Circulation

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Contents

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BHS–JBA Trust 2011 MSc Studentship Competition

This year, for the first time, we have been able to offer a number of MSc studentship awards. The JBA Trust has supported the BHS MSc Studentships Funding Competition in Autumn 2011, enabling additional students to receive awards and enhancing the funding for all of those students receiving support from the scheme. Six students beginning Masters-level study in hydrology at British universities in September/October 2011 have been given awards. The Society is grateful to JBA Trust for supporting the scheme and investing in the future of British Hydrology.

The competition was open to all students who previously would have been eligible for a full Natural Environment Research Council studentship, and who were not receiving support from other awards.

A total of 23 applications were made. The awards contribute towards the costs of tuition fees for the courses taken and also include BHS membership for the year.

Rebecca Ing	Integrated Management of Freshwater Environments	Queen Mary, University of London
Sharla McGavock	Hydrology and Water Resources Management	Imperial College London
Susan Mickey	River Environmental Management	University of Birmingham
David Mindham	Sustainable Water Management	Lancaster University
Abigail Rees	River Environmental Management	University of Birmingham
Jade Ward	Hydrogeology	University of Birmingham

Applications were ranked based on candidates' CVs and a brief statement explaining their motivations for their proposed courses. The award winners and the courses being undertaken for 2011/12 are as shown above.

The Society will run the competition again in the coming year, and seeks to encourage further companies and bodies to contact the Society if they feel they could contribute support. Please contact either the BHS President or Dr **Neil Macdonald** (Neil.Macdonald@liverpool.ac.uk) for further details.

New members

Sada Al-Janabi.....Leicester
Rebecca Bailey.....Halcrow,Studley,Warwick
Christina Bakopoulou.....Imperial College London
David Barratt.....Dundee University
Sean Burke.....Rotherham
Anna Carruth.....University of Durham
Michal Czechanowski.....Mitcham, Surrey
Iain Hissett.....Hydro Logic Ltd, Exeter
Lan Hoang.....Exeter University
Andrew House.....Cheltenham
Tim Johns.....Bath Spa University
Oladipo Lafinhan.....Nottingham University
Craig Mcqueen.....Northumberland County Council
Roisin Murray-Williams.....Scottish Water, Currie
Alexander Nicholson.....Newcastle University
Alexandra Pitcher.....Haycock Associates, Pershore
Victoria Raiment.....Scott Wilson, Chesterfield
Abigail Rees.....Birmingham University
Seyedehzahra Samadi.....Cardiff University
Mohammad Shamsudduha.....University College London
Mike Simpson.....Imperial College London
Danielle Skilton.....URS Scott Wilson Ltd, London
Jason Stopps.....Gloucester University
Rory Stuart.....Dunfermline
Claudia Vitolo.....Halcrow Group, Crawley
Michael Walker.....Imperial College London
Jenifer Weaver.....Environmental Gain Ltd, Langport
George Woolhouse.....H R Wallingford Ltd

Travel grants

Travel grants are awarded from the Society's general funds to help BHS members whose travel expenses to attend scientific meetings are not met by an employer. Applicants should have been members of the Society for at least six months. The amount will depend on the nature and location of the meeting and the case put forward.

Priority is given to members under 35 or retired from employment, who are presenting papers and who have not previously received support from BHS. Successful applicants will be expected to write a short report for *Circulation*. Travel grant applications should be made to the Hon Treasurer at least two months before the conference or meeting.

To apply, use the form at *www.hydrology.org.uk/about_awards.htm* or contact **Nigel Goody**, SEPA, 7, Whitefriars Crescent, Perth PH2 0OPA *(tel 01738 448806, email: nigel.goody@sepa.org.uk).*

President's piece

It is a great honour, and indeed a pleasure, to be chosen as President of the BHS. As one of those who worked to set up the Society, which I now realise was nearly 30 years ago (I was very young!), I feel very privileged to be in a position to develop it further and to continue to move BHS forward. There has been a great many able Presidents in the lifetime of the Society, and I am conscious that I am following in some very big footsteps.

At the time we set up the Society there was an increasing number of hydrologists who did not fit the more traditional civil engineering mould, and we thought the Society could be a home for all hydrologists, something that could build links with the newer environmental sciences and perhaps even establish a chartered hydrologist qualification.

We have exceeded some of those aspirations. The recent Hydroecology conference at Birmingham showed how far hydrology has come in the environmental arena, as whole new areas of hydrological expertise have sprung up and been accommodated within the Society. The membership has slowly grown over the years and includes an interesting mix of academics, consultants and regulators from a wide range of backgrounds. Incidentally, this is something that appears unique to Britain as other national hydrological societies are more academically focused and do not include a large number of practitioners, as revealed by the recent gathering of them called by IAHS in Melbourne. It was heartening to hear that the hydrological societies in other countries consider the Society to have achieved a great deal in bringing these varied groups together, and want to emulate BHS in their own countries.

One or two of those original aspirations for the Society still remain, though, and there are some newer ones that have been added in more recent years. We explored some of these in the recent membership questionnaire and, whilst we want to keep all the good things about BHS, raising the profile of hydrology, and the Society, is a continuing desire.

It could easily be argued that hydrology has become more important, both in Britain and in the world, than was realized thirty years ago. A series of serious floods in Britain and Europe has concentrated attention on flood impacts, catchment management, and runoff generation. We are now much more aware of the impact of urban development on increasing flood response and the new methods of managing it that have been developed, from SUDS to river restoration.

Globally, however, climate change and the need to provide water for an ever-increasing population from an ever-shrinking and variable resource proves how fundamental hydrology is to the world. It is therefore vital that the Society continues to facilitate the dialog between all the hydrological disciplines, and between researchers and practitioners, to develop the science and application of hydrology. But it is also vital that BHS promotes hydrology to government and the wider public, and we intend to do that too.

Bo9b Sargent
President

BHS Student Award 2011

Eleven undergraduate dissertations were submitted to this year's student prize award. Prizes are awarded on the achievement, relevance, originality and presentation of submitted final-year dissertations addressing scientific and applied issues in hydrology, judged by a panel drawn from the BHS Main Committee. **Gemma Coxon,** University of Bristol, was judged to be the winner of the competition for her work 'An evaluation of multiple hydrological model hypotheses in the UK using a framework for understanding structural errors'. Gemma is continuing at Bristol to study for a PhD.

Two runner-up prizes were also awarded, to **Alexandra Semproni**, Southampton University, for 'A morphological investigation of step-pools using flume experiments' and to **David**

Morrell, Lancaster University, 'Using geochemical isotopic indicators to characterise the glacial drainage system and identify subglacial volcanism, Sólheimajökull, Iceland'. Abstracts from these three dissertations are below.

Look out for details of the 2012 award from April next year.

Claire Walsh, Honorary Secretary

Gemma Coxon, University of Bristol

An evaluation of multiple hydrological model hypotheses in the UK using a framework for understanding structural errors.

Hydrological models are important predictive tools for operational purposes and hydrological research. However, little consideration has been made in the hydrological literature over which hydrological model to choose for a given application. It is demonstrated in this dissertation how multiple flexible model structures can be used to assess model structural errors and model structure identification. As an example application, eight UK catchments, assumed to represent a range of different climate and hydrological characteristics, are applied within a Framework for Understanding Structural Errors (FUSE). Model structure and parameter uncertainty is assessed through a Monte Carlo framework. A set of behavioural models is then used to look at multiple model structures in a regionalisation context.

FUSE has been shown to perform reasonably well in UK catchments with a maximum Nash-Sutcliffe efficiency of 0.89 for some of the catchments. Significant model structural uncertainty is found, whereby a large range of different model structures are able to fit the observed data well. Although a range of different model structures is shown to perform well for certain catchments, FUSE is unable to produce reasonable results for three of the catchments. This is attributed to input data errors or a limitation of the lumped conceptual models that are used as part of FUSE.

The study clearly justifies the use of multiple model structures in hydrological modelling methodologies in order to gain an understanding of model structural error and reduce model bias. However, significant challenges remain. The findings highlight the inherent limitations of discriminating between multiple model structures using rainfall-runoff data with large errors. The need for better diagnostic tools to test models is also clearly demonstrated.

Alexandra Semproni, Southampton University

A morphological investigation of step-pools using flume experiments.

Step-pool systems are present predominantly in steep channels where lateral erosion and incision are high. To reduce the potential energy of the water, the step-pool sequences encourage tumbling flow, which dissipates energy.

This investigation considers step-pool morphology through a series of flume experiments. The relationships between key variables are investigated and compared with the findings in the literature. The variables are normalised by other key variables which are thought to have some control, removing scale and dimensions. Dimensionless variables are important as this is the only method by which findings from different studies can be compared adequately. Without the issue of scale, trends and relationships can be easily identified. This investigation found a number of strong correlations, the strongest of which is between step height and keystone size (R2 = 0.87). Wavelength/step height and slope illustrated correlations shared by this investigation, Chin (1999) and Curran and Wohl (2003). Future research progressing from this study will be to conduct a wider, more in-depth comparison of dimensionless variables of previous findings. This has the potential to improve the management and restoration of step-pool systems.

David Morrell, Lancaster University

Using geochemical isotopic indicators to characterise the glacial drainage system and identify subglacial volcanism, Sólheimajökull, Iceland.

Up until now most research concerning glacial stability and longevity has focused on the top-

down approach to parameterise melting. However, this approach disregards bottom-up forcing and resultant melt. In particular, the role of subglacial volcanism has received little attention but is understood to have potentially significant effects upon an ice mass' stability and dynamics. An understanding of this is of major importance as many of the world's glaciated areas overlie volcanically active zones such as the Icelandic Ice Caps and the West Antarctic Ice Sheet.

In this study hydrological and geochemical indicators collected over two short field seasons during 2009 and 2010 were used to gain an understanding of the hydrological system associated with Sólheimajökull, Iceland. A number of sample sites were chosen in order to gain the fullest characterisation possible of the hydrological system. Hydrological data were taken from an automatic logger mounted on a bridge at the terminus of the proglacial system provided by the Icelandic Metrological Office and gave a continuous time series for the period studied allowing more detailed temporal analysis. This in turn was used to gain a knowledge of the processes that occurred within the system. Sulphate concentrations coupled with conductivity readings allowed identification of subglacial upwellings and seeps. A proportion of this was attributed to geothermal melting through the use of sulphur isotopes as definitive indicators of geothermal activity. The δ34S values, together with sulphate concentration aided by δ18O and δD values, allowed three end members of the system to be identified; supra glacial inputs, inputs from Jökulsárgil, and subglacial melt water, of which a proportion was identified as being from a subglacial geothermal origin through analysis of the isotopic indicators.

Flood forecasting for small catchments

A half-day seminar was hosted at Plymouth University on June 17th 2011, attended by approximately 55 delegates. This sell-out event was organised by Dr **Martin Borthwick**, Plymouth University, with support from BHS South West and ICE South West Sections, and benefitted from having delegates with both a hydrological and civil engineering background.

