This Special Session will focus on the science of catchment management and its application in operational management of water resources. Invited speakers will highlight the importance of an interdisciplinary catchment based approach to managing and protecting water resources. Contributions will be drawn from the fields of hydrological sciences, freshwater policy, international basin management and operational water supply. The session will highlight current and future activities related to the International Hydrological Programme of UNESCO and Hydrology and Water Resources Programme of WMO. Presentations detailing recent and current projects will be followed by a panel session to discuss future global priorities for catchment science. The event’s scope will be global, incorporating international experiences in catchment management, and also highlight examples of current initiatives within the UK.

**SESSION CONVENERS**

The Session is convened by the UK Committee for National and International Hydrology, a partnership of UK government departments, agencies, research bodies, professional societies and universities which aims to better coordinate UK engagement in national and international hydrological and water resources management research. The Session is convened by the Committee Secretariat at the Centre for Ecology & Hydrology (www.ceh.ac.uk) and will be Chaired by Alan Jenkins (Director of Water and Pollution Science, CEH).

**SESSION PROGRAMME**

<table>
<thead>
<tr>
<th>Title</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment Management: The Future?</td>
<td>Bob Ferrier, James Hutton Institute</td>
</tr>
<tr>
<td>Urban Catchment Management and Science: Experiences from the Water Industry</td>
<td>Mark Williams, Scottish Water</td>
</tr>
<tr>
<td>Global Developments in Integrated Flood Management</td>
<td>Giacomo Teruggi, World Meteorological Organization</td>
</tr>
<tr>
<td>River Basin Management in Scotland</td>
<td>David Harley, Scottish Environment Protection Agency</td>
</tr>
<tr>
<td>Local Stakeholder Engagement in IWRM: Lake Naivasha, Kenya</td>
<td>David Harper, University of Leicester</td>
</tr>
<tr>
<td>Addressing Global Water Security Through IWRM: The Eighth Phase of the International Hydrological Programme</td>
<td>Blanca Jiménez-Cisneros, UNESCO</td>
</tr>
</tbody>
</table>

**PANEL QUESTION AND ANSWER SESSION**

Following the presentations a panel made up of the session speakers will discuss the most pressing issues related to catchment management science and its application. Audience members will have the opportunity to question the panel on their experiences and ideas regarding future global priorities for freshwater science.
SESSION CHAIR

Alan Jenkins   Director of Water and Pollution Science
Centre for Ecology & Hydrology

Professor Alan Jenkins is the Deputy Director of the Centre for Ecology & Hydrology and Director for Water and Pollution Science. He is Chair of the UK Committee for National and International Hydrology, Head of the UK Delegation to the UNESCO International Hydrology Programme and Hydrological Adviser to the UK Government with the World Meteorological Organization. He is the author of over 90 ISI journal papers and over 130 reports. Alan’s personal research focus lies in hydrochemical modelling and in particular the development of models for predicting the impact of air pollution on soils and surface waters.

PRESENTATIONS

CATCHMENT MANAGEMENT: THE FUTURE?

The many issues around the use of our water resources in a changing world have never been more critical or urgent. Catchment or river-basin based approaches have increasing been implemented across the globe in response to the need for better and improved water resources management, and the protection of goods and services supporting our health, well-being and economic prosperity. In Europe and elsewhere, such management requires a holistic approach involving natural sciences, social, legal, economic and other sectors. Importantly though it must be informed by stakeholder engagement and encompassing the need for land management interventions, in order to protect and improve water resources and dependent aquatic ecosystems and to mitigate against flooding and the impact of climate change. So where are we now? Many new initiatives are providing support and opportunities linking land and water management but these are not universally implemented across the globe. So is catchment management delivering; has our scientific understanding informed policy and it implementation for sustainable use of water resources? In critical areas, is the problem just one of lack of implementation? This presentation will provide a global context by way of an introduction to the current and emerging challenges for catchment science.

