

Safe & SuRe: Towards a New Paradigm for Urban Water Management

Professor David Butler has won a prestigious five year Fellowship from the EPSRC. The five-year Fellowship, worth around £1.5 million, will fund a project which aims to develop a new approach to water management in UK cities.



EPSRC Fellowships are awarded to outstanding UK researchers who show a high level of creativity and ambition in their research ideas, and are able to take more established fields in new and innovative directions.

Entitled 'Safe & SuRe: Towards a New Paradigm for Urban Water Management', the project will draw upon multi-disciplinary collaboration with leading academics inside and outside the field.

Professor Butler said: "The water sector in the UK has, by many measures, been very successful up to now. However the sector is increasingly under threat as a result of climate change, increasing population, urbanisation, demographic shifts and tighter regulation. The current way of working looks increasingly out of date and out of step with emerging thinking and best practice in some leading nations."

"The vision of this work is to develop a system which is sustainable and resilient. A comprehensive, quantitative evaluation framework will be developed to test in detail what options or strategies can contribute towards a Safe and SuRe water future, focusing on the challenges of water scarcity, urban flooding and river pollution."

Others closely involved with this project from the Centre for Water Systems are Drs Raziye Farmani, Guangtao Fu and Sarah Ward .

Students are challenged by water security issues



This year, the Centre for Water Systems is leading the "water security" dilemma in the University's Grand Challenges programme. Led by Professor Dragan Savic and Professor David Grey, students will study the politics of water, hidden water footprint, water-energy-food nexus and water security in England.

The University of Exeter's Grand Challenges programme provides all first year students with an exciting educational and social experience at the end of the academic year. Students are challenged to produce solutions and ideas to tackle some of the key dilemmas of the 21st Century.

For more information see: <http://www.exeter.ac.uk/grandchallenges/thedilemmas/watersecurity-livingwithdroughtsandfloods/>

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Special points of interest:

- Success in the 'Battle for the Water Networks II'
- International Conference on Flood Resilience: Experiences in Asia and Europe (ICFR) to be hosted in Exeter

Current Research

CWS wins two new EU funded projects to address water issues in India

Led by Professor Fayyaz Ali Memon, a CWS team has secured funding for two FP7 projects both aiming to improve the provision of water related services to India in a sustainable way:



SARASWAT: This project will conduct an integrated evaluation of the existing wastewater treatment and water reuse technologies across India. It will then pilot selected proven European technologies for wastewater treatment and reuse in India and develop recommendations for rolling these out across the country.

The CWS team is responsible for developing decision support tools to identify optimal technological solutions on a sustainable basis in developing countries. They will be working with over 10 partners from the EU and India. The project will run for four years.

WATER4INDIA: This is a three year project which will investigate smart, cost-effective solutions for water treatment and monitoring in small communities in India and develop decision support systems to address problems particularly relevant to India both regionally and nationally. The CWS team will develop multi-criteria based optimisation tools for potable water treatment technologies and to enhance water efficiency in build-

ings. The other project partners come from the EU, India and Israel.

For further details contact Prof. Fayyaz Ali Memon (f.a.memon@ex.ac.uk)

A new UKWIR funded project: runoff modelling for wastewater networks

A CWS team involving Professors Dragan Savic, Slobodan Djordjevic and Dr Ed Keedwell is involved in an HR Wallingford-led effort to carry out a study into revising the existing runoff model which is commonly referred to as the New PR equation.

The project partners recognized that the original UKWIR (UK Water Industry Research) requirements could not be satisfied by a revision of the current runoff model. They decided that a 'root and branch' change to how we currently address runoff and infiltration modelling, not just an alternative equation, was needed. UKWIR agreed with that and decided to fund the project. CWS researchers will extend their current work for UKWIR to produce a neural network model or similar tool which allows the prediction of infiltration response in catchments based on measured flows and relevant historic catchment data.



CWS researcher wins \$5,000 for work on flooding in developing countries



Dr Michael Hammond has won a year's research funding as a result of attending a summer programme at Brown University in the USA.