The seminar dealt with an interesting array of issues arising from the operational response to the recent flash flood event in Cornwall (Nov 2010). An important point was that the Met Office correctly predicted the heavy rainfall accumulations but not in the right place. Traditional operational rainfall-runoff models based on deterministic catchment average rainfall will not be effective in increasing the flood warning lead time for small fast responding catchments if they are not supplied with the correct rainfall forecast.

Some suggested solutions to this rainfall–runoff modelling problem were presented which included the use of probabilistic rainfall forecasts and catchment maximum rainfall in conjunction with increasing the size of the modelled catchment through use of a buffer.

The final presentation summarised a DEFRA project to identify land management techniques to mitigate flood risk on rapid response catchments. A factsheet to complement this presentation is available under: **http://archive.defra.gov.uk/environment/flooding/documents/manage/multi-objective-fm-scheme-factsheet1.pdf**

Copies of these presentations are available on the BHS South West Section website http://www.bris.ac.uk/civilengineering/research/water/bhssw/bhssw.htm. Users will need to scroll down the events page to the section on "Flood Forecasting For Small Catchments".

Oliver Pollard

Just a thought.....

'per capita footprint'.

Doesn't that suggest some confusion as to which way is up?!

12th International Symposium on the Interactions between Sediment and Water

International Association for Sediment Water Science
Dartington, UK
19–23 June 2011

The IASWS symposiums bring together a broad range of international researchers every three years to explore how sediment–water interactions 'drive, influence and link many of the physical, chemical and biological processes at play within and between terrestrial, freshwater and marine ecosystems'. The 2011 symposium was held at Dartington Hall, an historic 1200-acre estate nestled at the foot of Dartmoor National Park along the River Dart in the beautiful countryside of Devon, UK. We were given a glimpse of the history and culture of the venue during the reception event in the medieval Great Hall (built in 1388) on the first evening, which featured storytelling, Morris dancing, medieval musicians and some delicious local ale.

The interdisciplinary tone of the conference was set by a series of excellent plenary speakers who highlighted the importance of sediment-water interactions to the study and management of water resources and aquatic environments. For example, **David Paterson** (St. Andrews) opened the conference with a discussion of biological mediation of sediment transport processes in aquatic environments. He argued that we need a better understanding of these types of multi-way interactions, across a range of environments (lakes, rivers, estuaries and coasts), if we aim to apply an ecosystem approach to management. **Carl Amos** (Southampton) extended this argument by bringing temperature into the picture. Coastal waters are exhibiting significant increases in temperature, which will not only affect biological and chemical processes but also physical transport processes, such as sediment erosion. **Sue White** (Cranfield) discussed the management of sediment quantity, quality and transfer dynamics as an integral component of river basin management. She presented a tool, the Sediment Risk Ranking Model, which assesses the impact of sediment on biotic and abiotic endpoints (e.g. salmonid stocks and water quality) based on the sediment source and type (e.g. agricultural and fine).

One of the main focuses of the symposium was on quantifying and modelling the transport dynamics of sediment and sediment-bound contaminants. For example, I presented the results of an empirical study of sediment transport dynamics that documented significant temporal variations in the erodibility of fine sediment in chalk streams. Seasonal biological activity in the sediment alters the sediment properties, changing its erosion thresholds, which has implications on the storage of sediment and sediment-bound contaminants in the systems.

Dominique Aubert (Perpignan Via Domitia) presented results from a field study that emphasised the need to monitor water quality during flood events in order to quantify the flux of heavy metals to the sea. **Jason Go** (Imperial) outlined a modelling framework to predict contaminant distributions in bed sediment based on physical transport processes and chemical reactions, and provided several examples of its use on sediments contaminated with polycyclic aromatic hydrocarbons (PAHs). **Aaron Packman** (Northwestern) reviewed the mathematical formulations used in physical transport models, and highlighted the use of a stochastic approach as a means to improve the representation of suspended sediment dynamics in rivers.

The IASWS symposium was an excellent opportunity to stay abreast of current developments in the field, but even better for networking. The week-long conference was filled with social events that allowed even the shyest of postgraduate student to pluck up the courage to chat with the many renowned experts present. There is something about standing on

an exposed moor in the driving rain during a field trip that encourages camaraderie, particularly when followed by a pint of good Devon ale. Overall it was a great experience, and I heartily recommend the 2014 symposium which, rumour has it, will be in South Africa.

Robert C. Grabowski
Queen Mary, University of London

International Union of Geodesy and Geophysics (IUGG) XXV General Assembly

Melbourne, Australia
28 June–7 July 2011

I am very grateful to the Exeter Travel Fund of BHS for providing funding to help me participate in the IUGG XXV Assembly in Melbourne, Australia, which was very slickly organised and achieved a number of improvements over previous Assemblies. For example, posters were given a higher prominence in the conference venue and there were two dedicated evening poster sessions with drinks and canapés. Up-to-date information was also available to session convenors so that the inevitable 'no show' talk slots could be used effectively.

Although the IAHS symposia and workshops did not kick off until halfway through the Assembly, I represented IAHS in the IUGG 'Geosciences and the Future of Planet Earth' Symposium, held on the first day. The aim of this symposium was to invite early and mid-career scientists to make suggestions as to how IUGG and its Associations could enhance the role of earth and space sciences in the service of mankind. The Symposium was very successful in itself; it was well-attended, very multi-disciplinary and had lively discussions, particularly about communicating with policymakers and the public. Hopefully the Symposium will have a legacy in suggesting priorities and methods to IUGG for improved communication between scientists and society.

My main interest in the IAHS programme was water quality workshops and symposia, which included co-convening the 'Interaction between fresh water and ecosystems in the coastal zone' workshop. This workshop contained some fascinating talks on freshwater-coastal ecological interactions. Particularly noteworthy was the presentation by **Thomas Stieglitz** (James Cook University, Townsville, Australia) about habitat usage of a groundwater-fed coastal inlet in the Yucatan Peninsula, Mexico, by queen conches. Results from tagging conches at different stages in the lifecycle suggest that, despite being poor in resources, these coastal inlets are used by juvenile conches as refuges from predators. The next step for the research team is to find out how the juvenile conches get into the inlets in the first place as all the adults tracked so far have moved out to sea from the inlets.

I also enjoyed the 'Revisiting experimental catchment studies in forest hydrology' workshop. This included useful critiques of paired catchment studies and also provided a great introduction to forest paired catchment studies in Australia which were strongly represented in the programme. Some of the land management issues which are the focus of Australian paired catchment research, such as salinity and wildfire, are rather different from those of concern in the UK. Given that a carbon tax was introduced in Australia at about the time of the Assembly, I was rather surprised that there were few presentations in the workshop on forests and carbon management, which was the topic of my presentation, focussing on comparing aquatic carbon losses in drainage from forests with carbon sequestered by the trees and soil. The workshop provided an excellent background to the field visit the day after the workshop. The trip was the best value event in the Conference (see Des Walling's report in the previous edition of *Circulation*). For less than the cost of the IAHS Banquet, participants enjoyed a fully-catered visit to view ongoing research into hydrological impacts of wildfire and forest thinning in Melbourne's water supply catchments (see photo) which were badly affected by the infamous "Black Saturday" bushfires in January 2010.

Kate Heal
The University of Edinburgh

Palaeofloods: a session held within the 18th INQUA Congress

The XVIII International Union for Quaternary Research (INQUA) Congress was held between the 21–27 July in the city of Bern, Switzerland. Whilst many of you may ask why is this of interest to hydrology, this is because the meeting included a number of sessions examining palaeohydrology and palaeofloods (which includes historical floods), both of which can provide valuable information on extreme hydrological events, of great value in better understanding the risks presented by extreme events. The congress was attended by over 2000 with a wide range of academics and practitioners from over 92 countries, with a wide range of sessions covering a range of diverse environments and temporal periods. The rest of this report though will focus on a session discussing Palaeofloods in Earth's History. A selection of papers from the session are currently being planned for a future special issue within the BHS official journal *Hydrology Research*. Copies of abstracts can currently be viewed on the INQUA2011 webpage for both oral and posters: http://www.inqua2011.ch/?a=programme&subnavi=sessions&id=90.

The session was divided into three sections: the first two were oral slots and the final section was devoted to posters. The first of the oral slots was notionally focused on long timescales (Pleistocene) with the second section focusing on more recent floods (Holocene). The first session began with a paper exploring the development and discharge reconstructions of the Flueve Manche (English Channel) by **Samual Toucanne**. The paper provided an excellent overview of the current debate concerning the English Channel and its development, particularly the oscillations between source of flow and contributions of various NW European river systems.

The second speaker, **Janine Meinsen**, provided a detailed paper examining the reconstruction of glacial outburst floods from the Münsterland Embaymen in NW Germany and the potential role these floods may have had in shaping the English Channel palaeochannel and bedforms. These talks were followed by four talks examining megafloods (events over ~1M m^3s^{-1}), one examining the reconstruction of discharges for the Missoula megaflood in N. America (**Petteri Alho**), two focused on the Alti

megaflood in Russia (**Paul Carling** and **Valery Zemtsov**) and the final megaflood considered was that of the Lake Vitim event in Siberia (**Martin Gold**).

The second section was opened by a stimulating paper from **Tina Swierczynski** examining seasonal records of runoff within varved lake sediments in Austria. The second speaker was **Lothar Schulte** who similarly explored lake and fan sediment deposits to reconstruct a history of flooding in the Swiss Alps. **Hongbo Zheng** then presented what must be one of the longest records of historical flooding from documentary sources, with records spanning the last 2000 years; these were also supplemented with sedimentary evidence of flooding to provide an excellent flood record for the Yangtze river (China). **Wim Hoek** then returned to Europe with a paper examining the flood history of the Rhine over the last 7000 years, with additional flood information provided from historical records for the last couple of hundred years. **Mateja Ferk** provided an initial report on the work being undertaken on palaeoflood reconstruction within the Planina karst polje, Slovenia. The final talk was presented by **Libor Ellerder** on reconstructing flood records for Prague from historical sources.

The poster section of the session provided an opportunity for a variety of topics to be presented and for delegates to engage in discussions relating to the topics discussed, with a dedicated 80 minute slot given to just posters. This provided a valuable opportunity for some young (and some more established) researchers to meet and discuss their posters with international colleagues within the field. Posters were presented by **Daniel Schillereff** on 'Simulating the flood stratigraphy of lacustrine sediments in the English Lake District'; **Markus Czymzik** on 'Climate control on the frequency

of high-magnitude floods in a seasonal 2000 year flood layer record from varved sediments of pre-alpine Lake Ammersee (South Germany)'; **Stephanie Kermode** 'Catastrophic stripping: response of the Shoalhaven River to high-magnitude, low-frequency flood events, NSW, Australia'; **Douglas Howard** 'Field evidence and hydraulic modelling of a large Holocene jökulhlaup at Jökulsá á Fjöllum channel, Iceland'; **Jürgen Herget** 'Obstacle marks as palaeohydraulic indicators of Pleistocene megafloods'; **Willem Toonen** 'Extreme palaeoflood discharges of the Holocene Lower Rhine'; **Virginia Ruiz-Villanueva** 'Advanced methodologies for the dendrogeomorphic analysis of past floods and related risks'; **Andres Diez-Herrero** 'The palaeoflood record of Pelayo and Arenal Rivers (Central Spain) reconstructed by dendrogeomorphology'; **Neil Macdonald** 'Reassessing flood frequency for the River Trent, Central England, since 1500'; **Suzanne Leroy** 'Resolving the deposition pattern of the Dead Sea laminae and its implication for understanding hydro-climatic short-term variations in the Levant'; and **Gleb Glazirin** 'Dynamics and outburst potential of high-mountainous naturally dammed lakes in Central Asia – review of selected examples from the Tien-Shan, Uzbekistan'. The posters are not described in detail beyond their titles as full abstracts can be extracted from the above website (whilst available).

