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IAHR/IWA Working Group on Water Sensitive Urban Design Conference Workshop



INTER-DISCIPLINARY URBAN WATER RESEARCH:

Lessons in How to Integrate the Social and Physical Sciences

Monday, 3 April 2006

Convened by Dr Rebekah Brown, Monash University

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7TH INTERNATIONAL CONFERENCE
ON URBAN DRAINAGE MODELLING

IN CONJUNCTION WITH
4TH INTERNATIONAL CONFERENCE
ON WATER SENSITIVE URBAN DESIGN

GRAND HYATT MELBOURNE
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Introduction

This inter-disciplinary workshop is an activity of the international Working Group on Water Sensitive Urban Design (WSUD) of IAHR/IWA joint committee on urban drainage. It forms part of the *7th International Conference on Urban Drainage Modelling & the 4th International Conference on Water Sensitive Urban Design*, hosted in Melbourne from 3-7 April by Monash University, Engineers Australia, the International Water Association and the Stormwater Industry Association.

It is now well accepted that advancing inter-disciplinary approaches is essential for pursuing more sustainable urban water outcomes. This workshop: *Inter-disciplinary urban water research: lessons in how to integrate the social and physical sciences*, draws from Australian and International case studies to portray the commonly experienced difficulties with integrating the social and physical sciences in large urban water research programs.

A range of experienced presenters will discuss their current research projects in urban water, discussing the benefits and function of inter-disciplinary approaches, and associated challenges and successes they have experienced. The aim of this workshop is to promote active and open discussions and it is expected that participants will improve their capacity for inter-disciplinary thinking and research.

About the IAHR/IWA Working Group on Water Sensitive Urban Design

The aim of the Working Group is to find ways to encourage urban design that improves the integration and management of all 3 urban water 'streams' at all levels within concepts such as ecological footprinting and other approaches to sustainable development. Urban design involves multi-disciplinary inputs including (but not limited to) town planning, landscape architecture, building design, ecology and infrastructure engineering. WSUD has no scale constraints and is equally applicable from individual houses to whole catchments (systems), encompassing building architecture to urban planning and design of large-scale urban development and associated open space.

Theme areas include: stormwater treatment techniques and management as a resource within an integrated urban system; potable water reclamation and recycling; and policy and planning issues. Framed by the philosophy of promoting urban development that integrates sustaining the water cycle and protecting urban aquatic ecosystems, the WSUD approach includes:

- “fit-for-purpose” use of urban water resources by matching alternative sources of water and associated water quality to end uses;
- improved stormwater quality discharged to receiving waters
- managing the hydrologic impacts of urban development on aquatic ecosystems

This approach has clear multi-disciplinary implications with the need to engage other types of professionals with the Working Group. This includes all types of architects, planners, lawyers, political scientists (governance specialists) and other scientists such as ecologists and social scientists. Ideally these professional groups should be encouraged to become part of the Working Group in order to build capacity across all practitioners involved in urban design.

Chairman of Working Group
Dr Tony Wong (Australia)
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Secretary of Working Group
Professor Richard Ashley (England)
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Workshop Overview

Session Time	Presenter	Content
10.00 – 10.15	<i>Tea and Coffee on arrival</i>	
10.15 – 10.45	Dr Rebekah Brown Monash University <i>Australia</i>	Welcome and introduction. Setting the stage for interdisciplinary urban water research.
10.45 – 11.30	Dr Liz Sharp University of Bradford <i>United Kingdom</i>	Combining Social Science with Engineering: Reflections from the WaND research program.
11.30 – 11.45	<i>Morning Tea</i>	
11.45 – 12.30	Dr Govert Geldof TAUW <i>The Netherlands</i> (Keynote Conference Speaker)	Coping with Complexity: from the serial to the parallel approach for research and practice.
12.30 – 1.15	<i>Co-Facilitated discussions</i> Prof Richard Ashley University of Sheffield <i>United Kingdom</i> & Dr Rebekah Brown	PARTICIPATORY SESSION: Considering the integration of the social and physical sciences
1.15 – 2.00	<i>Lunch</i>	
2.00 – 2.45	Prof Jenny Dixon University of Auckland <i>New Zealand</i>	Low Impact Urban Development & Design (LIUDD) research program.
2.45 – 3.30	Mr Alan Gregory Commonwealth Scientific and Industrial Research Organisation (CSIRO), <i>Australia</i>	Urban Waterscapes National Research Flagship Program.
3.30 – 3.45	<i>Afternoon Tea</i>	
3.45 – 4.15	Dr Jonathan Chapman Environment Agency <i>United Kingdom</i> & Mr Gavin Blakey Brisbane City Council <i>Australia.</i>	Governance and institutional issues from an urban hydrology and flood management perspective.
4.15 – 4.55	<i>Co-Facilitated discussions</i> Prof Richard Ashley & Dr Rebekah Brown	PARTICIPATORY SESSION: Pathways for future interdisciplinary research and practice.
4.55 – 5.00	Dr Rebekah Brown	Session Closure