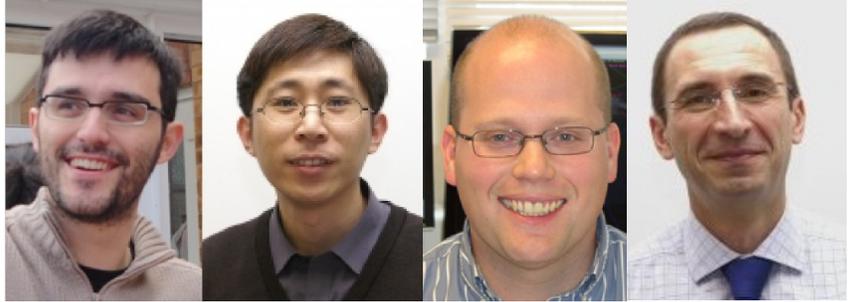
Michael participated recently in the Brown International Advanced Research Institutes (BIARI) programme. Together with partners from Mexico, Pakistan, Bangladesh and Brazil, he was awarded \$5,000 to study the vulnerability of people living in informal settlements in developing countries due to flooding. They will have a year to work on this project and will study the settlements in Dhaka in Bangladesh and Belo Horizonte in Brazil.

Contact Michael (M.J.Hammond@exeter.ac.uk) for more information.



Double victory for CWS team in the “Battle of the Water Networks II”

A team of researchers from the Centre for Water Systems has won the BWN II (Battle of the Water Networks II) competition. The CWS entered three teams in the contest against 14 international research groups from major universities. Members of the winning team were Dr Michele Guidolin, Dr Guangtao Fu and Prof. Dragan Savic from Exeter University, and Dr Patrick Reed from Penn State University



The competitors were presented with a challenging water distribution system design and operation problem based on a real-life pipe network. The problem had three objectives: to minimise cost, green house gasses and water age.



In September, at the 14th Water Distribution Systems Analysis (WDSA) symposium, each competitor presented their optimal solution and the methodology they had implemented. To obtain their results, the winning team used a master-slave parallel version of ϵ -NSGAI, in conjunction with the use of a supercomputer. While their winning solution had a relative higher cost, it had the best values in water age and greenhouse gas emissions results, which made it the overall winner of the competition. Contact Michele (M.Guidolin@exeter.ac.uk) for more information

Professor Dragan Savic, who presented the paper during WDSA, also won **the best paper prize** for the team.

Centre for Business and Climate Solutions

“Profit from a changing climate”

The Centre for Business & Climate Solutions, located at the University of Exeter’s Innovation Centre, has been established to promote and assist South West businesses deal with potential disruption as a result of a changing climate.

The Centre provides specialist practical help and technical advice in the form of **Climate Assist** packages for small to mid sized businesses part funded by the European Regional Development Fund. The Climate Assist package can help businesses minimise the adverse impact of climate change and extreme weather events by exploring ways to profit from new climate opportunities.

Here are some of the Climate Assist opportunities available to your business:

<i>Improve return on energy renewables</i>	<i>Networks and new access to markets</i>
<i>Business related climate workshops</i>	<i>Climate modelling for your business</i>
<i>Energy and water assessments</i>	<i>Innovation and R&D scoping</i>
<i>ISO 14001/ Green Accord</i>	<i>Reduce water wastage</i>
<i>Carbon Neutral advice</i>	<i>Sustainable practices</i>

Further details on the CBCS can be found on its new website www.exeter.ac.uk/climateassist and the Centre has produced its own video which has been downloaded on YouTube at: http://www.youtube.com/watch?v=KDgqlc5_GC4



Overseas Partnerships



Professor Ni-Bin Chang from the **University of Central Florida (UCF)**, who is now the program director of the Hydrological Science Program in the National Science Foundation (under the Earth Science Division of the Directorate of Geosciences), visited CWS in May. He discussed a number of joint research activities with CWS members and gave a research seminar entitled "Remote Sensing for Monitoring Water Quality Changes in a Lake with an Integrated Data Fusion and Mining Technique".