I would like to thank the BHS for providing a grant to help support the cost of attending the meeting.

Neil Macdonald
(Palaeofloods Session Convenor)
University of Liverpool

Coherent flow structures in geophysical flows at Earth's surface

Simon Fraser University, British Columbia, Canada August 2011

Not since 1995 has the research community come together for a conference devoted to the subject of coherent flow structures (CFS). Since then, however, advances in numerical and physical modelling and field instrumentation have substantially improved our knowledge of these structures, which can be most simply defined as regions of flow showing quasi-uniform characteristics over time and/or space. That last, and inaugural, CFS conference in Leeds focused on open channel flows but the research community involved in the study of CFS has now expanded to include those engaged in a range of atmospheric boundary layer and gravity current flows.

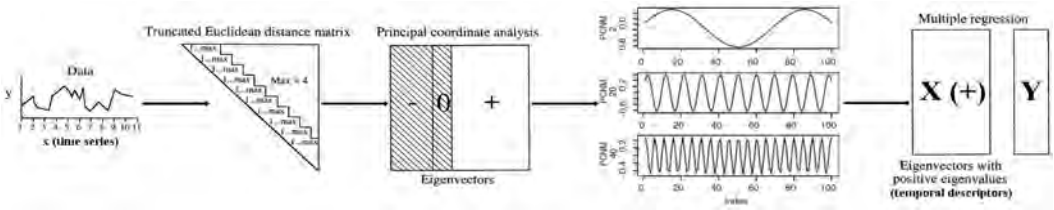
A major theme of this second CFS conference, therefore, was multidisciplinarity, with topics as diverse as forest-atmosphere CO_2 fluxes (**Gabriel Katul**, Duke University) and coherent structures present in lava flows (**Gordon Grant**, USDA Forest Service). Unsurprisingly then, the elucidation of coherent structure in fluid flows is in demand from many quarters. This was, perhaps, the most striking impression left by the conference: that the range of applications for CFS research is so wide and deep, including river engineering and management, climate change research and mineral exploration, to mention just a few. According to keynote speaker **Marcelo Garcia** (University of Illinois), methods used to study CFS in laboratory flumes have even attracted the attention of astrophysicists studying black holes!

Being a river scientist, I was most interested in the talks on CFS in open channel flows observed in the flume and field and modelled using a variety of numerical techniques. Two approaches to detecting the structure of fluid flows in the laboratory have been used: flow visualisation through the injection of dyes and tracers; and flow quantification using particle imaging or acoustic Doppler technology. **Ron Adrian** (Arizona State University) summed up the results from these approaches in the opening keynote lecture which emphasised the organisation of quasi-streamwise hairpin vortices into 'hairpin packets' that dominate motion throughout much of the flow depth.

The second keynote lecture, by **Thorsten Stoesser** (Georgia Institute of Technology), contrasted several approaches to numerical modelling and demonstrated the ability of one method in particular, Large Eddy Simulation (LES), to resolve a range of CFS. The detection of turbulent structures in the field is more challenging than in the laboratory flume but a number of talks focused on larger-scale secondary flow structures occurring in rivers, such as the full width eddies responsible for patterns of scour and deposition in the Colorado River (**Scott Wright**, USGS). **Geneviève Marquis** (University of Montreal) presented results from five gravel-bed rivers which show the occurrence of flow fluctuations in the order of several minutes long which help to bridge the gap in knowledge between 'hydraulic' and 'hydrological' scales in river systems.

In a fascinating final keynote lecture, **Vladimir Nikora** (University of Aberdeen) drew these strands of evidence from different settings and scales together by showing how secondary currents and turbulent flow structures relate to the concept of the energy cascade.

I presented my ongoing PhD work in a poster, '*Multi-scale patterns of turbulent flow in hydraulic river habitats: towards an objective and ecologically relevant classification of physical biotopes*', which gave me an opportunity to talk in great depth to researchers from a variety of backgrounds. I applied a novel time-series analysis technique which is usually used in spatial ecology (see diagram). It was particularly helpful, therefore, to get advice and exchange ideas with delegates whose work focuses on the interaction of CFS and



Schematic diagram of principal components of neighbour matrices (PCNM), the technique used to analyse velocity time-series from river habitats.

aquatic biota. Much work is being done on plant-flow interactions in rivers.

Tim Marjoribanks (University of Durham) presented results of models simulating flow around individual river plants, **Ponnambalam Rameshwaran** (CEH) explained how plant-flow interactions affected reach-scale processes and, in her keynote lecture, **Heidi Nepf** (Massachusetts Institute of Technology) provided the crucial link between these scales with an analysis of flow structures around patches of vegetation. In other ecologically-oriented talks, **Xavier-François Garcia** (Leibniz Institute) and **Jay Lacey** (Université de Sherbrooke) provided evidence linking CFS to the drift of benthic invertebrates and the swimming behaviour of fish respectively, work which is very relevant to my research.

I would like to thank BHS for making it possible for me to attend this long overdue CFS conference. Let's hope we don't have to wait another 16 years until the next one!

Martin Wilkes
University of Worcester

12th International Conference on Urban Drainage (ICUD)

Porto Alegre, Brazil
11–16 September 2011

We have two accounts of this meeting from recipients of BHS Travel Awards

(1) Hydro-optimism' – science and communication at the frontier of urban drainage in the cities of the future

The International Conference on Urban Drainage series has a history of bringing together a vast range of perspectives, both disciplinary and internationally, representing interests in urban drainage. The 12th in the series was no different and was attended by around 400 participants from over 27 countries including hydrologists, numerical modellers, water/wastewater managers, urban planners, landscape architects, social scientists and policy makers, to name but a few.

Although 3-5 parallel sessions made it difficult to see presentations across different disciplinary topics, the connections between hydrometry, modelling, decision-making, participatory processes, urban planning and the implementation of urban drainage techniques (both structural and non-structural) were clearly evident in the programme.

SuDS/firefighting water at Porto Alegre airport

At this conference it was clear to see that everyone has a part to play in developing the urban drainage/water management sector in an uncertain future world. Particularly, 'social' aspects have become part of the mainstream thinking in relation to urban drainage. Social and technical (as well as socio-technical) papers were spread across sessions on: urban rainfall; hydraulics; urban planning; pollutants; stormwater source control; sewer processes; climate change adaptation; water sensitive urban design; real time control and modelling; rainwater harvesting; monitoring, data collection and processing; performance assessment; perspectives on education; GIS; urban flooding; modelling and simulation and, finally participatory processes, decision-making and social acceptance. Far too many papers and topics to describe in this article, so I shall attempt to connect them together with some underpinning messages.

One message in particular I took away, is that there is a lot of mutual learning going on – but more needs to happen, especially between developed and developing countries. And that's not just a one-way process. From the conference it was clear to me that 'developed' countries have much to learn from 'developing' countries, with particular regard to participatory processes and community/collective action in problem solving. This includes the way in which the things science tells us are communicated – it seems developing countries are able to truly involve people, as they trust them to make the right choices. Many presentations from Brazil, Colombia, Uruguay and Samoa highlighted that when local governments aren't quite sure about what to do, they ask the people.

This fits well with the UK's recent 'localism' agenda, but is perhaps not something that sits easy with the way things have traditionally been done (perhaps we have become too reliant on the 'establishment' and cannot see the system working without it?). That's not to say asking the people would work for everything everywhere, but I think we could learn a thing or two from the processes followed. Talk of 'co-production' of information, responses and benefits was introduced by **Carlyne Yu** (Monash University, Australia), showing that developed countries are beginning to think about how to integrate 'people' within institutional and organisational responses to urban water challenges.

Particularly interesting sessions were the UNESCO Workshops – held each day with the title 'challenges of integrated urban water management in developing countries'. This is where the phrase I use in the title, 'hydro-optimism', emerged, thanks to **Maria Rafaela Matos** (Department of Environmental Hydraulics at LNEC, Portugal). Speaking about 20 years of experience in urban drainage and participatory processes, Maria highlighted some 'steps to success' that can only work alongside 'hydro-optimism'. In a different session, **Richard Ashley** (University of Sheffield, UK), also highlighted the value of 'Learning Alliances', which may well replace 'networks' or 'partnership working' as the new buzz word, but what is crucial is that the sentiment behind all of these terms is not lost i.e. that 'working together' is key.

Sessions also emphasized that there are technical lessons to be learnt

Water meter outside a shop on the high street in Porto Alegre

about what works and what doesn't work in different contexts and how even in these challenges 'we' can help each other fill in the gaps. **Li-Pen Wang** of Imperial College London, presented 'an enhanced blend of SVM (support vector machine) and cascade methods for short-term rainfall forecasting', showing that a coupled model trained on real data produced better results. This was complemented by the conferences' Poul Harremoës Award' winner **Nuno Simões** (University of Coimbra, Portugal) presentation entitled 'urban drainage models for flood forecasting: 1D/1D, 1D/2D and hybrid models'. The connection between these papers highlighted that high resolution hydrometric data collection and processing is still crucial, even in the 'age of models', as without calibration, validation and training with 'real' data, we would not be able to identify the usefulness of model outputs.

On more structural technical responses, several field trips were undertaken to observe various aspects of urban drainage and water management in Porto Alegre. I opted for the tour of the 'favelas' (called 'villas' in Porto Alegre) or shanty towns, as I had learnt about them in GCSE geography and yet had never been to one. We were taken to three different areas: a 'real' villa, a newly built villa and a rebuilt one that had been established for 10 years. When the residents of the villas' were asked (as part of the 'Participatory Budgeting Cycle') what their number one priority was, adequate housing was the biggest request (most of the structures we saw in the 'real' villa were ready to fall down and were located in an area prone to pluvial, fluvial and sewer flooding). So this became the number one priority to address – re-housing the villa dwellers. However, although bricks and mortar are the most common items associated with housing, good water supply and drainage facilities are not far behind if the housing is to function as intended and for the health impacts of poor sanitation to be overcome (we witnessed mosquitoes breeding in areas of open wastewater). Therefore it was easy to see that even in what was effectively a re-homing programme, water and sanitation infrastructure were still clear priorities posing challenges and requiring planning and management — the most sustainable or integrated techniques were not always implemented. This of course echoes the process in new developments in developed countries. It is therefore obvious that developed and developing countries need to unite in addressing the water and sanitation challenges in the cities of the future, where a 'new water governance' needs to be implemented by actors at institutional, organisational and procedural levels (**Adriana Piperno de Santiago**, Dirección Nacional de Aguas- MVOTMA, Uruguay).