Project descriptions

Combining Social Science with Engineering: Reflections from the WaND project

Dr Liz Sharp, Pennine Water Group, United Kingdom

This presentation considers whether, when and how engineering and social science could or should be combined in large projects. It draws on experience from the WaND (Water Cycle Management for New Developments) project. It also draws on Flyvbjerg's discussion of different types of science.

Disciplinary stereotypes suggest that social scientists are pedantic about language, full of jargon, and more interested in theory than solving problems. Likewise, engineers may be viewed as problem focused, narrow-minded and see human beings as machines. Flyvbjerg's discussion of science is used to throw some light on these stereotypes – most engineering science falls into the category of 'techne', pragmatic and context-related science which is used to pursue particular instrumental goals. In contrast, many social scientists aim to develop 'phronesis' science, that is, examining the values that are perpetuated by current patterns of development and raising questions about their appropriateness. Flyvbjerg argues that both areas of work are held back by a perceived need to present the work as 'episteme', that is, traditional science which develops universal theories.

Whereas Flyvbjerg argued that 'techne' and 'phronesis' are frequently presented as episteme, in the WaND project, it is argued, both the whole project and almost all specific work packages present themselves as 'techne' in that they are science which aims to help fulfil an identified instrumental problem. While for many work packages this is appropriate, it is suggested that some of the social science packages are actually aiming to achieve something closer to phronesis. The process of the WaND project is also analysed. While some elements of the WaND project do further inter-disciplinary working, for example, workshops run by specific work packages, overall, it is argued, there are limited opportunities to exchange and develop new understandings about water management. The – highly effective – management of the programme has concentrated on delivery of pre-defined goals of different work packages, not on the sharing or development of new understandings between work packages. It is suggested that this mode of management may itself be more suited to 'techne' than 'phronesis'.

It is concluded that there were a number of elements of the WaND project which have restricted the development of closer inter-disciplinary working between engineering and social science including the following:

- Source of funding and peer review meant project was inevitably engineering led;
- Power-dynamics between scientists on an engineering-led project mean that social scientists are likely to be less experienced;
- Norms of managing a big project limited the space for exchange of findings and development of new ideas.

Having almost completed the research, and having got to know each other quite well along the way, it may be that we are finally now ready to embark on inter-disciplinary science!

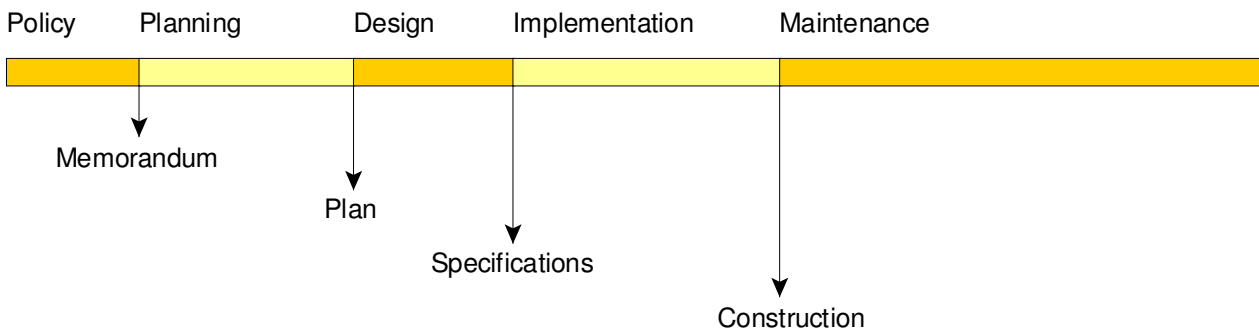
Coping with Complexity: from serial to parallel

Dr Govert D. Geldof, Tauw, the Netherlands

In this workshop I will present a triptych. The first part is about the problem, the second part about mechanisms and the third part about practical implications. My contribution is not about interdisciplinary research, but about a philosophy to organise interdisciplinary processes in practice, from the perspective of a reflective practitioner.