Speaker: Bob Ferrier   Director of Research Impact, James Hutton Institute and Director of the Centre of Expertise for Waters

Bob Ferrier is Director of Research Impact at the James Hutton Institute in Scotland and Director of the policy: research Centre of Expertise for Waters (CREW). He has over 20 years experience in water resources management in particular the hydrological, hydrochemical and ecological consequences of environmental change; in particular land use and management, and climate change. His research interests centre on the potential role of policy and land use change on water resources and the development of systems based approaches and frameworks for sustainable management. He has been a champion for catchment management and in particular, addressing the global challenge of diffuse pollution.

URBAN CATCHMENT MANAGEMENT AND SCIENCE: EXPERIENCES FROM THE WATER INDUSTRY

Improving urban water courses is a significant challenge for towns and cities that have developed over decades with surface drainage systems that served a primary function of managing water quantity rather than quality. Addressing this legacy in a constrained urban environment where land is at a premium is difficult. Deployment of surface water treatment systems such as “Sustainable Urban Drainage Systems” (SUDS) is a welcome development. For regeneration projects and new developments they are an ideal means to manage quality and quantity of urban runoff, and to create green space. However, retrofitting such schemes in the urban environment may not always be possible either financially or spatially.

Scottish Water operates a large number of surface water outfalls, and was faced with the challenge from the Scottish Environment Protection Agency of addressing discharges in 6 urban catchments. It was quickly recognised that at >£20m the costs of retrofitting a SUDS system would far exceed the relatively small benefits in the receiving water, and was further constrained by existing land use – light industrial and trading estates. Instead, Scottish Water developed a different approach, agreed with SEPA of ‘Surface Water Action Plans’. These require studies of the sources and fate of potential pollutants within surface water catchments to enable action plans to be developed identifying the roles and responsibilities of all operators in the catchment. Scottish Water’s controls do not extend to the drains and gulleys that empty into the system, hence engagement of operators in understanding their contribution to water quality, and promoting ‘good housekeeping’ is at the heart of this approach.

The longer term benefits are still to be fully understood, however there are key areas of focus for regulators, local authorities and operators to support longer term water quality objectives. These range from planning and regulatory controls to drive good behaviour through to simple strategies for managing activities such as car washing.
Speaker: David Harley  
**Water and Land Manager, Scottish Environment Protection Agency**

David Harley is the Scottish Environment Protection Agency’s (SEPA) Water & Land Manager, overseeing a department designed to support SEPA and partners deliver River Basin Management Planning objectives. This is achieved through water & land policy development, regulatory support, diffuse pollution priority catchment work, developing external partnerships and direct funding. David has worked with SEPA and predecessor bodies since 1991 in ecological assessment, regulation and policy development before taking on his current role in 2009.

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**GLOBAL DEVELOPMENTS IN INTEGRATED FLOOD MANAGEMENT**

In response to the increasing trend of disasters caused by floods, the World Meteorological Organization (WMO) and Global Water Partnership (GWP) Associated Programme on Flood Management advocates the concept of Integrated Flood Management (IFM). IFM aims at maximizing the net benefits from the use of floodplains and minimizing loss of life from flooding. IFM is a process promoting an integrated – as opposed to fragmented – approach to flood management. This presentation will discuss the current developments in IFM, detailing the experience of the WMO in applying a catchment based approach to Disaster Risk Reduction and Flood Management.

**Speaker: Giacomo Teruggi  
Scientific Officer, Associated Programme on Flood Management, World Meteorological Organization**

Holding an MSc in Hydraulics/Hydrology and an MSc in Environmental Engineering, Giacomo Teruggi has been engaged in World Meteorological Organization’s Climate and Water Department since 2004. For the past six years he has been taking care of the Associated Programme on Flood Management (APFM), particularly focusing on capacity building activities, and advocating for the concept of Integrated Flood Management, which promotes considering the whole river basin as planning unit. At the same time, starting from similar concepts he assisted in the setup of the Integrated Drought Management Programme (IDMP), launched in March 2013.