One final message was delivered by the showing of the short film 'Water, Nature and the City' (produced by **Bernard Chocat**'s team at INSA Lyon, France), which emphasized that 'in the city of the future, communication is as important as science'. Following this, **Pieter Lems** (Wageningen University) presented an interesting paper on self-referential and empathetic communication, surreptitiously posing the question to those at the conference – are we (water managers/urban drainage professionals) better at communicating with ourselves than with others?

In conclusion, my main message from attending this conference is that whether you are a hydrologist, a planner or a policy maker, we need to become 'hydro-optimists' and use science and communication to reconnect people with water, as well as connecting pipes with ponds. I should like to thank BHS

Solid waste contributing to surface water pollution in a 'villa'

Improved worker WCs facilities outside a rubbish sorting plant in a 'villa'

for providing me with a travel grant, which assisted me in attending and enabled me to present some of my PhD work and formulate these (hopefully useful!) conference insights.

Sarah Ward
Centre for Water Systems
University of Exeter

(2) *Sudip K Pal*, Heriot Watt University, writes

The 12th International Conference on Urban Drainage (ICUD), which kicked off on 11th September 2011 in the City of Porto Alegre in Brazil, was held in the Hotel Plaza Sao Rafael until 16th September 2011. The conference goal was to create a multigenerational, multicultural community for diverse people of all levels having an interest in urban drainage and to offer conference participants the opportunity to work with and learn from established, passionate, award-winning professionals who are committed to innovative research, teaching and mentoring. I felt privileged to be there as one of the over 500 conference participants from many different parts of the world in the atmospheric, cordial and historic setting of Porto Alegre.

To start with my journey, the flight from Edinburgh, UK to Porto Alegre, Brazil took more than 20 hours: pretty long and tiring. I found the weather in Porto Alegre was completely different to Edinburgh, the mercury reading 35ºC on average during mostly sunny and dry days at this time of the year. I stayed in the same hotel (Hotel Plaza Sao Rafael) where the conference was held and it was very handy to move around during and after each day's events.

The conference itself primarily comprised five days of more than 20 parallel sessions (based on conference themes) along with key note addresses and plenary sessions covering technical, social and other relevant aspects of urban drainage issues. The conference facilities were outstanding, with up to date technologies. I was privileged to be the first speaker of the technical session 'Pollutants in urban areas: sources, accumulation and wash-off' where I presented my paper 'On the relationship between pollutant build-up on roads and antecedent dry days'. I got very good and constructive feedback from the attendees during the question and answer slot. I attended several other technical sessions to get knowledge from research done by other people around the world. In addition, the breaks between sessions were always free and open to meet people to make contacts for facilitating future networking. It was a great pleasure for me to meet and get acquainted with my peers, and to discuss various aspects of my research.

Other activities included

roundtable discussions on various research group agenda, speeches by conference organisers, a gala dinner for participants outside the conference venue and a variety of field visits. Among the five field visit options, I went for 'SUDS in practice around Porto Alegre City'. It was a nice guided tour and I got an idea how SUDS work in the city context, and indeed took in the city sights.

At this early stage of my research career, the conference provided the perfect groundwork to get me started and keep me moving in the right direction. I found the conference was one of the most inspiring, informative and stimulating experiences I have ever had. Although I have attended conferences in the UK and abroad, this was one of the best: the opportunity for genuine interaction with high profile people set it apart. All of the attendees were incredible individuals. They were pleasant, quirky, knowledgeable, friendly, capable, inspiring researchers, and seemed genuinely glad to be there. I wish I could take the opportunity to attend the next ICUD conference with all of them.

At last but not least I should acknowledge the British Hydrological Society (BHS) for their support. As a member of BHS, I am pleased to say that this scheme for young researchers, to provide an opportunity to present their work at conferences or workshops, is an incredible one. Finally, appreciation also goes to the Sustainable Water Management Research Group in the Institute for Infrastructure and Environment at Heriot Watt University, Edinburgh, UK for financial and logistical support to make my presence possible at this prestigious conference.

Sudip K Pal
Heriot Watt University

This international conference was jointly hosted by the Irish Agricultural Catchments Programme (Teagasc / DAFF) and the UK Demonstration Test Catchment Projects (Defra / EA). Aimed at scientists, policy makers, farmers and land managers, the conference brought together international experts to address the questions:

- Can we manage agricultural catchments for economic and environmental objectives?
- Where are we seeing successes and why?

These questions were explored in four themes:
Scale issues, catchment uncertainty, counting the cost and case studies.

The conference was opened by **Simon Coveney**, Irish Minister for Agriculture, Food and Marine, who used this opportunity to announce the continuation of funding for the Irish Agricultural Catchments Programme that studies the practicalities of

tackling diffuse water pollution from agriculture at a catchment scale to deliver Water Framework Directive objectives. His announcement surprised and delighted the Irish convenors and set an upbeat tone for the following three days.

The first session on Case Studies was opened by Professor **Dennis Frame** from University of Wisconsin who outlined the Discovery Farm watershed projects, which aims to 'demonstrate, with tangible data, a relationship between changes in land management and improvements in water quality'. The programme is striking through its effectiveness in engaging with the farming community and eliciting its logistic and financial support towards the project.

Ross Monaghan from AgResearch in New Zealand summarised the 10-year research programme from four regionally-representative dairying catchments in New Zealand, now (sadly) coming to an end. Not surprisingly, the effectiveness of the Best Management Practices (BMP) varied across the four study catchments. The research found that farmers prefer a 'toolbox' approach to BMPs, rather than a 'one size fits all' prescriptive approach. This toolbox has been used to guide the Farm Planning initiatives within the catchments. Field-day presentations followed by one-on-one interactions with farmers showed some success in improved farm environmental performance, as evidenced by changes in fertiliser and effluent management practices. However, the adoption of other more costly or complex management practices is much slower and unlikely to take place on a purely voluntary basis.

Further catchment scale initiatives that were discussed included the England Demonstration Test Catchments programme by **Dan McGonigle** of Defra, The Tarland Catchment Initiative (river Dee in Scotland) by **Susan Cooksley** of The James Hutton Institute and the Little Arkansas River watershed initiative by **Dan Devlin** of Kansas State University.

A Special Session on Mitigation Methods included brief examples of practical mitigation measures, including the (lack of) effectiveness of soil aeration to alleviate soil compaction and decrease pollutant losses from pastures (**Fiona Curran-Cournane**, New Zealand), soft engineering methods in the Belford Burn catchment Northumberland (**Mark Wilkinson**, Newcastle University), the effectiveness of constructed wetlands for mitigation of diffuse pollution from agriculture (**Mary Ockenden**, Lancaster Environment Centre), demonstration of the new FARMSCOPER software (**Yusheng Zhang**, ADAS) and a calculation of N and P balances and efficiencies on contrasting dairy farms in Australia (**Cameron Gourley**, Ellibank Centre, Australia).

The discussion then moved onto the different scales of investigation, with a general view that whilst it may be difficult to prove or disprove the merits of individual BMPs at a catchment scale, it may be easier to demonstrate smaller scale effects within the wider catchment through a nested experimental design. **Brent Clothier** from the New Zealand Institute for Plant & Food Research pointed out a gap in our understanding of landscape attenuation of nutrient transfers from farms to rivers. **Scott Wilkinson** from CSIRO in Australia outlined one way of bridging this gap by 'using a range of empirical, conceptual and mechanistic models, in combination with water quality data and sediment and nutrient tracing/dating techniques to evaluate the impact of agricultural land management change at a range of scales'. Prof. **Bridgett Emmett** of CEH Bangor talked about the ambitious NERC funded two-year pilot of setting up an Environmental Virtual Observatory using state-of-the-art cloud computing technology to make environmental data more visible and widely accessible, whilst **Robert Orr** of Rothamsted Research described the new North Wyke Farm Platform, which forms part of the UK national scientific capability.

Opening the session on 'Uncertainty', Prof **Helen Jarvie** from CEH Wallingford reminded the audience that whilst river water quality can improve rapidly following point source controls, the response to diffuse pollution mitigation is likely to take much longer and is greatly more uncertain due to 'issues of scale, intensity and location of BMP implementation, influence of other sources and lags associated with the macronutrient legacy'. In some cases, well-meant mitigation measures can even lead to unexpected adverse ecological responses, due to complex biological feedbacks. **Paul Withers**' presentation (Bangor University) on the underestimated significant impact of unauthorised or badly maintained rural septic tanks

on water quality highlighted just one of the unaccounted factors that may lead to a confounded catchment response. Prof **Brian Kronvang** from Aarhus University and **Jorgen Windolf** from Silkerborg Research Institute, Denmark, presented the results of the 20 years' monitoring of the implementation of Danish Action Plans for the Aquatic Environment. Whilst the Action Plans have been very successful in reducing the N-loading by 47% nationally, large regional differences caused by different anthropogenic and natural processes highlight the complexity of the ecosystem response.

The final session on 'Counting the Costs' included fascinating presentations that added socio-economic complexity to the natural variability already discussed. Prof **Catherine Kling** from Iowa State University presented the use of integrated economic and biophysical models as a tool for identifying

most efficient and cost-effective BMPs. The Swedish FyrisCOST model described by **Dennis Collentine** of Uppsala University also calculates the cost efficiency of alternative scenarios for nitrogen management at a catchment scale. **Laurence Smith** of SOAS, University of London, stressed the importance of good governance to achieve catchment wide objectives whilst **Julia Martin-Ortega** of the James Hutton Institute reviewed the progress made at the European level in the economic analysis of the WFD and the challenges in using the ecosystems services approach to assess the (dis) proportionality of WFD implementation by weighing up of costs and benefits.

I am grateful to the BHS for enabling me to attend this stimulating conference.

Miriam Glendell
University of Exeter

Hydroecological tools for river basin planning

BHS National Meeting
University of Birmingham
20 September 2011

This National Meeting addressed a high priority set of issues related to hydroecological perspectives on, and tools for, river basin planning. Papers and posters encouraged dialogue between delegates with different backgrounds (academics, water managers, consultants and stakeholders) on a range of important matters including: mismatches between hydrology and ecology datasets, assessment and modelling approaches, scales of enquiry, sources of uncertainty, hydroecological process understanding and interrelationships, and river restoration.

Following a context-setting introduction by the conveners, the morning session was themed by presentations on hydroecological perspectives on river basin planning. **Stuart Smith** (Atkins) provided an overview of immediate concerns, near-future approaches and future expectations for the confident assessment of the quality of the aquatic environment. The availability of data and the locations of existing monitoring were identified as key to reducing uncertainties.