CWS has been leading training courses in Exeter for two EU projects:

SANITAS project

A training week, for Research Fellows from across the **EU** funded under the project, was devoted to developing research skills such as methodology, writing and presentation skills as well as exploring the relationship between science and policy. Students were also taken on site-visits to the medieval underground passages in Exeter and to Broad Down on Dartmoor.

The SANITAS project recognizes a need for sustainable and integrated urban water management in Europe to address adequate water quality and supply needs and for urban infrastructure renewal in emerging economies.

TEMPUS project

Two weeks of intensive training was given to Water Engineers from various **Egyptian universities**. Topics covered included Advanced Water Distribution Management, Groundwater and Environmental Management, an introduction to Computational Fluid Dynamics using Open Source Tools and Uncertainty Modelling of Water Systems.

Tempus is the European Union's programme which supports the modernisation of higher education in the Partner Countries in Eastern Europe, Central Asia, the Western Balkans and the Mediterranean region, mainly through university cooperation projects.



In July and August, members of the Centre for Water Systems, participated in the **University of Exeter's International Summer School**, giving lectures on the pathway, "Global Climate Change: Environment, Technology and Society". This gave the students a broad vision and perspective on Global Climate Change. It included its mechanisms, impacts upon society and the environment, emerging mitigation technologies, and adaptation strategies. Students from all over the world attended the three week programme. Further information can be found at <http://www.exeter.ac.uk/international/summerschool/>, or by contacting Dr. Diego Gomez, D.E.Gomez@exeter.ac.uk the pathway's academic coordinator.

In September, Professor Akbar Javadi welcomed visitors from the **United Arab Emirates** and **Egypt** for a PMI2 project meeting in Exeter. PMI2 is a collaborative research project between Exeter and two universities in the United Arab Emirates. The visiting team comprised Professor Mohsen Sherif, the Associate Provost at the UAE University, Professor Abdel Azim Ebraheem, Water Resources Consultant at Ministry of Environment and Water in Dubai, UAE, and Dr Ahmed Sefalnasr of Assiut University in Egypt.



The partners also discussed plans for a new water security project. Funded by the British Council and United Arab Emirates University, this will study the control of seawater intrusion. The project is led by Exeter and includes partners from UAE University, Kuwait Institute for Scientific Research (KISR), Sultan Qaboos University in Oman, Cardiff and Newcastle Universities in the UK together with two industrial partners, Hydrointernational plc in the UK and Schlumberger Water Services in Qatar and the UAE.



CWS out and about



On two separate occasions during September and October Professors Zoran Kapelan and Dragan Savic visited the Centre for Water Sensitive Cities, **Monash University in Melbourne**. The Centre's director, Professor Ana Detic, invited them to give talks while they were there. Professor Kapelan gave a lecture entitled, "*Real-time Event Recognition using Sensor Data and Artificial Intelligence*", while Professor Savic presented results of the FRMRC2/UKWIR project on "*Real-Time Machine Learning Approach to Near-Term Assessment of Risk of Flooding in Urban Areas*".

Professor Kapelan also visited UNESCO-IHE Institute for Water Education to examine a PhD thesis and to give an invited talk: *Real Options in Flood Risk Management Decision Making*, at the mini symposium: Resilient Adaptation to Changing Flood Risk.

Earlier in the summer, Professor Zoran Kapelan was a member of the committee that examined Nemanja Branislavljivic's PhD thesis entitled 'Methodology for automated validation of measurement data in urban water systems'. The public thesis defence took place at the Civil Engineering Faculty of the University of Belgrade. The candidate, who was supervised by Professor Dusan Prodanovic, defended the thesis successfully.



Professor Slobodan Djordjevic visited **Kyoto, Japan**. He gave a lecture to students on the Global COE Program Sustainability / Survivability Science at Kyoto University, with a talk entitled "*Urban flooding simulation under climate change – experience and research projects*". Afterwards he tested the experimental facility for measuring the speed of evacuation from flooded underground spaces at the hydraulic laboratory of the Disaster Prevention Research Institute.