I. The problem

We have different disciplines, because nobody can overlook the whole. The whole process is so complex, that we chop it into pieces. Each specialist is focussing on her or his special thing. There are different dimensions for disciplines. On the same level we find disciplines like water, traffic, housing, recreation, etc. At different levels we find policy people, planners, designers, implementers and asset managers. Also we can distinguish politicians, civil servants, people from private companies (banks, consultants, factories, etc.) and civilians. All these actors influence the results of a process. The problem is that people from different disciplines fail to communicate. The quality of plan will drop and many plans will never be implemented. Each discipline acts from a *rational* and *self-referential* position. Proposition: especially the connections between policy, planning, design, implementation and maintenance are poorly developed.

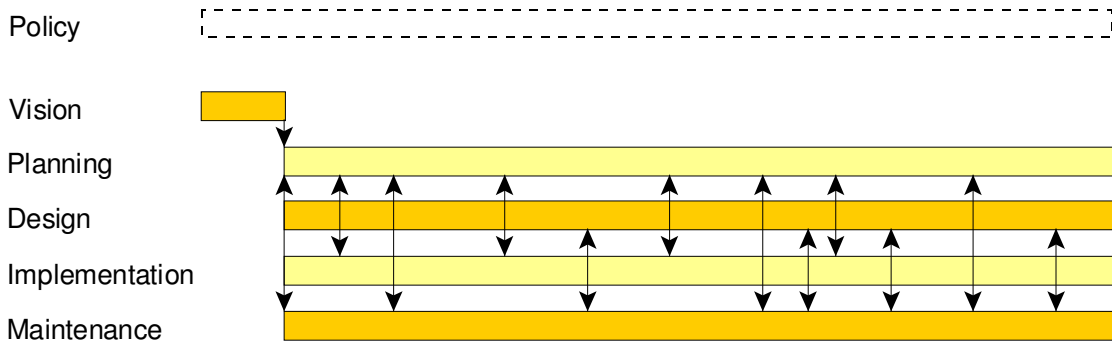


II. Mechanisms (theory)

We can distinguish between complexity and complicatedness. Complexity is viewed as a healthy and natural feature of a developing system, perceptible in both societal and natural processes. Complexity is a precondition for change. Complicatedness is viewed as the result of human actions. In order to get a grip on processes, people think up systems, set up structures, and define rules. Proposition: complicatedness is often the result of resisting complexity. By accepting the fact that processes are complex and that they cannot always be completely controlled, they become easier to deal with. In short: *by accepting that something is complex, it becomes simpler*. Instead of optimising a process (looking for the best solution in an objective way) we should apply an adaptive approach, that offers structure and surprise, asks for subjective decisions and results in an emergent social construction.

III. Practical implications

One of the most significant changes from optimising to adaptation is going from a serial approach (first picture) to a parallel approach (second picture). In this process there is a lot of interaction between people from policy, planning, design implementation and maintenance (asset management). It is e learning process.



For each discipline there is a system – their ‘thing’ – and a context. The essence of adaptation is to have just enough interaction between system and context. This will not be successful when people continue to act pure rational and self-referential. They have to be really interested in others! Context sensitivity is one of the buzz words.

For more: you can download the book “Coping with complexity in integrated water management” from www.govertgeldof.nl → English

Low Impact Urban Design and Development (LIUDD)

Prof Jenny Dixon, LIUDD Co-Programme Leader, School of Architecture and Planning, University of Auckland, New Zealand

The purpose of the New Zealand Low Impact Urban Design and Development (LIUDD) research programme is to facilitate the uptake and implementation of low impact design practices in urban development. Led by Landcare Research Ltd, along with other research partners, the six-year programme (2003-2009) has four key themes. These address the human and social dimensions of 'buy-in', integration of natural features and treatment processes through the application of innovative science and design, development of new economic tools and implementation of LIUDD through organisational change, council policies and practices.

Some selected social research questions

Overall aim: How can we mainstream low impact urban design and development in urban development processes and practices?

