mogden Formula Charging with Regard to its Ability to Recover Costs When Meeting Modern Sewage Treatment Works Consents*, managed by **Steve Clay**, UKWIR Client Manager Thames Water's **Howard Brett**, said that the trade effluent consenting process was much more complex nowadays.

He added that it was a pro-active water industry initiative and not a response to any external pressure.

Dr Arthur Thornton from the contractor, Atkins, said that, because of the formula's wide familiarity and acceptance, we had stopped looking at the detail. Issues relating to treatment of nutrients, priority substances and metals had come to the fore. There is a need to anticipate the effect of environmental policies related to climate change and carbon footprint.

He confirmed that this was a good time for a review of the Mogden Formula following the Water White Paper, the implementation of the

Water Framework Directive, and the need to meet new standards on priority substances and metals. These factors and the debate over 'retail' versus 'wholesale' water utilities, all reflect a changing landscape.

Importantly the project has the support of the economic regulator, Ofwat.

The formula should reflect that costs of sewage and sludge treatment have increased substantially, address discrepancies in charging between different traders and establish whether there is equality with domestic sewerage charges.

The opportunity was taken to see if changes in the formula could incentivise more sustainable behaviour.

Formula differences

Atkins' **Luiza Piekarniak** explained the different approaches found in England & Wales and Scotland. In particular, in Scotland

Mogden Formula in England & Wales is:

$$C = R + V + (Ot/Os)B + (St/Ss)S$$
 C = total charge per cubic metre of trade effluent
 R = reception and conveyance charge
 V = volumetric and primary treatment cost
 Ot = the COD of the trade effluent
 Os = the average COD of settled sewage for the region
 B = biological oxidation cost
 St = the suspended solids in the trade effluent
 Ss = the average suspended solids in crude sewage for region
 S = treatment and disposal costs of primary sludge

there are two charges using a 'Mogden type' approach based around the biological oxygen demand and the total suspended solids.

A short list of substances that could be included in the Mogden formula was devised:

- ammonia (increased treatment requirements)
- total phosphorus (increased treatment requirements)
- total nitrogen (possible higher treatment costs)
- total zinc (potential large spend in future)
- di(2-ethylhexyl)phthalate (DEHP) (used in plastic manufacturing processes)

It was also decided to include 'hard' chemical oxygen demand (COD) as it could have serious implications for compliance with consents

She showed how each of the short-listed parameters had been looked at in detail, with the costs involved, and how they may fare in the future.

The approach taken was that the formula had to be reasonably simple to understand and be practical to apply.

The project concluded that the *Mogden Formula* was generally fit for purpose but recommended that ammonia could be included the next business planning cycle and that there was the potential to include zinc as the costs of treatment were expected to rise significantly.

Where multiple substances are removed there should be a fair apportionment of costs.

- pumps and pipelines
- water supply deficit reduction
- phosphorus removal
- meeting consents.

Workbook

The opportunity was taken at the workshop to inform delegates about the latest version of UKWIR's *Workbook for Estimating Operational GHG Emissions*.

It meets Ofwat's reporting requirements and Defra/DECC's recommendations for voluntary reporting of carbon emissions.

Gordon Wheale, Project Manager of both projects, said that the design had been improved and accommodated recent changes.

These included recent enhancements to provide details on short cycle carbon, energy use, discharge of effluent, sludge reporting tables, emissions from the use of chemicals, third party supplies and public transport.

Framework for carbon accounting

At a dissemination workshop for the project *A Framework for Accounting for Embodied Carbon in the Water Industry*, UK Client Manager, Scottish Water's **Mark Williams** confirmed that the water industry was at the forefront of the subject.

UKWIR carried out a groundbreaking project in 2008 on the subject but, as Mark Williams related, there was now an opportunity to revisit the issue as it is changing rapidly with DECC making significant modifications to the whole carbon accounting methodology.

Adrian Johnson, from the contractor, MWH, said that the project's aim was to:

- review and update accounting boundaries for whole life carbon accounting
- provide guided access to databases of carbon emission factors to facilitate their common use across the water industry
- to support decision-making for low carbon capital investment.

The result is a common framework for companies to assess embodied carbon and whole-life carbon costs for use in promoting low carbon solutions.

The framework is designed to be consistent with government principles and provide practical help for planning and reporting,

whilst allowing incentive for innovation.

The framework then goes on to help in estimating future operational emissions.