Addressing similar issues at a broader scale, **Mark Everard** (Environment Agency) postulated the potential value of an ecosystems services approach in

reconceptualising the implementation of future planning cycles of the Water Framework Directive. Some issues of principle were highlighted using WFD case studies that have taken an ecosystems approach.

Ongoing development of the river restoration community across Europe was the focus of a talk by **James Holloway** (River Restoration Centre). Examples of river restoration best practice included the creation of an online wiki-database of case-studies; providing a platform for a range of stakeholders; and potentially influencing policy development.

David Corbelli (Cascade Consulting) presented an overview of guidance and toolboxes in development to help practitioners deliver Good Ecological Potential (GEP) in Artificial or Heavily Modified waters. Derived from existing datasets and scientific knowledge, these approaches are intended to aid improvements in understanding the relationships between ecology and hydromorphology, and identification and implementation of mitigation measures required to achieve Good Ecological Potential.

Conceptual models describing adverse ecological effects on river and wetland habitats as a result of modified flow regimes and regulation were presented by **David Bradley** (APEM Ltd). The models have been used to develop a suite of simple indicators that may be used to guide improvement measures in the worst affected water bodies and optimisation of flow releases.

A Prototype GIS-based spread-sheet tool developed to assess the ecological impact of fluvial flooding and coastal inundation was presented by **Gareth Old** (Centre for Hydrology and Ecology). The tool assesses the impact of a given hydrological scenario by comparison with sensitivities of mapped ecological assets.

After lunch and the BHS AGM, talks were themed on the development and application of hydroecological tools. **Michael Dunbar** (Centre for Ecology and Hydrology) presented two hydroecological tools that allow reference conditions to be estimated for monitoring sites, and which quantify relationships between hydromorphological stressors and ecological response. RICT is the platform through which the latest version of the RIVPACS reference condition model is delivered. DRIED-UP complements RICT/RIVPACS by modelling the response of the macroinvertebrate LIFE metric to flow and habitat modification.

Attila Lazar (University of Reading) addressed validation of complex ecological models where limited ecological data are available. Results from a new Primary Producer Model were compared with existing riverine pollution theory for the River Thames in order to explore the response of the modelled system and evaluate the proposed theory.

Barry Hankin (JBA Consulting) presented work to improve mitigation of the potential ecological impacts of point discharges. SIMCAT models, linear statistical models that simulate flow and water quality at any point within a catchment were used. The models account for seasonality as they are based on summer, winter and annual flow duration curves and provide improved predictive accuracy of point source flow and distribution within catchments.

Gemma Harvey (Queen Mary, University of London) considered the robustness of habitat characterisation and assessment at the mesoscale for rapid field-based assessment. Linkages between physical and ecological components of the instream environment were identified, along with the key issues associated with mesohabitat approaches and consideration of the robustness of habitat features at multiple spatio-temporal scales.

Alexander Milner (University of Birmingham) used datasets from pristine areas in the USA to demonstrate a new statistical approach for understanding natural variability in stream ecosystems and when this is exceeded. The method utilises Taxonomic Distinction and Multi-dimensional Scaling with the application of control charts that can identify significantly years that exceed natural physico-chemical variability.

Granville Davies (Royal Haskoning) reviewed the Hull Headwaters Sediment Modelling project. A combination of modelling techniques used to appraise the impact of structures on the river and SSI were described; the potential risks and opportunities that structure removal presented were explored; and a discussion was provided of how knowledge from this project could be applied elsewhere.

The Meeting concluded with **Diana Hammond** (River Restoration Centre) who described the outcomes

of a scoping study for restoration of Cudworth Dike, Yorkshire, which currently achieves 'bad' overall ecological status. A number of catchment based restoration opportunities in conjunction with a number of potential partners were proposed including: channel narrowing, introduction of deflectors to increase flow variability, thinning of dense tree cover, re-meandering; and sympathetic bank management.

On behalf of my fellow delegates, I thank the University of Birmingham for hosting this event, and the convenors, **Sarah Hainie** (Environment Agency), **David Hannah** and **Chris Bradley** (University of Birmingham), for organising a stimulating meeting in a new and fast-developing field.

Grace Garner
University of Birmingham

Droughts: research and management

BHS Pennine Hydrological Group/Royal Met Soc meeting Liverpool University 28 September 2011

The first meeting of the newly reformed Pennine Hydrological Group of the British Hydrological Society took place on Wednesday 28th September 2011, at the University of Liverpool and was organised by Dr Neil Macdonald. The theme of the meeting was particularly pertinent as became clear during the event, as droughts are still a concern for a number of water companies and regulatory agencies.

The first speaker was **Beverley Todd** of Liverpool University, who talked about her work on the variability of droughts from 1767 to 2010, describing the hindcasting of droughts using historical data. **Jamie Hannaford** from CEH Wallingford followed, describing work carried out for the WATCH project, looking at spatial and temporal dynamics of drought at a European scale. The work described how trends in low flows and drought indicators show that the UK seems to be a good indicator for drought in Europe.

Next followed **Ian Stevens** from Yorkshire Water, who spoke about the inevitability of the "d" word (drought). He used interesting examples from the construction of the Sheffield reservoirs during the early 20th century. The 1904 drought seems to have been as large in magnitude (using a 6-month drought severity index) as any of the droughts in the recent record.

Peter Ede from Mott Macdonald described water resources management in Anglian region in the light of droughts since 1800. Historical flows have been simulated with a view to simulating indicative flows if historical climatic conditions (rainfall and PET) were to be repeated.

Four short poster presentations followed. The first, given by **Rod Wilkinson** of Severn Trent Water, emphasised the importance of historical data when considering the issue of calculating levels of service in water resources planning. **Frederick Wetherhall** then described the global drought forecasting carried out in the European Centre for Medium Range Weather Forecasts. He was followed by **Louisa Peaver** of Anglian Water, who spoke more about the multi-season droughts project described earlier by Peter Ede, which showed that an event in the 1800s may be more extreme and significant than droughts in the more recent period. The final poster presentation was by **Geoff Petts** (University of Westminster), on incorporating ecological drought in river flow management, and the importance of considering recovery from drought, as well as seasonality and likely natural flows in drought situations.

Christel Prudhomme from CEH Wallingford spoke on perspectives on low flows and the use of the CERF model (continuous estimation of river flows). She described the work carried out for the UKWIR/EA project applying the CERF model to climate change scenarios, and spoke briefly about the likely results.

Richard Gosling from SEPA described the development of drought and low flow indices, and their use for regulatory purposes and for climate change risk assessments. The use of a 6-month drought severity index (DSI), normalised with regards to the annual mean to allow comparison of the statistic between sites was described. Richard also explained how UKCP09 scenarios could be applied to drought indices to assess the effect of climate change on drought duration and severity. The use of the standard precipitation index (SPI) applied to flow and standardised according to the annual mean was also discussed.

Pauline Smith from the Environment Agency gave a regulatory perspective on the challenges presented to water resources management during droughts, with examples from the 2011 event, which was drier earlier than in previous years. Fish rescues started in May (usually these do not occur until July/August). She highlighted the importance of understanding environmental needs, multivariate triggers and different modes of failure: with the increased resilience seen in many systems, when failure does occur, it can be catastrophic. Communication was acknowledged to be essential — but how to explain low probability, high consequence events?

And finally, **Mark Smith** from United Utilities described drought management in the north-west, based on the experience of the 2010 drought. With reservoir stocks falling fast, and no significant rainfall forecast, hosepipe bans were introduced on the 9th July, saving an estimated 50Ml/d. There followed a period of heavy rainfall, with July experiencing 180% of the LTA. Some important lessons learned from the event have been incorporated into operational procedures, such as the importance of communication — weekly multi-agency telecoms, the need for further pro-active communication, the need for structures to decide how to deal with non-supply (compensation) reservoirs, etc. A biennial drought exercise between UU and EA has been introduced.

The day was summarised by Professor **Janet Hooke** (Liverpool University), noting the interesting content and the wide variety of the talks. The combination of research and applied presentations showed the importance and interconnectedness of the two parts of the topic. The importance of longer term records to point up the characteristics of severity, duration, and frequency was highlighted. She noted the use of various drought indices, and there was some discussion on the possible drivers of droughts. The natural variability of the climate, and the question as to whether past droughts are indicators for the future, or are they simply representative of historical climatic conditions, was discussed.

Miranda Foster
Yorkshire Water

BHS 29th Annual General Meeting

The 29th AGM of the British Hydrological society was held on 20th September 2011, at the University of Birmingham

Twenty-one members attended the AGM held on 20th September 2011 at the University of Birmingham. The meeting began with an explanation that this year the award of the student prize was slightly behind schedule and that the winning dissertations will be announced in *Circulation* and on the website in due course.

President **Andrew Black,** began by reflecting on the large number of meetings held since the International Symposium in July 2010 and also the many regional programmes, in particular highlighting the strengthened committee in the Pennine's region. Andrew cited this year's membership survey which gathered useful information on member's hydrological activities and interests, information from which will be fed into the design of future meetings and activities.

The Society has been in dialogue with the ICE about the way it is working with associated societies and also with IAHS regarding the promotion of a network of hydrological societies. Also highlighted were members'

contributions to bumper issues of *Circulation*, *Hydrology Research* journal and the joint Symposium on Weather radar with RMS.

An important announcement was the launch of a scheme to help fund young people with postgraduate studies. Andrew also mentioned that BHS has a number of initiatives to invest in growth, including the leaflet recently circulated to all members which he encouraged members to use to target new audiences. Finally, Andrew thanked Frank Farquharson (past President) for inviting him to take office as President, also to the Executive Committee he has worked with: Nigel Goody (Hon. Treasurer) and Claire Walsh (Hon. Secretary), Celia Kirby (Technical Secretary), Ian Littlewood (BHS Editor of Hydrology Research), Tim Fuller (BHS Secretary) and welcomed **Bob Sargent** into the role as President for the next two years.

This year's President's Prize was awarded to **Helen Braithwaite** (née Proctor). Before she moved to Australia, Helen was a very active member of the South East region, being associated with 36 meetings. On learning of the award, Helen was delighted.

The minutes of the 28th AGM were approved by Nigel Goody (SEPA) and Celia Kirby.

Claire Walsh (Hon Secretary) reported that since the last AGM in September 2010, there had been a further nine national meetings, including this one here in Birmingham today, covering a wide range of topics: ' Flood Risk from Extreme Events' jointly hosted with CIWEM and The Institute of Marine Engineering, Science and Technology; 'Upland Hydrology', a very successful Peter Wolf Early Career Hydrologists' Event at Loughborough, where over 60 delegates met over two days; International Symposium on 'Weather Radar and Hydrology', jointly sponsored by the RMS, this event dedicated a whole day to hydrology; a discussion workshop on 'Hydrology in a Changing Economic Climate', two meetings held here in Birmingham: 'River Temperature: research and management in a changing climate' and 'Providing an efficient and effective hydrometry service'; and our biannual meeting with CIWEM on 'Hydrology of Water Resources'. In addition, 13 regional meetings have also taken place.