- How do we achieve buy-in from stakeholders (eg councils, developers?)
- How can organisational change be managed in order to facilitate LIUDD?
- What planning instruments, strategies and practices can best facilitate LIUDD?
- What governance models are most effective for maintaining low impact design features on multiple-owned residential sites where there is common ownership of some facilities?

Rationale for our inter-disciplinary approach

- Launch of our joint Centre for Urban Ecosystem Sustainability
- Recognition that science of low impact design well understood but implementation is much more to do with institutional and social issues
- Interdisciplinary 'gaze' of the research funders (government research strategies)

Conducting long term inter-disciplinary research

Challenges

- It takes time to build relationships and work collaboratively with new colleagues
- Dealing with the unanticipated (restructuring; stakeholder resistance)
- Recognition of different perspectives and modes of working
- Reconciling different organisational goals in respect of programme outputs
- Defining programme 'boundaries' with those of other projects underway
- Delineation of tasks within research groups can exacerbate disciplinary focus and undermine collaboration across disciplines
- Technology cannot always overcome geographical barriers to collaboration
- Juggling high workloads on stretched budgets (both financial and time)

Benefits

- Learning about and integrating other disciplinary contributions
- Establishing new collegial relationships both within and outside programme
- Being able to build on other research initiatives during lifetime of programme
- Changing our thinking- recognition that capacity and implementation issues are key to moving forward and changing behaviour of organisations and individuals

Lessons for others in a perfect world!

- Takes time to create inter-disciplinary research from multi-disciplinary teams
- Build in sufficient time to project budgets to enable collaboration
- Develop and maintain effective communication channels
- Avoid over commitment of key individuals and ensure time to mentor new researchers
- Reconcile different output requirements of researchers (individual and collaborative)
- Keep tasks and outcomes flexible so opportunities and new ideas can be grabbed
- Inter-disciplinary research is time-intensive but avoid unnecessary duplication of effort
- It won't all happen at once – but significant moments can signal exciting turning points!

CSIRO Urban Waterscapes National Research Flagship

Mr Alan Gregory, Program Leader, CSIRO, Australia

The Urban Waterscapes program is one of the four research themes contributing to CSIRO's Water for a Healthy Country National Research Flagship. The program aims to provide supporting science to enable Australia's cities to transform their current water systems to more sustainable configurations in the future. The program includes three complementary streams of research:

- Water Smart City Systems, focusing on:
 - developing methods, processes and tools to analyse complex interactions across urban water systems in physical, social and economic terms
 - improve decision analysis for adaptive integrated water service planning, in the face of increased uncertainty
- Water Smart Technologies focusing on the development of improved water treatment, storage and distribution technologies that will enable new water service options to be successfully implemented.
- Water Smart Communities focusing on:
 - developing implementation strategies for successful water system transition to new integrated water cycle configurations.
 - developing structural or non-structural solutions to diminish barriers to implementation and ensure ongoing safe and reliable service delivery.

The transition to water smart cities is dependent on improving our cross systems understanding of the linkages between water infrastructure, the natural water cycle, economic and institutional structures and most importantly, the communities' acceptance and adoption of alternative water service configurations. The choices for future water system alternatives are many including increasing diversity of water sources, fit for purpose product quality, distributed vs centralised systems, public vs private management, and potentially recycling to potable supplies. However, the potential social, environmental and economic benefits from less linear urban water systems are significant. An interdisciplinary approach to this challenge is the only way the complexities and tradeoffs of integrated urban water management choices can be understood and effective sustainable water policy developed.

While the Urban Waterscapes program strives for interdisciplinary research, in practice it has been challenging to achieve. Some of the reasons for this include cross disciplinary communication barriers, difficulty in reaching a common frame of view on research objectives and methods, insecurity of working in a team environment, concern about lack of individual ownership of the research and recognition, conceptual differences between disciplines and limited incentives for integration. There is a tendency for one discipline to dominate a particular project (depending on the nature of the work), with other disciplines acting almost in a sub-contractor role.

Ultimately, the success of interdisciplinary research depends on the individuals involved and the relationships between them through the life of the project. In particular, it requires good leadership with an appreciation of a range of skills and frames of reference, targeted selection of scientists with the right research and interpersonal skills, preferably some researchers with transdisciplinary experience, and appropriate team and recognition structures that reduce career concerns of individuals.