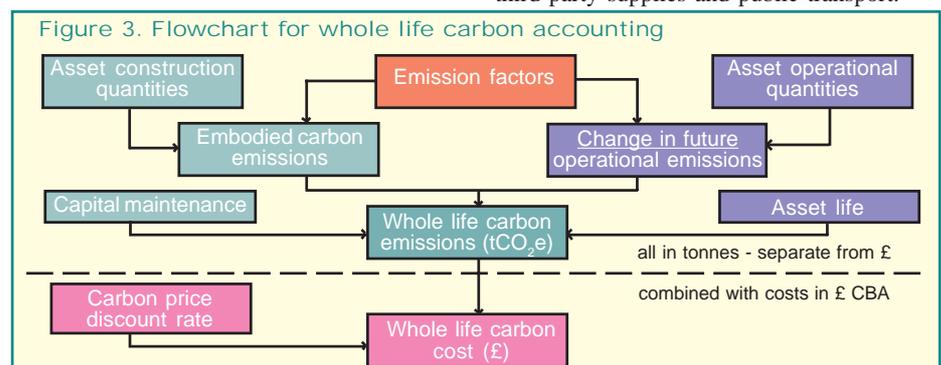
Water companies were consulted on their current carbon accounting systems to identify commonality and gaps in knowledge.

Organisations in the supply chain were also contacted in order to understand their engagement in the process.

The project report contains figure 3 that shows the components of whole life carbon accounting.

Robin Grenfell took delegates through a demonstration of a meta database devised to help companies develop their own low carbon investment appraisals and track progress.

Charles Ainger gave an update on whole-life carbon accounting and carbon targets following intense debate within government. He then outlined four case studies on:



Encouraging responsible use of sewers

In his introduction to a dissemination workshop, UKWIR Client Manager, **Barry Luck**, noted that, in recent years, investment in sewers has resulted in a significant decline in 'hydraulic' sewer blockages, caused mainly by overloaded sewers and sewer collapses.

On the other hand, there has been less progress in reducing avoidable blockages from other causes, primarily due to irresponsible disposal of inappropriate items. He said the main culprits are:

- flushing wet wipes and other inappropriate objects down the toilet
- putting fats, oils and greases (FOG) down the sink
- disposing of food waste down the sink.

UKWIR has responded to this concern by carrying out *Best Practice for National Customer Communications - Responsible Use of Sewers*, managed by **Manocheer Asaadi**.

Paul Le Masurier from the main contractor, MVA Consultancy, said the research objective was to look at different customer groups and examine how tailored information can be provided through appropriate media channels. This required discovering what motivated behavioural change and finding out what the barriers are to people altering their habits.

He said that '*many people nowadays misunderstand what sewers were originally built for, and simply see the sewer as a convenient, effective (and hygienic!) means of*

disposing of bathroom and kitchen waste', asserting that more effective engagement with customers and stakeholders was required to change this attitude.

The core research study involved exploratory qualitative research followed by a quantitative questionnaire survey of 1,126 customers to understand their current attitudes and behaviour regarding flushing. This was supplemented by a study of a sewer blockage 'hot spot' area in which residents were sent, by direct mail, an educational leaflet and promotional items.

Both before and after this mail out, a sample of residents were contacted and asked to complete a short questionnaire, allowing change in attitudes/behaviour to be measured.

Once gone

Liz Dickens set out the results which found that '*people often thought that once an item had gone past the u-bend then it had flushed without any problems*'.

In addition, people seemed not to connect inappropriate flushing behaviour with local sewer blockages, often because flooding only affects properties further down the system. This appeared especially true where there were several joint connections.

Through the use of focus groups it was found that messages with strong imagery and personal accounts of being flooded were

effective. Repetition of messages, although annoying, did have an impact.

The project included an appraisal of communication channels. **Chris Gilmour**, of Beattie Communications, explained to delegates the potential '*pros and cons*' of national versus local campaigns and the relative merits and costs of TV, radio and newspaper advertising.

WRc's **Andy Drinkwater** described in detail an additional 'hot spot' area, the focus of which was a pumping station. As a consequence of inappropriate material being put down the sewer, it had to be cleaned much more frequently than should be necessary.

As part of the 'hot spot' follow-up survey, residents were asked how useful they considered the leaflet and promotional items to be. Promotional items consisted of a sink strainer, plate scraper and 'fat catcher'. The survey showed that 80% of residents considered a leaflet to be useful and around 75% considered a plate scraper and/or sink strainer to be useful.