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**RIVER BASIN MANAGEMENT IN SCOTLAND**

The European Union adopted the Water Framework Directive in October 2000. Its principal objectives are to prevent deterioration of aquatic ecosystems and to aim to restore them to good status by 2027 at the latest. The Directive also identified the best approach as being one based on the management of river basins, rather than on administrative or political boundaries. SEPA leads and co-ordinates river basin planning for Scotland, and works with a wide range of partners and stakeholders to deliver the required improvements. The Water Framework Directive gave SEPA the opportunity to redefine its historic water legislation by introducing new regulations for controlling activities to the water environment.

The first river basin management plans (RBMPs) focused on the period from 2009 to 2015 and since 2009, SEPA has been working with other public bodies, voluntary organisations, land managers and other businesses to remove barriers to fish migration, tackle pollution problems, improve water flows and levels and restore more natural habitats in our rivers, lochs, estuaries and coastal waters. The presentation will discuss the successes and challenges in the production of the first RBMP including the challenges faced with agreeing and implementing measures for improvement with a wide range of sectors including hydro-generators, farmers and the water industry.

The status of many water bodies is adversely affected by rural diffuse pollution and/or the effects of past engineering works that have damaged habitats and left barriers to migratory fish. Addressing these impacts is challenging and has required SEPA to develop new approaches in partnership with a range of different organisations. It is clear that in order to meet the Directive’s targets and secure a high quality water environment right across the country, Scotland will need to direct more effort on addressing diffuse pollution and restoring damaged habitats. This will be the focus of the consultation on the second RBMPs. It is also the challenge, and the opportunity, for SEPA and our partners over the next 12 years, if we are to protect and restore our water environment for the benefit of generations to come.

**Speaker: Mark Williams  
Head of Environmental Science and Regulation, Scottish Water**

Following an academic career in marine biology and chemical ecology at the Universities of St Andrews and Cardiff, Mark joined the water industry in 2000 to work in environmental management and regulation. In 2006 Mark was appointed Business Strategy and Climate Change Manager, developing a long term Vision and strategy for Scottish Water, and developing and implementing climate and carbon strategies. Mark is currently Head of Environmental Science and Regulation within Scottish Water, covering all aspects of environmental science, strategy and regulation. The focus is to support to operational and investment teams across Scotland in meeting regulatory, environmental, climate and carbon objectives. A key element is to work closely with SEPA and other stakeholders at local and national levels to take appropriate steps to protect our environment. Mark also leads the climate and carbon programme for UK Water Industry Research, a collaborative research organisation acting on behalf of all UK water companies. This has delivered a number of projects to guide the industry on adapting to climate change and mitigating carbon in recent years.
Lake Naivasha is the economic & ecological jewel of Kenya. Its waters for irrigation make it the world centre for exporting cut flowers — 70% of Kenya’s flower exports (£260M p.a.), making 40% of the EU’s supermarket trade — and for vegetables (20% of Kenya’s exports, £25M p.a.); together they are 10% of Kenya’s total foreign exchange revenue. Its high biodiversity (350+ bird species; 1200+ hippopotamus; Ramsar Convention Wetland; Important Bird Area (IBA)) makes it a major centre for tourism (1.8M tourists, 4,000 beds). Its waters sustain Africa’s first geothermal power station (30% of Kenya’s power). Its artisanal fishery provides an economically-accessible source of protein to a quarter of a million people.

The basin became a UNESCO HELP basin and an Ecohydrology demonstration site in 2003/4 as a consequence of the research which demonstrated the ecohydrological basis of this wealth and at the same time showed that it was under threat of collapse through alien species impacts and over-exploitation. Considerable research investment from British, Dutch & Canadian sources, together with practical interventions funded by the retail purchasers of cut flowers and the implementation of Kenya’s 2002 Water Act have gone some way in the past decade, towards mitigating the worst effects. The water-using groups have agreed a “traffic-light” abstraction strategy to deal with future water shortages, but no real progress has been made on addressing the sustainability of biodiversity or ecosystem services. The presentation will assess the prospects for a sustainable future in this basin.

