

## **Institutional Capacity Attributes of a Water Sensitive City: the Case of Sydney, Australia**

Susan van de Meene\*

National Urban Water Governance Program, School of Geography and Environmental Science,  
Monash University, Clayton, Victoria, Australia, 3800

\*Corresponding author, e-mail [susan.vandemeene@arts.monash.edu.au](mailto:susan.vandemeene@arts.monash.edu.au)

### **ABSTRACT**

The future, sustainable urban water management system, or the “water sensitive city”, is likely to be characterised by complex and flexible governance arrangements, increased inter-organisational interaction and wide stakeholder participation, which contrasts significantly with the traditional approach. Recently there has been significant financial investment in urban water reform, however the reforms have not been as successful as anticipated and numerous institutional barriers remain. Understanding and assessing institutional capacity is key to addressing institutional impediments. Institutional capacity is the individual, intra- and inter-organisational and external rules and incentives capacities. This paper reports on the first case study of a social research project that aims to develop an institutional capacity assessment framework. Empirical data from semi-structured interviews with 59 water industry experts in Sydney, Australia, and a meta-analysis of the literature were used. The key capacity attributes identified could form the basis of an institutional capacity assessment tool and reveal common and differing attributes across stakeholder groups which provide insight into stakeholder relations. Synthesis of the results revealed that intra- and inter-organisational capacities were facing particular challenges and should be explicitly addressed in reform, policy and capacity development initiatives.

### **KEYWORDS**

Capacity assessment framework; institutional capacity attributes; Sydney, Australia; sustainable urban water management; water sensitive city.

### **INTRODUCTION**

Development of the traditional urban water management approach resulted in a compartmentalised system of water supply, sewerage and drainage, underpinned by the social value of protecting public health, whether it be provision of clean drinking water, conveyance of floodwaters or removal of wastes using water (Cech, 2005). Separation of the three streams was often reflected in the separation of organisational roles and responsibilities where one organisation or part of an organisation was responsible for water supply, one for sewerage and one for drainage (Raadschelders, 2005). Due to the separate nature of the physical systems, there was generally little encouragement or need for organisations to interact with each other or with other sectors such as infrastructure and planning (Vlachos and Braga, 2001).

Today, traditional urban water management is widely recognised as needing to change to enable sustainable urban water conditions, or the vision of a “water sensitive city” (Brown *et al.*, 2008; Wong and Brown, 2008). Transitioning to a water sensitive city requires a complex array of values and factors to be considered: environmental integrity, social equity, landscape

aesthetics, economic efficiency, beneficial uses, integration of different professions, organisations and water systems, community engagement, and physical uncertainty (Niemczynowicz, 1999; Chocat *et al.*, 2001; Harremoës, 2002; Rauch *et al.*, 2005; Brown *et al.*, 2008). Without considering both the physical and socio-institutional components, progress towards the water sensitive city will be hampered (Brown *et al.*, 2006b).

In response to these challenges dedicated water reform has become an important policy priority. This has included considerable investment across tiers of government from the supra-national and national, state and local government levels. Examples of reforms include the European Water Framework Directive, the recent Water Future Strategy in the United Kingdom and the Australian National Water Initiative, and local water sensitive urban design policies. Recent reforms in Australia and internationally are focussed on increasing efficiency and competition, and utilising market mechanisms (McKay, 2005; Saleth and Dinar, 2005).

However many commentators argue that despite wide-spread recognition of the need to change from the traditional water management approach, the transition is too slow and ad hoc. Harding (2006, p. 234) states that progress towards sustainable urban water management (SUWM) has been “slight or nonexistent!”. Furthermore Dovers (2005) suggested that sustainability reform has been initiated at the edges of institutions and policy rather than undertaking the more substantial change considered to be required. While water reform efforts across developed countries are varied in their scope and level of implementation, there are many common challenges (Hussey and Dovers, 2006).

In addition to these criticisms, many institutional barriers stand in the way of the transition to a water sensitive city (Mouritz, 2000; Vlachos and Braga, 2001; Hatton MacDonald and Dyack, 2004; Brown, 2005; Cech, 2005). Brown and Farrelly (2007) characterised barriers to a water sensitive city as being predominantly administrative and systemic and note that few strategies have been proposed to overcome them. Building institutional capacity has been identified as a strategy for overcoming institutional impediments and achieving sustained institutional change (Grindle and Hilderbrand, 1995; Brown *et al.*, 2006a). In urban water management, capacity building programs have developed focusing on developing professional skills and knowledge in new technology and policy areas. Examples include the Water Sensitive Urban Design in Sydney Project and the SWITCH project (Sustainable Water Management Improves Tomorrow's Cities' Health) in Europe.