Brisbane's Flood Management Strategy

Mr Gavin Blakey, Principal Officer Flood Management, Brisbane City Council, Australia

Brisbane is a sub-tropical city subject to the vigour and extremes of a sub-tropical climate. Flooding can occur adjacent to the Brisbane River and Brisbane's creeks, from overland flow, and in low-lying coastal areas. The objective of Brisbane's Flood Risk Management Strategy is to comprehensively address and mitigate the impacts of flood risk on individuals and communities living and working across the city's floodplains.

Up to 11,000 residential buildings may be prone to flooding by a 100 year ARI flood from creek and river flooding alone. Of these, about 7,000 can be attributed to creek flooding. Many more properties are prone to flooding by the 'Probable Maximum Flood' (the largest flood that could conceivably occur) and to flooding from local overland flow and storm surge. Extensive industrial and commercial zoned land is also located in flood prone zones. The average annual cost of flood damage in Brisbane is expected to be very significant. The cost of damage caused by the 1974 Brisbane River Flood, which inundated some 15,000 properties above ground level (including properties in Ipswich) was nearly a billion dollars in today's values.

The people of Brisbane expect to be able to live and work with no untoward flood risk to their life or health, and no unacceptable flood risk to their goods and possessions or to public infrastructure. Flood risk can be managed by a variety of measures that modify property at risk (eg land use controls), response of individuals or communities at risk (eg flood warning), or flood management itself (eg the use of pipes to reduce overland flow).

Individuals and communities in flood prone areas also have important roles to play in the management of flood risk. Council endeavours to inform the public of their exposure to flood risk (flood awareness) and how individuals and organisations can actively contribute to the management of this risk to reduce the impact of flooding on themselves and their possessions (flood readiness, flood response and flood recovery).

In Queensland local governments are primarily responsible for flood risk management. State and Federal Government support this role, for example through some funding programs (eg Natural Disaster Risk Management), legislation (eg requiring Councils to include flood hazard maps in their Town / City Plans), and disaster risk management planning and provision.

Council is working with the community to achieve the best possible outcomes for the people of Brisbane. This requires an interdisciplinary approach. At least the following professions are involved in the development of the Flood Risk Management Strategy: engineering, town planning, community development, social planning, volunteer coordination, communication / marketing. In addition a range of stakeholders are involved, including: elected representatives, community members, community based catchment management groups, the development industry, and State Government departments.

With such a broad range of disciplines and stakeholders a special challenge is the time taken to consult, involve, iterate, and implement. Each discipline also has its own expertise, language, and problem solving techniques and each of the stakeholders has views, needs, and expectations. However by actively involving the disciplines and the stakeholders in the process the solutions are more likely to be workable, acceptable, and sustainable.

Strong leadership by Brisbane City Council's elected representatives has enabled flood risk management to be significantly progressed. One of the mechanisms used has been the *Lord Mayor's Taskforce on Suburban Flooding* (go to www.brisbane.qld.gov.au).

Lessons being learned from this work include: consultation and involvement take time but are critical to the success of the strategy, listen carefully to the stakeholders to identify their key issues, communicate often and use a range of modes (eg face to face, written, presentations,

focus groups, interviews), each discipline or stakeholder group has its own language and style – try to communicate on their terms. Flooding is a social issue – people’s lives are affected by the impact of adverse flooding.

In a complex environment that like flooding in urban environments, the clear benefit of involving so many professions and stakeholders is that the solutions identified will more effectively address the impact of flooding on people and properties. There is no one solution, one silver bullet. A diverse range of solutions needs to be implemented to minimise the impact of flooding. An interdisciplinary approach to flood risk management is not just the best way forward, it’s the only way forward.

Speaker Profiles & Contact Details

Prof Richard Ashley

Pennine Water Group, the University of Sheffield, *United Kingdom*

Prof Richard Ashley, of the University of Sheffield, is the Co-Director of the EPSRC funded Platform Centre, the Pennine Water Group. Prof Ashley is also the Secretary for the international Working Group on Water Sensitive Urban Design. Richard's current research projects in sustainable water systems include: 1) 'Water cycle management for new developments (WaND) project, a UK Government project looking at all aspects of sustainable water management; 2) No Rainwater in Sewers (NORIS), and 3) Urban Water Cycle Management (UWC).

Pennine Water Group: <http://pwg.group.shef.ac.uk/>

WaND: <http://www.wand.uk.net/>

Contact: r.ashley@sheffield.ac.uk

Mr Gavin Blakey

Principal Officer Flood Management, Brisbane City Council, *Australia*

Mr Gavin Blakey manages the flood management and sustainable water programs for Brisbane City Council. Gavin specialises in policy and strategic planning in urban water management, with a particular interest in the integration of water elements to achieve sustainable water outcomes.