**Speaker:** David Harper  
**Professor Emeritus of Limnology & Catchment Science, University of Leicester**

David Harper is Professor Emeritus of Limnology & Catchment Science at the University of Leicester. His research has been into the ecohydrological processes in lakes and rivers and his greatest effort has been in understanding the Lake Naivasha ecosystem, which he has studied for over 30 years. His understanding of the impacts of alien species was followed by concerns about over-abstraction and hypertrophication. His research helped the creation of a Lake management agency through the involvement of HRH Prince of Wales – ‘Imarisha’ – that incorporated his recommendations into its Sustainable Development Action Plan (2012-17), which if correctly implemented will underpin the increasing sales of ‘Fair Trade’ products and ensure the sustainability of Naivasha’s ecosystem services for future generations.

**ADDRESSING GLOBAL WATER SECURITY THROUGH IWRM: THE EIGHTH PHASE OF THE INTERNATIONAL HYDROLOGICAL PROGRAMME, 2014-2021**

This presentation will describe the major challenges at global, regional and local level, including those derived from climate change to achieve Water Security and the ways in which the International Hydrological Programme (IHP) is addressing them. The IHP is an intergovernmental scientific programme hosted at UNESCO. It was created in 1975 as a result of the International Hydrological Decade. Progressively, and with time it has evolved in a multi- and transdisciplinary programme applying sciences and innovation to enhance the management of water resources and to improve their governance with the participation of the main stakeholders. The Programme is at its Eighth Phase and it is devoted to promote international collaboration to support science and technology development, strengthen the policy and science interphase and to promote awareness raising and human and institutional capacity building. This eight phase comprises six themes focusing on: (a) water related disasters and hydrological changes; (b) Groundwater; (c) Water Quantity and Quality; (d) Water for rural and urban settlements; (e ) Ecohydrology and engineered combined solutions ; (f) Education and awareness raising. The programme is conceived, among other goals, to help implementation of the international post-2015 agenda and the forthcoming Sustainable Development Goals (SDG). To implement the IHP-VIII, UNESCO has a Water network, including 169 IHP National Committees, the UNESCO secretariat in Paris and 5 regional offices, a category 1 centre UNESCO-International Hydrological Education Institute located in the Netherlands; the World Water Assessment Programme (WWAP), based in Italy ad periodically producing the World Water Development Report of the United Nations; 30 category 2 water centres under the auspices of UNESCO; and 35 water chairs placed all in various parts of the world. This represents in all the mobilisation of around 2000 experts around the world.

**Speaker:** Blanca E. Jiménez Cisneros  
**Secretary, International Hydrological Programme and Director, UNESCO**

Blanca Jiménez is an environmental engineer with Masters and PhD degrees in wastewater treatment and reuse obtained in France. She has authored more than 414 papers, published and presented in international scientific journals, books and conferences. She received the Mexican National Prize for Science and Technology (2009); was president of the Environmental Engineers’ Association (1999-2000), and of the Mexican Federation of Sanitary Engineers and Environmental Science Association (2001-2002). She was a member of the board of directors of the International Water Association (2004-2008) and chair of the IWA Water Reuse Specialist Group (2006-2009), as also holds membership of the Nominating Committee for the Stockholm Water Prize (2007-2012). Currently, she is the Director of the Division of Water Sciences, Secretary of the International Hydrological Programme at UNESCO. She sits on the editorial committees of several international journals such as Water Science and Technology; Water Reuse and Desalination; and Residuals Science and Technology. She is co-coordinator of leading authors for the freshwater resources chapter under the adaptation group of the IPCC. In 2010 she received the Global Water Award from the International Water Association.