While he was there, he also visited the Lake Biwa aqueduct and several dams as well as technical museums around Kyoto and Osaka.

Professor Slobodan Djordjevic was an invited speaker at the 2012 APEC Typhoon Symposium held in **Taipei, Taiwan** in June. He delivered a talk entitled "*Flood resilience in urban areas – from modelling to strategies*".

He also delivered a series of ten lectures at the post-graduate Summer Course "*Urban Water Systems: Interactions and integrating modelling, planning and management*", organized at the Tallinn University of Technology in **Tallinn, Estonia**. The course was attended by twenty engineers from consultancies and universities in Northern Europe.

CWS will be organising the **International Conference on Flood Resilience: Experiences in Asia and Europe**. The conference will be held at the University of Exeter, 5-7 September 2013. The aim of this event is to gather professionals to present and discuss the latest research advances and practices in the development and implementation of resilience measures and flood management plans.



The International Conference on Flood Resilience welcomes submissions from all areas with relevance to flood resilience. The focus on cities in Asia and Europe is motivated by the approach applied within the FP7 project **CORFU** coordinated by CWS, which investigates differences in flooding problems and solutions in a number of case studies on these two continents.

ICFR will provide the opportunity to meet flood risk management professionals from around the world. An exhibition area where you may be interested in presenting your organisation to a wide audience will be offered.

More information can be found on the conference web site www.ICFR2013.org and if you would like to find out how you can become involved with the ICFR, please contact the organisers at icfr@exeter.ac.uk.

News of Past and Present CWS Members

Congratulations to:

Professor Zoran Kapelan (right) who has been awarded a prestigious fellowship from the International Water Association (IWA) A fellowship is awarded to members who have made a distinguished contribution to the field of water science, technology and management. See: <http://www.iwahq.org/1tq/membership/our-members/fellows-program-overview/fellows-2012.html>



Professor David Butler (left) who has won the President's Award for 2012 from the Chartered Institution of Water and Environmental Management "in recognition of exceptional service to the work of the Institution".

Professor Slobodan Djordjević who has been recognized by the ASCE (American Society of Civil Engineers) *Journal of Hydrologic Engineering* as a '2012 Outstanding Reviewer'. He has also been promoted to Professor of Hydraulic Engineering in the University.

Chris Binnie who has been appointed an Honorary Visiting Professor to the College of Engineering, Mathematics and Physical Sciences; **Fayyaz Memon** who has been promoted to Associate Professor in Water Engineering and **Raziyeh Farmani** who has been promoted to Senior Lecturer.

Jo-Fai Chow (below left), supervised by Professors Dragan Savic and Zoran Kapelan who won the Best Younger Researcher Poster Award at the 9th UDM conference.



Associate Research Fellow, **Dr Sarah Ward** (right), who received her 'graduation award' from the Water Environment Leadership Institute, at the Water Environment Federation's Technical Exhibition and Conference in New Orleans.



Well done to CWS students who have been awarded PhD degrees:

Istvan Galambos, now Senior Hydraulic Modeller at Mott MacDonald in Cambridge, thesis title: "Improved understanding of performance of local controls linking the above and below ground components of urban flood flows"

Michelle Woodward, now working for HR Wallingford, thesis title: "The use of Real Options and Multi-Objective Optimisation in Flood Risk Management"

Maryam Astaraie-Imani, thesis title: "Modelling the performance of an integrated urban wastewater system under future conditions".

Welcome! CWS welcomes:

New PhD students: Miriam Garcia, supervised by Professor Slobodan Djordjevic and Dr Gavin Tabor; Zunaura Asif, supervised by Professor Fayyaz Ali Memon; Seith Mugume, supervised by Professor David Butler.

STREAM EngD Students:

Shenan Grossberg, supervised by Dr Gavin Tabor and in conjunction with Hydro International . His topic is: "The optimisation of wastewater treatment systems using adjoint solutions for CFD-based simulations."