Brisbane City Council: <http://www.brisbane.qld.gov.au/>

Contact: Gavin.Blakey@brisbane.qld.gov.au

Dr Rebekah Brown

School of Geography and Environmental Science, Monash University, *Australia*

Dr Rebekah Brown is the Program Leader of the National Urban Water Governance Program, School of Geography and Environmental Science at Monash University. Rebekah leads a number of research projects focusing on 1) institutional development and reform, 2) organisational receptivity and change, and 3) socio-technical transitions.

National Urban Water Governance Program: www.urbanwatergovernance.com

Facility for Advancing Water Biofiltration: www.monash.edu.au/fawb

Contact: Rebekah.Brown@arts.monash.edu.au

Dr Jonathan Chapman

Environment Agency, *United Kingdom*

Dr Jonathan Chapman is leading an institutional/governance review 'making space for water', developing a new Government Strategy for flood and coastal erosion risk management in England. This review is exploring how to integrate the priority of urban flood management within the integrated water management agenda across England and Wales.

Making Space for Water:

<http://www.environment-agency.gov.uk/yourenv/consultations/921321/?version=1&lang=e>

Contact: jonathan.chapman@environment-agency.gov.uk

Prof Jenny Dixon

LIUDD, School of Architecture and Planning, University of Auckland, *New Zealand*

Prof Jenny Dixon of the School of Architecture and Planning, University of Auckland, is the Co-Programme Leader of the Low Impact Urban Development & Design (LIUDD) project. This is a six-year funded multi-disciplinary programme that is investigating alternative approaches and

techniques for application on greenfield and brownfield sites in New Zealand's built environment. The specific goals include: 1) The transformation of urban development; 2) Designing sustainable settlement form for 21st century; 3) Sustainable buildings with reduced environmental impact, water and energy needs; 4) Reduced stormwater infrastructure, energy demands and urban wastes; 5) Measured improvement in urban freshwater, native, terrestrial environments; 6) Urban communities embracing nature and low impact development in cities; and 7) Sustainable development – making an economic return.

LIUDD: <http://www.landcareresearch.co.nz/research/urban/liudd/index.asp>

Contact: j.dixon@auckland.ac.nz

Dr Govert Geldof

Tauw, *the Netherlands*

Dr Govert Geldof, Senior Consultant, studied Civil Engineering at the University of Technology in Delft. From 1986, Dr Geldof worked at Tauw, where he started to develop ideas about integrated urban water management, both in new and existing urban areas. Dr Geldof introduced source control techniques in the Netherlands. He supported the writing of the 4th Dutch Policy Paper on Water Management, in which source control in urban areas is one of the spearheads of policy. To build the bridge between the technical and social sciences, Dr Geldof uses insights from complexity science. Dr Geldof is a Keynote speaker at the International UDM and WSUD Conference.

Tauw: http://www.tauw.nl/Corporate_en/index.php

Contact: gdg@tauw.nl

Mr Alan Gregory

Regional Coordinator, Urban Waterscapes, CSIRO Manufacturing & Infrastructure Technology, *Australia*

Mr Alan Gregory is the Regional Coordinator of the Urban Waterscapes National Research Flagship Program. The Urban Waterscapes program is one of the four research themes contributing to CSIRO's Water for a Healthy Country National Research Flagship. The program aims to provide supporting science to enable Australia's cities to transform their current water systems to more sustainable configurations in the future.

Water for a Healthy Country Flagship: <http://www.csiro.au/csiro/channel/ich4...html>

Contact: Alan.Gregory@csiro.au

Dr Liz Sharp

Pennine Water Group, University of Bradford, *United Kingdom*

Dr Liz Sharp is leading the Pennine Water Group's social science input to the EPSRC funded WaND programme (Water cycle management in New Developments). This research focuses on the processes through which society makes decisions about the environment, and in particular, the ways the public contribute to, and are influenced by, these decisions. The two key projects include: 1) the decision processes through which innovations are included or excluded from new developments; and 2) how public perceptions and behaviour with respect to water innovations might be influenced.

Pennine Water Group: <http://pwg.group.shef.ac.uk/>

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Contact: e.sharp@Bradford.ac.uk