The meetings programme for 2010–11 is becoming densely populated with planned national meetings on droughts, groundwater, flood hydrology, new technologies in the environmental sector and the Peter Wolf Early Career Hydrologists meeting as well as the National Symposium being held in Dundee in July 2012. Claire encouraged members to suggest topics for meetings as we wish to offer a programme of meetings that satisfies and benefits our whole membership.

Nigel Goody (Hon Treasurer) presented the accounts for the Financial Year 2010–11, providing explanation for variation from the original budget predictions, both under- and over-spend on various items. The Reserves for the Society continue to be very healthy and have further increased during the year.

The Committee recommendation that the rates of Annual Subscription and for advertising within the Register of Consultants should remain unchanged was approved by the AGM, as was the draft budget presented for 2011–12. The latter includes provision for the MSc Studentship Awards scheme, the proposed change to the mechanism for subscribing to IUGG, the potential registration and set-up costs which would be incurred should Committee agree in pursuing enrolment with the Society for the Environment (to permit BHS to award professional qualification as Chartered Environmentalist), and contribution towards sponsorship of two one-off educational events.

We see a number of changes to the committee this year. Isabella Bovolo and Mark Wilkinson step down as elected committee members but Mark remains for six months or so to drive forward redevelopment of the website. Simon Mathias resigned from his post as elected member. Following nominations for ordinary committee members, I am pleased to welcome Aidan Burton from Newcastle University and Darren Lumbroso from HR Wallingford to the main committee. Nigel Goody remains as Honorary Treasurer for a second term and Bob Sargent became the 14th President of BHS.

Claire Walsh
Hon. Secretary

UK Hydrological Bulletin: August-October 2011

Fortunately, in the context of the 2011 drought, the second driest spring (March–May) in the 112-year England & Wales rainfall series[1], was followed by a decisive synoptic change during early June — heralding a summer during which cyclonic weather patterns were dominant. For the UK as a whole the summer was both wet and relatively cool: average temperatures over the June–August period were the lowest since 1993 and rainfall was above average for the fifth year in succession.

However, regional contrasts, which have been a feature of rainfall patterns throughout the year thus far, were exceptional. This was exemplified in August when rainfall for the Tweed basin was the third wettest since 1963 whilst some areas to the south remained notably dry: Shrewsbury recorded only 12 mm of rain over the month, contributing to the lowest summer rainfall total for the Midlands for 15 years; the Western Isles in Scotland were also very dry.

The associated regional contrasts in soil moisture conditions were reflected in summer river flows. Flood Alerts were widespread in both July and August in Scotland where soils were close to saturation. To the south however, soil moisture deficits continued to increase, albeit erratically, and river flows were generally well below average across southern Britain and parts of Northern Ireland. By the late summer, a zone of especially depressed runoff extended from Cornwall to the Humber. In Somerset, runoff for the River Tone was the lowest for the March–August period since the extreme drought of 1976. Low river flows, often accompanied by low oxygen levels, necessitated fish rescues e.g. in the River Tarrant (Dorset) and River Redlake (Shropshire); aeration equipment was also deployed (e.g. in the Hatfield Waste Drain near Doncaster).

The early autumn rainfall generally served to accentuate the existing spatial contrasts. September was wet in Scotland, particularly in the west where the remnant of Hurricane Katia produced a 2-day rainfall of 142 mm at Invergulas during the second week. Across much of the English Lowlands however, monthly rainfall totals were less than 50% of average. Regional contrasts are remarkable over a range of timespans. In the March–September timeframe, Scotland exceeded its previous maximum rainfall whilst the Midlands registered its second lowest rainfall (after 1990) in a series from 1910; rainfall deficiencies were especially notable in Leicestershire, Warwickshire and Shropshire.

With declining baseflow contributions from groundwater (see below) September river flows were again depressed across much of southern, central and eastern England where the failure of high level springs increased through the month. Runoff over the water-year (October-September) was been notably low in index catchments across the Midlands, south Wales and south-west England: the Trent

[1]Unless otherwise stated all rainfall comparisons are based on time series maintained by the National Climate Information Centre (Met Office).

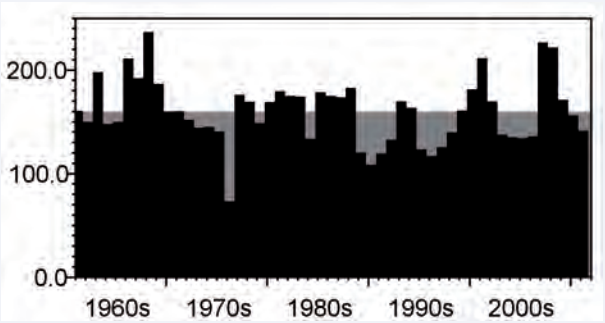


Fig 1 *Estimated Q95 (for the water-year) outflows from the English Lowlands (in m^3s^{-1}); the grey infill is the long term average*

registered its 4th lowest runoff, whilst the Taw registered its 2nd lowest, both in records beginning in 1958. Nevertheless, the frequency of modest, and short-lived, summer spates generally ensured that river flows remained above drought minima – see the 50-year series of estimated Q95 outflows from the English Lowlands (Figure 1).

Early October reservoir stocks were very healthy across most of northern Britain but well below average in many gravity-fed reservoirs in parts of southern England (see Figure 2) and the Midlands where stocks at Charnwood (Leicestershire) were only around 40% of capacity. After very sustained recessions, groundwater levels are now substantially below average across most major aquifer outcrop areas, and nearing natural base levels in a few index wells and boreholes, e.g. at Alstonfield in Magnesian Limestone of Staffordshire and Rockley in the Wiltshire Chalk (see Figure 3).

In most of the drought-afflicted areas, no short term recovery in reservoir stocks and, particularly, groundwater levels can be expected. Whilst soils remain close to saturation across much of northern Britain, soil moisture deficits (SMDs) at the end of September across much of eastern, central and southern England were the equivalent 10-12 weeks of average residual rainfall. October was a remarkably mild month but, again, whilst much of Scotland and Northern Ireland was notably wet, below average rainfall characterised many areas to the south. The limited rainfall and seasonally high temperatures, and the associated desiccated soil conditions caused significant problems for farmers – the lifting and sowing of crops in particular – and has further delayed the seasonal recovery in runoff and recharge rates. Late October saw a sequence of active Atlantic frontal systems crossing the UK bringing substantial rainfall totals to western areas, Bodmin (Cornwall) recorded a 2-day total of 70.6 mm on the 23/24th, and flood alerts were common in northern and western Britain. However rainfall across the English Lowlands, whilst very welcome, was generally of a moderate magnitude. The recent unsettled spell will need to herald a sustained change in synoptic patterns to allow rain-bearing frontal systems to track across those regions with long term rainfall deficiencies and help to ensure that surface and groundwater resources are restored to their normal range by the spring of 2012.

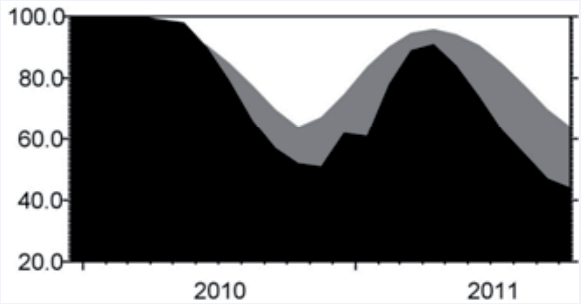


Fig. 2 *Monthly reservoir stocks (as a % of capacity) for Wimbleball Reservoir (Somerset); the grey infill is the long term average*

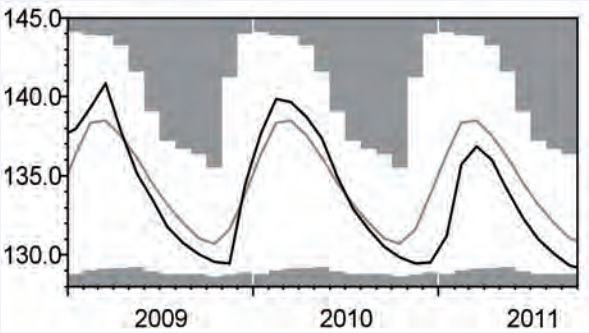


Fig 3 *Groundwater levels (metres aOD) in the Chalk at Rockley*

Terry Marsh
tm@ceh.ac.uk

National Hydrological Monitoring Programme:
http://www.ceh.ac.uk/data/nrfa/nhmp/nhmp.html

Aquator™ User Group Meeting

The fifth Aquator™ User Group Meeting was held on 6th October 2011 at the Severn Trent Centre in Coventry. Jointly promoted by Oxford Scientific Software and Hydro-Logic, the event was attended by 25 delegates drawn from water companies, regulators, consultants and academia.

The event included workshop and case study presentations, with several speakers addressing the topic of optimisation using the Aqua-Solver global optimiser available with the latest version of Aquator™ (v4.1).

The keynote address was delivered by Marcus O'Kane of STWL on the Challenges Facing Water Resource Modellers and Planners.

The regular User Group meetings provide an opportunity for users to meet and discuss their experiences of working with Aquator™. For further information on the User Group, and Aquator™ in general, contact Paul Roberts at proberts@hydro-logic.co.uk or 01189 331325.

Our new Committee Members

As a Senior Research Associate at Newcastle University **Aidan Burton** specialises in modelling climate change impacts on hydrological systems. His rainfall models are used worldwide and he is a key contributor to the UK Climate Projections weather generator. Voluntary activities include chairing events for the public understanding of science and assisting with hydro-meteorological instrumentation of a tropical rainforest.

Darren Lumbroso is a principal engineer at HR Wallingford, with 20 years experience undertaking water related projects and studies in the UK and some 25 countries worldwide. He has spent six years working in sub-Saharan Africa, one year in Indonesia, as well as carrying out flood risk management, water resources and hydrological studies in the Middle East, South-East Asia and the Pacific. His hydrological interests include: pragmatic methods to estimate peak flash flows for ungauged catchments; arid zone hydrology; and runoff generation in the tropics.

Malawi Water Resources Investment Strategy

Lake Malawi

British hydrologists have a long association with Malawi; for example contributing to landmark studies of Lake Malawi during the 1970s and 1980s and to some of the first flood studies in Malawi. Here **Ben Piper** from Atkins reflects on developments since the first National Water Resources Master Plan (NWRMP) was completed in 1986

Malawi has a population of about 13 million people and an area of about 120 000 km$^{2.}$ Agriculture plays a key role in the economy with numerous commercial farms growing tobacco, tea, coffee and other crops, and several major irrigation schemes for rice and sugar. Lake Malawi, Africa's third largest lake, is also the source of Malawi's largest river, the river Shire; hydropower schemes on the Shire provide most of the nation's power supply.

This reliance on agriculture and hydropower means that climatic and hydrological influences can have a major influence on income and livelihoods. For example, floods on the Lower Shire occur regularly and there have been several severe droughts in the past two decades. Water level records for Lake Malawi date back more than a century and during that period of record it is reported that outflow from the lake ceased completely for about twenty years due to low rainfall and the formation of a sandbar at the lake outlet.