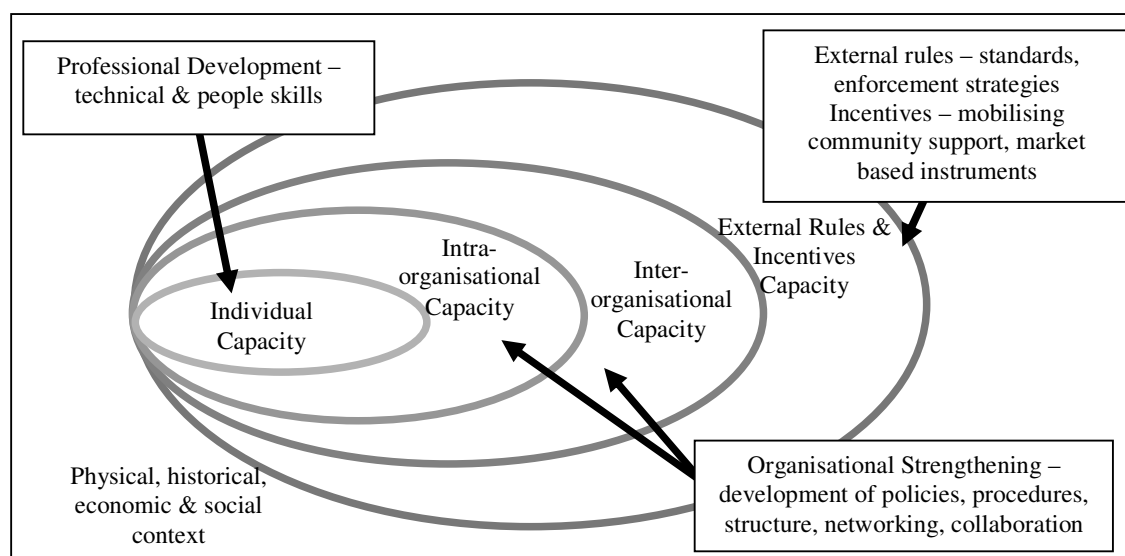
This paper attempts to build on the current knowledge of institutional barriers and focuses on institutional capacity and how it can be improved and assessed. The paper reports on a case study which forms part of a social doctoral research project, aiming to develop an institutional capacity assessment framework for sustainable urban water management at the city scale. A meta-analysis of the literature and interviews with water industry experts across different stakeholder groups in Sydney, Australia were combined to identify key capacity attributes for the external rules and incentives, inter- and intra-organisational and individual capacity spheres. The resulting schema of capacity attributes can be used as a preliminary institutional capacity assessment framework and to provide insight into stakeholder relations, thereby informing the design and implementation of future reform initiatives.

## BUILDING CAPACITY TO ADVANCE SUSTAINABLE URBAN WATER MANAGEMENT

Researchers and practitioners advocate building institutional capacity to achieve institutional change across a range disciplines: urban management, technology innovation and development, and natural and water resources management. Institutional capacity refers to the ability of the whole institution, from individuals through to organisations and the legislative and policy instruments used, to undertake a task, in this case, sustainable urban water management. Institutional capacity has recently been recognised as underpinning the successful development, adoption, and implementation of sustainable urban water technologies (Wong, 2006). Once the objective is established and associated characteristics of good capacity identified, existing capacity can be assessed, and capacity building strategies can be developed and implemented to achieve the objective (Fisher *et al.*, 1996).

However, the current challenge to the design of capacity building programs is that we do not reliably know what the ‘characteristics of good capacity’ should be to deliver sustainable urban water futures, or the water sensitive city. While there has been research into various aspects such as the technical need for diverse water sources, and perhaps more complex governance arrangements, this has largely not moved from the position of rhetoric. Hence this subject is the focus of doctoral research currently undertaken, aimed at identifying the ideal capacity attributes for sustainable urban water futures and developing an institutional capacity assessment framework which will inform the assessment of capacity deficits.

Institutional capacity assessment (ICA) is essential to form coherent strategies for investment in capacity development and water reform. The objective of ICA is to identify the underlying constraints so that relevant and effective capacity building interventions can be designed and implemented (Grindle and Hilderbrand, 1995). ICA enables the capacity deficits to be identified and therefore ensure there is demand for capacity building interventions (Peltenburg *et al.*, 2000).



**Figure 1.** Institutional Capacity Assessment Framework and Capacity Building Initiatives for Sustainable Urban Water Management (Brown, *et al.*, 2006a).