Peter Melville-Shreeve, supervised by Professor David Butler and Dr Sarah Ward in conjunction with Severn Trent Water. His topic is: "Rainwater harvesting in the wild".

Binian Ashagre, supervised by Professor David Butler and Dr Guangtao Fu in conjunction with Scottish Water. His topic is: "Dynamic licensing-integrated control of urban wastewater systems".

Visitors

Ricardo Martins from University of Coimbra, Portugal, who will be visiting CWS for 12 months working with Professor Slobodan Djordjevic; Valeria Puleo, from the University of Palermo is working with Professor Dragan Savic; Giada Ferrari, from the Technical University of Milan, working with Professor Dragan Savic.



Masters in Water Management (MSc)

The **MSc in Water Management** is offered by the Centre for Water Systems at the University of Exeter and is the only course of its type in the UK. It draws on the experience and cutting-edge research capability of the Centre staff together with external lecturers from leading companies and government agencies, ensuring delivery of a theoretically sound, yet practically relevant course.

This programme trains students in the essentials of urban water supply and urban drainage technology together with the hydroinformatic tools for simulating their performance, all in a context that encourages a wide, integrated systems approach to their implementation.

For full programme details and information about how to apply visit: www.exeter.ac.uk/cws/msc

Topical issues covered on the course include: **Water losses and leakage, Water efficiency, Climate change, Sustainability, Asset management, Whole-life costing, Urban flooding, Integrated modelling, Risk and uncertainty.**

Full or part time attendance is possible. The individual Research Project can be undertaken at a place of work with a University supervisor. A Postgraduate Diploma and Certificate can be studied over a shorter period.

For further information please contact Zoran Kapelan z.kapelan@exeter.ac.uk.



MSc in Water Management: accredited as a Technical course by JBM providing 'further learning' for those intending to become Chartered Engineers

Recent Publications

Chen A. S., Evans B., Djordjević S. and Savić D. A. (2012) [Multi-layered coarse grid modelling in 2D urban flood simulations](#), *Journal of Hydrology*, Vol. 470-471, 1-11.

Korteling, B. Dessai, S. and Kapelan, Z., (2012), "[Using info-gap decision theory for water resources planning under severe uncertainty](#)", *Water Resources Management*, DOI 10.1007/s11269-012-0164-4.

Astarai-Imani, M., Kapelan, Z., Fu, G. and Butler, D., (2012), "[Assessing the combined effects of urbanisation and climate change on the river water quality in an integrated urban wastewater system in the UK](#)", *Journal of Environmental Management*, 112, 1-9.

Economou, T., Kapelan Z. and Bailey, T., (2012), "[On the prediction of underground water pipe failures: Zero-inflation and pipe specific effects](#)", *Journal of Hydroinformatics*, 14(4), 872-883.

Fu, G. and Butler, D. (2012) [Frequency analysis of river water quality using integrated urban wastewater models](#). *Water Science and Technology*, 65(12), 2112-2117.

Quevauviller P., Barceló D., Beniston M., Djordjevic S., Harding R.J., Iglesias A., Ludwig R., Navarra A., Ortega A.N., Mark O., Roson R., Sempere D., Stoffel M., van Lanen H.A.J. and Werner M. (2012) [Integration of research advances in modelling and monitoring in support of WFD river basin management planning in the context of climate change](#), *Science of the Total Environment*, Vol. 440, 167-177.

Farmani R, Henriksen HJ, Savić D, Butler D. (2012) [An evolutionary Bayesian belief network methodology for participatory decision making under uncertainty: an application to groundwater management](#), *Integr Environ Assess Manag*, 8(3), 456-461.

Giustolisi O, Laucelli D, Berardi L, Savić DA. (2012) [Computationally efficient modeling method for large water network analysis](#), *Journal of Hydraulic Engineering*, volume 138, no. 4, pages 313-326.