The project concluded there was a particular need to target those aged 18-34 years old, those of non-white ethnicity and, rather surprisingly, middle and upper middle social classes.

Together with a 2010 UKWIR project *Development of a Joint Test Protocol to Determine the Flushability of Disposable Products*, the water industry is building up evidence to help address this important issue.

Chemical source apportionment

The second round of river basin planning needs to incorporate a better, more accurate, understanding of the actual concentrations of pollutants.

It also requires a better appreciation of the causes of environmental risk to develop remedial strategies.

To address this, UKWIR carried out *Chemical Source Apportionment under the Water Framework Directive - Model Development*, managed by **Brian Ellor**. The project's remit was to apportion all sources of contamination (including industry, agriculture, run-off) and not just those arising from sewage treatment.

At a project dissemination workshop UKWIR Client Manager, Thames Water's **Howard Brett**, said '*the water industry needed a model to show where pollution loads are coming from*'.

Mike Gardner, from the contractor, Atkins, listed the specific pollutants that required attention. These range from common nutrients, such as nitrogen and phosphorus, to metals and to trace contaminants such as biocides, plasticisers, household chemicals and pharmaceuticals as well as those derived from petrochemicals.

He emphasised that '*knowledge of the sources of such environmental contaminants makes it possible to adopt*

control measures, to meet the Directive, that are rational and justifiable and likely to be successful at minimum cost'.

SAGIS

Peter Daldorph then described how they had developed the SAGIS (Source Apportionment - GIS) model, building on the Environment Agency's SIMCAT model, to include diffuse pollution as direct inputs and a wider scope of nutrients, metals and trace organics.

The SAGIS model, see figure 4, uses a GIS interface, to provide user friendly outputs.

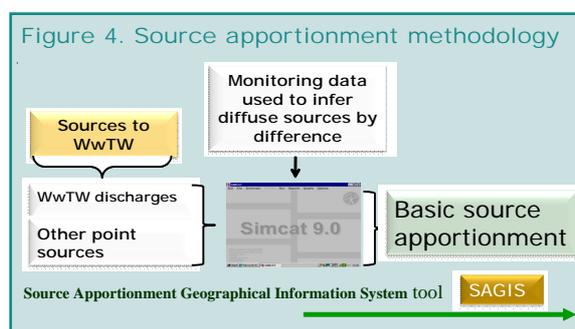
United Utilities' **Luke Pearson** showed the delegates how his company is using outputs from the project to define more explicitly the contribution of diffuse sources of pollution from different sectors.

The Environment Agency's **Tony Heaney** demonstrated how the model will be used through the next planning cycle. It will help towards a wider engagement with stakeholders at a catchment level.

Time is tight, as the regulator can only finalise the programme of measures after due consideration of the Chemical Investigation Programme, see page 4, and SAGIS outputs. This leaves only six months before inclusion in the draft water company business plans.

The evidence from the project can also influence the way in which the Water Framework Directive's programme of measures are drafted and then implemented. This can help to ensure the water industry is only required to undertake work which is fairly apportioned to it in accordance with the '*polluter pays principle*'.

The next stage of the project will be to enhance the functionality of the model developed in the UKWIR *Water Source Apportionment* project by expanding the range of sources and substances included and applying the model to lakes, estuaries and coastal waters. Meanwhile, water companies and the Environment Agency will use the existing models jointly to give a more detailed investigation and assessment of the sources of loads to the regional river systems involving nutrients, metals and other chemicals.



Investigating chemicals

The Chemicals Investigation Programme CIP is a £25m programme of investigations into the prevalence and management of a range of substances likely to be found in sewage. The CIP is being managed by UKWIR through **Brian Ellor**.

The overall aim is to help inform possible measures required under the Water Framework Directive to assist the UK in achieving 'good status' for surface waters by 2015, for both chemical and ecological criteria. This means using the outputs of the project to put forward cases for regulating these substances using 'upstream' source controls or, potentially, by investment in existing and novel treatment processes, to achieve downstream water quality standards. Water companies could then include these measures, if required, in their final business plans, due in April 2014.

UKWIR Client Manager, Thames Water's **Howard Brett**, introduced an interim project workshop in March to keep stakeholders up-to-date on CIP developments and publicise the interim findings. He said the project was timely but things had to move fast, given the tight timetable for business planning and the current proposals to revise the priority substances directive.