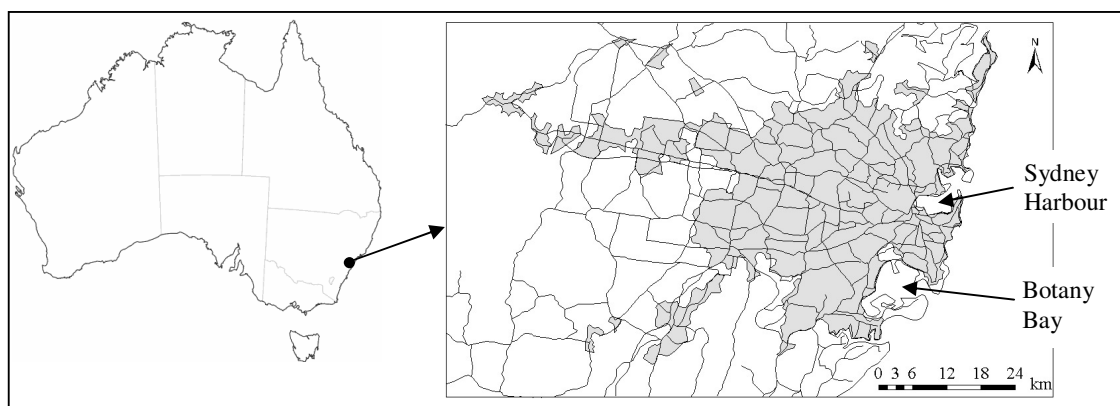
In order to undertake ICA, an assessment tool is needed, however ICA in urban water management is a relatively new field of research. There are some suggested conceptual frameworks developed, however, there are no empirically informed, practical frameworks that could be used as an ICA tool that encompasses the holistic nature of a water sensitive city and

take an institutional approach. Examples of frameworks include de Loë *et al.* (2002), de Loë and Lukovich (2004) and Ivey *et al.* (2006). These frameworks identify different components of capacity from the literature and apply them to case studies in North America. They vary in the level of focus and provide some indications of linkages between capacity components. More recently Bolton *et al.* (2007) developed and tested a tool that focused on water authority and local government interactions relating to stormwater. The most recent ICA framework (ICAF) developed in urban water draws on public administration and urban management literature (Brown *et al.*, 2006a). It is a nested model of four interrelated capacity spheres and links each sphere to capacity building interventions to advance SUWM (Figure 1).

In developing the framework based on their experience and literature from other disciplines, the authors state “there has been limited research or available guidance on how to assess and determine the quality of institutional capacity” to advance SUWM (Brown *et al.*, 2006a, p. 5-3). This paper acknowledges this call for research into ICA and contributes to this knowledge gap by exploring knowledge held by practitioners and presents a tentative ICA framework of key capacity attributes that could be used as the basis of an assessment tool.

## METHOD

The future institutional capacity attributes of a water sensitive city were identified using Yin’s (2003) case study approach and drawing on multiple data sources: i) semi-structured interviews with 59 urban water professionals from different stakeholder organisations in metropolitan Sydney; and, ii) a meta-analysis of empirical studies that identified attributes that contribute to institutional capacity as reported in van de Meene and Brown (2007). The interviews were used to explore the in-depth experiential knowledge held by urban water practitioners. Drawing on this knowledge was considered essential to inform the development of a practical institutional capacity assessment framework; the results of this paper form part of this larger doctoral research project. The qualitative research technique (see for example, Miles and Huberman, 1994; Patton, 2002) was considered appropriate as it enabled interview participants to talk in greater depth and identify significant attributes for each capacity sphere and also links between capacity attributes. The institutional capacity assessment framework described above (Figure 1) was used to structure data collection and analysis.



**Figure 2.** Location of Metropolitan Sydney, Australia, with Built Up Areas (shaded) and Major Roads (Source: Geoscience Australia).

Metropolitan Sydney (Figure 2) was selected as a case study because it is the largest Australian city and faces similar challenges to other large developed urban areas. A moderate population forecast predicts that Sydney’s will increase from the current population of 4.3 million to 5.6 million in 2051 (ABS, 2006). The health of waterways upstream and

downstream of Sydney has been impacted through river regulation, poor water quality and contamination of sediments (Gehrke *et al.*, 1999; Taylor *et al.*, 2004; Courtenay *et al.*, 2005). Climate change forecasts indicate that the security of water supplies is likely to decrease (Hennessy *et al.*, 2007), while the frequency of extreme flood events will increase (Schreider *et al.*, 2000). Sydney also has old and degraded urban water infrastructure due to a lack of investment and the end its design life (Vlachos and Braga, 2001).