The Malawi Water Resources Investment Strategy (WRIS) project started in early 2010 and has recently been completed. This was the first national scale water resources planning study since the 1986 NWRMP; few original copies of that study seem to exist although one or two volumes were located in the Institute of Hydrology archives at CEH Wallingford). The project was funded by the World Bank and managed by Atkins in association with Wellfield Consulting Services whose teams included several hydrological and hydrogeological staff who at one stage of their careers had been based at IH Wallingford. Atkins project office in Lilongwe was staffed by a full-time project manager with shorter term contributions from other international as well as national experts.

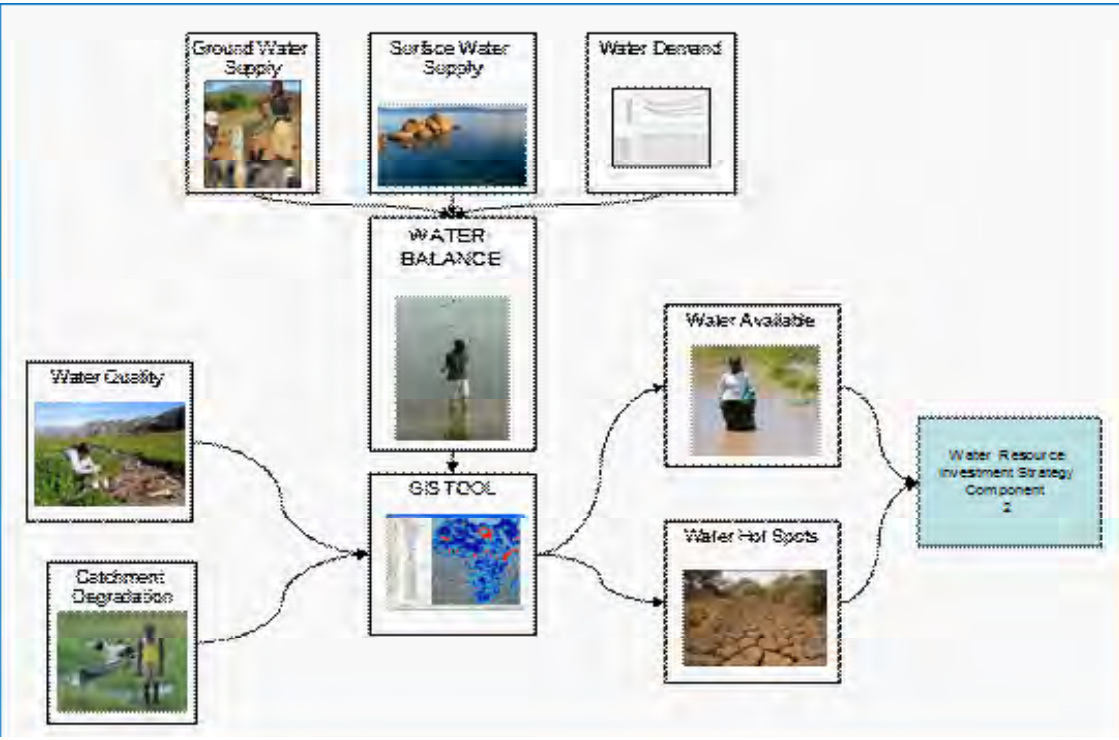
The main objective of the study was to identify and prioritise investments in the water resources sector, taking account of national development goals for economic growth and poverty reduction and sectoral development strategies. Consultation meetings and

workshops played a crucial role throughout the project in information gathering and providing feedback from Ministry staff, NGOs, the World Bank, community representatives and other key stakeholders.

Component 1 established the baseline surface water and groundwater availability (building on the data, analysis and interpretation of the NWRMP) and current water demands in the agriculture, water supply, hydropower, fisheries, tourism and others uses through a process illustrated schematically below. The project team also made extensive use of digital mapping to identify 'hot spots' in water use and to explore other issues such as water quality and catchment degradation.

Component 2 then considered possible investment strategies based on population growth, climate change, economic and other scenarios. Some of the options considered included additional irrigation schemes, hydropower development, water transfer schemes and inter-seasonal storage.

The aim was to identify strategic priorities and management measures and short, medium and long term actions. Like its predecessor — the



Overall approach to the Water Resources Assessment

1986 NWRMP — the resulting reports, datasets and strategy will inform thinking on water development in Malawi for many years to come. Underpinning both the 1986 NWRMP and the 2011 WRIS was a comprehensive synthesis of the surface water and groundwater resources of Malawi, making best use of available data and contemporary analytical techniques to complement robust conceptual thinking of the way in which catchments work.

Ben Piper
Atkins

Some more thoughts on the 'elephant in the climate figures'

David Evans' article in the last issue of *Circulation* has, unsurprisingly, prompted a few comments. Because of the topicality, and the hydrological importance of the subject, we summarise some of the important points here.

Firstly, concern over the veracity of data – (the stuff of hydrology nightmares) and in particular, the projections of rainfall. "It is well known," notes **James Dent**, "and even mentioned in UKCP09 that the 'signal' for rainfall variation/change in the future is weak, largely because the climate change models cannot model rainfall directly, and such estimates that are provided are based entirely on assumed relationships between temperature and rainfall. There are two massive assumptions in the rainfall projections. Dealing with flooding, it is that a warmer atmosphere must de facto contain more moisture, have more energy, and hence the potential for higher (more extreme) rainfall. Conversely, climate projections assume a poleward shift of zonal climate, hence parts of the UK will come under the influence of more continental or mediterranean climate types."

Secondly, the relevance of the periods chosen for analysis. James cautions the choice of seasonal period, noting that droughts are more lengthy in their generation, both for their impact on surface water reservoirs and groundwater resources. The crux for projecting the summer-autumn water availability is invariably the paucity of rainfall in the preceding winter-spring. "When working for the National Rivers Authority in the 1990s, I came across several examples of 'mining' of water, as groundwater levels fell progressively lower over a 2–3 year period, due to inadequate recharge."

He also concurs with the plea to think big and think nationally. Over the past 40 years at least, a number of major concepts for drought and water management have come and gone. The 'water grid' to bring water from the wet north-west to drier areas has largely failed to materialise. Major groundwater schemes for the flow augmentation in the Thames Valley and west Norfolk, planned and developed in the 1970s, remain unused, probably on environmental grounds which now seem largely acceptable; and no major upland reservoir scheme has been completed since the 1970s.

Neil Whiter commented that although the ideas coming forward from organisations such as WWF about giving companies an incentive to reduce abstraction from rivers in sensitive times are admirable, water companies have a responsibility to continue to supply water throughout the summer, so reducing abstraction from rivers can only be done if there is an alternative i.e. more storage. "Unfortunately, there is neither the money or EA licences available for duplicate storage or for the cost of additional investment — you can't escape from this."

Mike Lowing says he often wondered why everyone got quite so excited about leakage: "one man's leakage being another's enhanced low flow or groundwater recharge". So, yes, reservoirs are good but let them be good for maintaining residual flows (and, hence, the 'green environment') too. A good local (to me) example of this is the effect of Clatworthy reservoir in ensuring otters are a year-round presence in the River Tone.

David's reply:

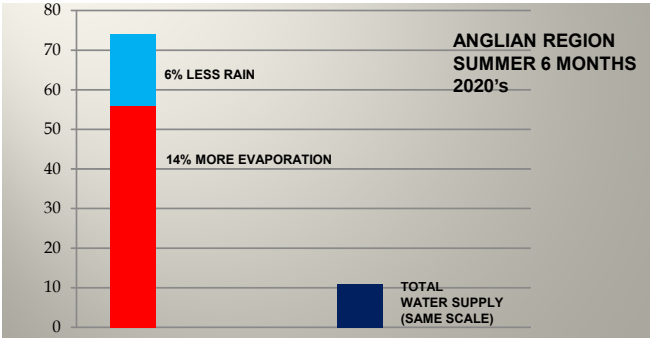
I hope that James Dent is right when he questions the prediction of lower summer rainfall. But higher evaporation is the bigger factor — see figure. And in warmer summers, higher evaporation is all too plausible.

James also questions the length of drought period to be considered. Yes, for water supply, with it's multi-season storages (whether reservoirs or groundwater), longer periods are relevant. But my concern is for the effects of summer desiccation on agriculture and the green environment, and for that I don't think there is any choice of period — it's the dry season, defined and dominated by when evaporation

exceeds rainfall. Broadly, that's April to September in the east; perhaps shorter as you go west (and probably increasing with climate change).

Neil Whiter questions whether companies can afford to invest in additional storage. But if they are to supply additional population without loss of security, little alternative. And the good news is that water supply reservoirs have the knock-on effect of transferring winter water into summer. Perhaps we should seek ways in which other beneficiaries (e.g. agriculture and conservation) could share the costs?

And thanks to Mike Lowing; I couldn't agree more with his comment.



Finally, the original article ended by asking if someone can prove this figure wrong in principle. Nobody has — but I'm still hoping.

David Evans

Book Review

The Water Footprint Assessment Manual – Setting the Global Standard

by *Arjen Y. Hoekstra, Ashok K. Chapagain, Maite M. Aldaya and Mesfin M. Mekonnen*

Building upon the concept of virtual water — the total volume of freshwater used (directly and indirectly) in the production of a product or service — water footprint estimation is a rapidly evolving tool to assist with environmental management. This Manual, which updates an earlier version published in 2009, will be of interest to many hydrologists and water resource managers. More than simply providing methods for calculation of water footprints, it sets out to demonstrate the value of a clearer understanding of both direct and indirect water use.

The Preface says that the Manual "… contains the global standard for 'water footprint assessment' as developed and maintained by the Water Footprint Network (WFN)". In the concluding chapter the WFN is recorded as having been established as recently as 2008, with the number of WFN partners, from "government, business, investors, civil society, intergovernmental institutions, consultants, universities and research institutes", increasing from 76 to 130 during the year or so to October 2010. The Manual was prepared with help from WFN partners and working groups and, therefore, has an impressive range of support.

The definition of a water footprint for a product begins with the statement (p2) that it is "the volume of freshwater used to produce the product, measured over the full supply chain". At this level the term water footprint has the same meaning as virtual water and embedded water, which are also commonly used to convey a cost of a product or service expressed as a total water-use. Moving beyond this simple but powerful concept, the bulk of the Manual (Chapters 2 to 6) presents and qualifies full water footprint assessment in four phases: setting goals and scope; water footprint accounting; water footprint sustainability assessment and water footprint response formulation.

A colour scheme is used throughout the book for referring to water at its various stages in the hydrological cycle. Blue water comprises surface water (rivers, lakes, etc) and groundwater. Blue water can be used for irrigation. A

blue water footprint is the combined loss from these bulk sources, due to evaporation, export to another catchment (or to the sea) and water incorporated in the product. Green water is the amount of precipitation that does not become surface water, i.e. "rainwater insofar as it does not become run-off". A green water footprint is the "consumption" of green water resources (an awkward and over-used word in the context of water resources and footprints). A grey water footprint is "the volume of freshwater that is required to assimilate the load of pollutants given natural background concentrations and existing ambient water quality standards".