Amongst the forty delegates present were representatives from the collaborators (eleven water companies, the Environment Agency SEPA, Ofwat and Defra) as well as the contractor, Atkins, and the subcontractors (Brunel and Cranfield Universities and wca Environment).

Impressive

The scale of monitoring in the CIP project is impressive, as Atkins' **Mike Gardner** demonstrated. It involves measuring and analysing:

- effluent discharges at 162 works approximately fortnightly over a year
- wastewater treatment process effectiveness - 28 works, influent, mid-process and effluent samples over a year
- urban catchments studies to look at upstream sources at nine towns.

Measurements were taken of 75 substances. These included 'priority' and 'priority hazardous' substances set at European level and 'specific substances' identified at UK level:

- 21 metals (total and dissolved)
- 22 EU priority substances (eg PAHs, tributyl tin, BDEs, steroids)
- 14 emerging (pharmaceuticals and consumer chemicals)
- 16 supporting substances including for metal speciation
- 2 biocides (sheep dips).

Statements contained in the UKWIR Newsletter do not necessarily represent the views of UKWIR or the Water Industry

This edition features a listing of UKWIR publications issued since the last newsletter.

CUSTOMERS

12/CU/02/10 Smart Metering in the Water Sector Phase 2: Building the Case by Understanding Customer Expectations and Benefits (1 84057 619 7) £250

CLIMATE CHANGE

12/CL/01/14 Workbook for Estimating Operational Greenhouse Gas Emissions Version 6 (1 84057 623 5) £200

12/CL/01/16 Impact of Climate Change on Asset Management Planning (1 84057 625 1) £300

DRINKING WATER QUALITY & HEALTH

12/DW/04/12 Alternatives to Phosphate for Plumbosolvency Control (1 84057 622 7) £500

REGULATION

12/RG/01/4 Serviceability Methodologies (1 84057 620 0) £20

SLUDGE

12/SL/01/7 Investigation of the Impact of Historic Biosolids Applications on Soil Microbial Activity (1 84057 624 3) £150

WATER MAINS & SERVICES AND LEAKAGE

12/WM/04/8 The Effect of Pressure Reduction on Burst Frequency (1 84057 618 9) £150

WASTEWATER TREATMENT

12/WW/05/6 Technical Study into Heat Sinks in Wastewater and Sludge Treatment (1 84057 621 9) £350

UKWIR research reports are available for non-members to purchase via www.ukwir.org

This resulted in about 0.75 million records. Mike Gardner demonstrated how they can be used through a series of graphs, illustrating average and peak values against environmental quality standards.

Atkins' **Arthur Thornton** then described the options appraisal which aims to identify:

- the range of approaches, at a high level, that could be used to achieve compliance with WFD objectives
- when and where it is appropriate for water companies to act
- those scenarios when and where it is appropriate for other stakeholders to take action.

Origins

Plymouth University's **Dr Sean Comber** explained how the CIP had its origins in a 1993 WRc investigation into metals. This demonstrated there were significant loads associated with domestic inputs and that urban sources of pollution were no longer dominated by industry and therefore not easily controlled.

This, in turn, led to an innovative UKWIR 2003 project that monitored sources of pollution in Bracknell, Berkshire. This traced domestic pollutants through the sewer and sewage treatment systems.

The knowledge built up in these and other projects has been fed into the CIP to assist in identifying contaminants from domestic and urban sources, such as commercial areas, light industry and general run-off.

Howard Brett concluded proceedings by saying that the outputs of the programme, and the knowledge gained from the parallel UKWIR project on *Chemical Source Apportionment* should help identify the sources of pollutants and which sectors of society are generating them and who should be responsible for their control.

This will provide the necessary evidence base to inform any future policy decisions regarding measures to regulate these substances, and in particular, consideration of the technical feasibility and proportionality of the costs of such measures.

UKWIR PEOPLE

Malcolm Dunk is the new UKWIR Client Manager for Sewerage. He is taking over from Southern Water's **Barry Luck** whom we wish to thank for his contributions to UKWIR.

Malcolm was educated at Brunel University and is now Customer Education Manager (Wastewater) at Thames Water and Chair of Water UK Sewerage Network Abuse Prevention Group.

He is also, a Member of EUREAU Flushability Task Force and Chair of the National Misconnections Strategy group.



If you wish to receive electronic copies of UKWIR NEWS, just send an email to mail@ukwir.org.uk