Sušnik, J., Vamvakeridou-Lyroudia, L.S., Savić, D.A., Kapelan, Z. (2012). "[Integrated System Dynamics Modelling for water scarcity assessment: case study of the Kairouan region](#)", *Journal Science of the Total Environment*, Vol. 440, pp. 290-306 (doi:10.1016/j.scitotenv.2012.05.085).

Hutton, C.J., Kapelan, Z., Vamvakeridou-Lyroudia, L.S., Savić, D.A. (2012). "[Dealing with Uncertainty in Water Distribution Systems Models: a Framework for Real-Time Modelling and Data Assimilation](#)", *Jour. Wat. Res. Plan. Man.*, ASCE (doi: 10.1061/(ASCE)WR.1943-5452.0000325).

Centre for Water Systems
College of Engineering, Mathematics and
Physical Sciences
University of Exeter
Harrison Building
North Park Road
Exeter EX4 4QF

Phone: +44 (0)1392-723732
Fax: +44 (0)1392-727965
E-mail: cws@exeter.ac.uk



Please contact us to
find out more about
any of the items in
this newsletter

Forthcoming events

Conferences:

2nd-5th April 2013: [AISB2013 Symposium: Machine Learning in Water Systems](#)

Part of: [AISB Annual Convention 2013](#)

University of Exeter, UK

<http://emps.exeter.ac.uk/computer-science/research/aisb/>

11th-13th April 2013: **1st EWaS-MED International Conference**
Thessaloniki, Greece

http://ee.uth.gr/attachments/331_1st_EWaS-MED_1st_announcement.pdf

17th-19th April 2013: **Asset management for enhancing energy efficiency in water and wastewater systems**

Marbella, Spain, <http://iceam2013.es/asset/index.php>

19th-23rd May 2013: **World Environmental and Water Resources Congress EWRI 2013** (including WDSA track)

Cincinnati, Ohio, USA, <http://content.asce.org/conferences/ewri2013/>

2nd-4th September 2013: **Computing and Control for the Water Industry** (CCWI2013)

Perugia, Italy, <http://www.water-system.org/CCWI2013.pdf>

5th-7th September 2013: **International Conference on Flood Resilience Experiences in Asia and Europe**

University of Exeter, UK

See: www.ICFR2013.org

Current CWS projects

- [ReVISIONs](#) SUE II Consortium (EPSRC) Contact: d.butler@exeter.ac.uk
- [STREAM Industrial Doctorate Centre](#) (EPSRC) Contact: g.fu@exeter.ac.uk
- [CADDIES Simplified Dual-Drainage Modelling](#) (EPSRC) Contact: d.savic@exeter.ac.uk
- [CORFU](#) – Collaborative research on flood resilience in urban areas (FP7) Contact: s.djordjevic@exeter.ac.uk
- KTP with Yorkshire Water Services 1: DSS for Real-time Failure Management (EPSRC / TSB) Contact: z.kapelan@exeter.ac.uk
- KTP with Yorkshire Water Services 2: Automated Model Building (EPSRC / TSB) Contact: z.kapelan@exeter.ac.uk
- [PREPARED Enabling Change](#) (FP7) Contact: d.savic@exeter.ac.uk
- [WASSERMed](#) – Water Availability and Security in Southern Europe and the Mediterranean (FP7) Contact: d.savic@exeter.ac.uk
- [TRUST – Transitions to the Urban water Services of Tomorrow](#) (FP7) Contact: z.kapelan@exeter.ac.uk
- [@qua ICT for Water Efficiency](#) Contact: d.savic@exeter.ac.uk
- [Bridging the Gaps: Exeter Science Exchange](#) — Contact: d.butler@exeter.ac.uk
- [Land of the MUSCOs](#) (EPSRC) Contact: d.butler@exeter.ac.uk
- KTP with United Utilities: Real-time Pipe Burst Detection System (EPSRC/TSB) Contact: z.kapelan@exeter.ac.uk
- SANITAS - Sustainable and Integrated Urban Water Management (FP7/ITN) Contact: d.butler@exeter.ac.uk
- iWIDGET— Contact: d.savic@exeter.ac.uk