It is unfortunate that the Manual champions this water colour scheme, rather than the much longer-established and descriptively far superior scientific and water resources terminology associated with the study and management of water as it enters, or passes through or is lost from catchments to the atmosphere above. For the reader who "really likes the use of the colours" (the authors know the colour scheme has major limitations for detailed work and will jar with some readers) the Manual uses light blue, dark blue and black (p26) for a blue surface water footprint, a blue renewable groundwater footprint and a blue fossil groundwater footprint respectively. While there may have been merit in the water colour scheme for initial popularization of the broad virtual water/water footprint concept, it works poorly at the higher (quantitative) level of detail expounded by the Manual.

Technical terms related to hydrological processes are often not clearly introduced or used well. For example, "Run-off occurs partly through overland flow (rivers and streams) and partly through groundwater flow" (p19). Also, "Historically, people have used run-off flows both as a source of fresh water and as a drain for their waste" (p21). Here, the term "run-off flows" grates. Why not simply say "… people have used rivers …"? It is disappointing that the word hydrology and its derivatives appear only about a dozen times in the Manual.

It is also disappointing that a large body of relevant hydrological research is not adequately acknowledged. "Why should we look at the total green water footprint of a crop? Why not look at the evapo[transpi]ration compared to evapo[transpi]ration from natural vegetation [the vegetation replaced by the crop]?" (p164). (The square brackets indicate additions for this review.) The authors must have been asked these questions many times, since they are posed in Appendix VI (Frequently Asked Questions, p164). However, the answer given is rather strange. "The change in evaporation [between the commercial crop and the previous vegetation] is interesting from the perspective of catchment hydrology and potential downstream effects, but not for the debate on how limited freshwater resources are allocated over different purposes". This ignores relevant applications of hydrological science to basic water resource allocation problems. Consider the classic issue of how best — from a water resources perspective — to allocate and manage land-use in upland catchments draining to reservoirs used for public water supply. Hydrological research has been undertaken to better inform water resource managers about the different water-uses of (a) conifer trees for timber and (b) grass for grazing. The research has shown that increasing the proportion of conifer trees in a grassland catchment can increase basin evapotranspiration, leading to a lower reliable yield for some upland reservoirs. Hydrological/water resources research on this topic (and others) is not sufficiently recognized and applied in the Manual.

Attention is given to the problem of what to include in (and exclude from) a supply-chain water footprint of a product but some of the arguments are confusing or lack clarity. For example, "We particularly recommend including the water footprint of transport when biofuels or hydropower are used as the source of energy, because these forms of energy are known to have a relatively large water footprint per unit of energy" (p11). It seems odd to discuss biofuels and hydropower together in this way. Hydrologists know that in many cases the attractions of hydropower are that (a) water taken from a river or reservoir for hydropower generation is returned only a short distance downstream from where it was abstracted and (b) the abstracted water could not be used for anything else in that locality (apart from leaving the hydrological regime downstream of the abstraction point unchanged if the water had not been abstracted). Why does the Manual lump hydropower with biofuels in this way? It might have been better to not mention

hydropower at all. It is possible for evapotranspiration from biofuel crops to be higher than from the vegetation it replaces but hydropower does not usually involve appreciable extra use (losses) of water (there may be some extra evaporation from constructed reservoirs). The rationale behind advice given in the Manual is not always sufficiently transparent to the reader and may not always be sound hydrologically.

The Manual very usefully discusses weaknesses of water footprints (as can be clearly seen from the good Contents list) but often such advice should have been given earlier in the book. For example, it is not until Chapter 6, headed "Limitations", that the reader is told "The water footprint is a relatively new concept and water footprint assessment a new tool. As is often the case with new concepts and tools that are promising and speak to people's imaginations, expectations are not always realistic."

There is discussion (p120) of the related issues of temporal variability in water footprint time series, detection of trends in such time series and uncertainties in water footprint data. With admirable honesty (but again rather too late in the book) the Manual states that "The uncertainties in data used in water footprint accounting can be very significant" and "Currently, no uncertainty studies are available". The authors themselves, therefore, acknowledge that water footprint estimation is still in its infancy as a science, in which case the earlier claim (Chapter 3) that "The method of water footprint accounting is now, after eight years of continued development, firmly established and widely adopted, both in the scientific community and in practice" seems premature and rather self-congratulatory. Although water footprint estimation, at its current level of development, certainly has a place in informing debate today, it clearly has a long way to go before it passes scientific scrutiny and can claim to provide sufficiently evidence-based input to assist with rational decision-making. The water footprinters might be able to learn from the methods of hydrologists and other environmental scientists. Good hydrologists constantly strive to quantify uncertainties. They know the difficulties that can arise concerning consistent instrumental monitoring of environmental variables over time, e.g. rainfall, streamflow and air temperature. They know the problems of detecting trends in long time series of such variables and the possible pitfalls when interpreting trends if any changes affecting the monitoring site and instrumental measurement methods over time are not well understood. The Manual does not go as far as to admit (but perhaps it should have) that obtaining temporally consistent annual (say) water footprints over years and decades will probably remain somewhat problematical.

The Manual is surely a considerable achievement. The reader looking for a good introduction to the topic will find this reference book very useful and often thought provoking. The References, List of Symbols, Glossary and Index are excellent. However, water footprint estimation is in its infancy with respect to the measurement of its components (nominal values are often substituted) and in its application of important findings of water resources oriented hydrological research.

Ian G. Littlewood

Editor's Postscript

Expect to see a lot more on this subject in the future: indeed we plan to have a follow-up article in the next issue of *Circulation*. Meanwhile, for those wishing to read up on the topic, have a look at the following:

- CIWEM's Policy Position Statement "Water footprinting" at www.ciwem.org/policy-and-international/ policy- position-statements/water-footprinting.aspx;
- The Parliamentary Office of Science and Technology briefing note POSTnote385 at http://www.parliament.uk/business/publications/research/post/pubs/ and
- a forthcoming Report to EU DGEnv by RPA and Cranfield University "Water Footprinting and Certification and Labelling Schemes".

Register of Consultants

BHS offers members the facility of advertising their services using the Register of Consultants on the web site (see http://www.hydrology.org.uk/register_consultants.htm). The costs are minimal and remain unchanged for 2012: £100 per annum for companies and £15 per annum for independent consultants. Any company interested in using this service should please register their interest with BHS Secretary, Tim Fuller (Tim.Fuller@ICE.ORG.UK): independent consultants should please contact the Honorary Treasurer direct (nigel.goody@sepa.org.uk).

Editorial

As noted earlier, we are in the throes of updating our web site. For those of you that do use it, you will appreciate that although not as clear as it could be, it does carry an impressive amount of information so the task is not easy. Meanwhile, however, we think it timely to remined everyone that <u>all</u> users can upload/amend details of forthcoming events on the 'Meetings' page and also submit any news items (subject, of course, to approval by the web adminstrator).

Celia Kirby

Terence O'Donnell (1927–2011)

Terence O'Donnell, former IAHS Editor (1983 to 1997) and winner of the IAHS/UNESCO/WMO International Hydrology Prize (1997) died on 28 September in Torquay.

After graduating from Cambridge University in 1948, Terrence became a research assistant in the Cambridge School of Agriculture investigating groundwater problems. In 1951 he moved to Imperial College London, constructing and testing hydraulic models in the Department of Civil Engineering. He then joined the newly opened Hydraulics Research Station (HRS) at Wallingford, before going back to Imperial College and a new group with Peter Wolf, undertaking teaching and researching in Engineering Hydrology for an MSc. Postgraduate Course. This course was the first of its kind at a UK University. His research concerned rainfall/runoff modelling of catchment behaviour using multi-parameter conceptual models.

The University of Lancaster appointed Terence to the Foundation Chair in Hydrology and Hydrogeology in its Environmental Sciences Department in 1972, the first professor of hydrology in a UK university. At Lancaster he continued research on deterministic modelling with a number of post graduate students. In 1984 he retired from his chair at Lancaster and from 1987 was the Editor of the *Hydrological Sciences Journal*. Volume 42 Number 3 June 1997 was the final number he edited and, the month before it was published, his long and valuable service to the Association was recognised when he was awarded the International Hydrology Prize in Rabat, Morocco at the Scientific Assembly.

[This extract comes from an obituary notice compiled by John Rodda with help from Keith Beven, John Sutcliffe, Bruce Webb and Zbyszek Kundzewicz.]

Forthcoming events

Fifth International Scientific Conference on Water, Climate and Environment

28 May to 02 June 2012
Ohrid, Macedonia

DEADLINE for abstract submission is 20th of November 2011

Further information at **www.balwois.com/2012.**

6th International Congress on Environmental Modelling and Software (iEMSs 2012)

Managing Resources of a Limited Planet: Pathways and Visions under Uncertainty

July 1–5, 2012

Leipzig, Germany.

The iEMSs 2012 conference will offer an interesting and comprehensive scientific programme with 10 streams and 48 sessions and workshops along with a variety of unique cultural events.

Abstracts are welcome for oral presentations (no posters). Technical instructions on how to prepare abstracts and further conference information:

http://www.iemss.org/iemss2012

Copy deadline for Circulation No. 112 23rd January 2012

3rd International Conference on
Flood Recovery, Innovation and Response

30 May - 1 June 2012
Dubrovnik, Croatia

View full details about the conference objectives, topics and submission requirements online at:
http://www.wessex.ac.uk/friar2012rem2a.html

Diary

17–18th November 2011
'Integrating multiple facets of river corridor development'
Conference organised by: University of Sheffield (URSULA project)
Venue: St Mercure St Paul's Hotel, Sheffield
Contact: Jenny Chambers (Tel: 0114 222 5725)

21st November 2011
'Exercise Watermark'
BHS South East Section Regional Meeting
Time: 18.30
Venue: ICE London
Contact: Jo Wakefield (Tel: 01372 756693)

21st November 2011
Natural Hazard Partnership
BHS South West Section / CIWEM Rivers & Coastal Group meeting
Time: 14.00
Venue: Met Office, Exeter
Contact: Peter Dempsey (Tel: 01392 884254)

30th November 2011
'Living with Floods'
Meeting organised by: BHS & University of Newcastle
Time: 10.30
Venue: Great North Museum, Newcastle upon Tyne
Contact: Claire Walsh (Tel: 0191 222 6618)

19th January 2012
'The hydrological implications of renewable energy'
BHS South East Section Regional Meeting
Time: 18.30
Venue: ICE, London
Contact: Jo Wakefield (Tel: 01372 756693)

23rd February 2012
'Sanitation in Mega-Cities'
BHS South East Section Regional Meeting
Time: 18.30
Venue: IICE, London
Contact: Jo Wakefield (Tel: 01372 756693)

BHS 2012

The 11th BHS National Symposium will be held in Dundee, from 9–11 July 2012

Put it in you diary now!