A criterion for the research was that interview participants represent the leading practitioners in their areas of speciality, and that they were sustainability leaders within their organisations. To ensure this a snowballing technique was used where leaders from all organisations were asked to identify their sustainability champions, combined with a number of informal processes seeking individuals to be identified by at least three independent sources. Interview participants were selected from state government (20%), local government (20%), water management organisations (WMOs) (12%), research (2%) and non-government organisations (NGOs) (5%), land development (19%) and consulting organisations (12%), professional associations (7%) and government liaison (bridging) organisations (3%). To allow for more open responses, all interviewees were assured that their opinions would remain anonymous, therefore improving the insight and validity of the research. Interview questions and discussion focused on the four spheres of institutional capacity, individuals, organisations, inter-organisational relationships and the external rules and incentives.

Qualitative data analysis followed the methods outlined by Miles and Huberman (1994), using both literature-based and inductive codes (themes). The top five themes for each capacity sphere were identified by examining the frequency of discussion in the interview transcripts, consideration of the context and relationships with other attributes. They represent the ideal attributes of a water sensitive city that received the highest level of saturation in the interviews and meta-analysis.

## **FINDINGS AND DISCUSSION**

The top five capacity attributes of a water sensitive city are presented in Tables 1 and 2. They are organised according to the capacity spheres of the institutional capacity assessment framework of Brown *et al.* (2006a) described above (Figure 1).

### **Stakeholder Observations**

There were some similarities and differences observed across stakeholder groups. The four top capacity attributes identified across stakeholder groups were information sharing between organisations, collaborative inter-organisational relationships, the need for community participation and engagement and the need for effective organisational leadership. Two of these attributes are located in the inter-organisational capacity sphere, the third in the external rules and incentives capacity sphere and the fourth in the intra-organisational capacity sphere. Communication, including the ability to express oneself and listen, forms the basis for collaborative relationships and requires positive relationships between stakeholders (Healey, 1998). Information sharing is essential to address knowledge gaps and promote individual, organisational and institutional learning (Brown, 2005; de Loë and Kreutzwiser, 2005; Pahl-Wostl, 2008). The consistent support across stakeholder groups for these attributes suggests that the water industry is likely to support initiatives to improve performance in information sharing, collaborative relationships, community participation and engagement and developing organisational leadership.

Indeed, these four attributes identified as being important across all stakeholder groups in the Sydney case study align with forecast characteristics and principles of a future sustainable urban water management system identified by scholars such as Pahl-Wostl (2008) and Brown

(2008b). In the future, a cross-sectoral approach to address challenges is needed (Pahl-Wostl, 2008) which requires inter-organisational collaboration and communication. Community and stakeholder participation and engagement is considered to be a foundation of sustainable urban water management systems (Brown, 2008b; Pahl-Wostl, 2008) which was also identified by the water industry experts interviewed. These three key capacity attributes contribute to transparency of the external rules and incentives and inter-organisational relationships, an integral characteristic of a future water sensitive city (Brown, 2008b) .

Differences between stakeholder groups were also observed as an example of local and state government, developer and consultant perspectives reveals. At the external rules and incentives level, developers and consultants considered that local government policies should be consistent across administrative boundaries; however, local government participants emphasised the importance of having a policy framework that enabled local governments to adapt their policies to suit local conditions. At the inter-organisational capacity sphere, local government respondents were not consistent regarding the need for organisations to be open minded and willing to engage. However, developers thought that consent authorities, which in Sydney are typically local government, and state government organisations, could provide support for new ideas and provide early input on a project. But local government participants often felt constrained by resources and a lack of technical capacity to review innovative solutions to challenging urban water management issues. There is clearly a divergence in the understanding of organisational and operational limitations between these stakeholders in the Sydney case study. These differing opinions highlight the need to consider integration among stakeholders when formulating policy initiatives and capacity building programs.

**Table 1.** Ideal Capacity Attributes and Stakeholder Observations (in italics) of a Water Sensitive City for the External Rules and Incentives and Inter-organisational Capacity Spheres

<b>Top 5 Capacity Attributes</b>	
<u>External Rules and Incentives Capacity</u>	<u>Inter-Organisational Capacity</u>
1. A mix of regulatory and incentive based approaches are used <i>(Developers consistently supported regulation)</i>	1. Both formal and informal relationships, between different types of organisations are acknowledged and actively maintained <i>(NGOs preferred formal relationships with government. Consultants and developers employed informal influencing mechanisms)</i>
2. Roles and responsibilities are transparent and enable coordinated urban water management <i>(State and local government consider that state government has a role in strategic planning)</i>	2. Relationships are founded on the principle of collaboration <i>(Stakeholder perspectives were similar)</i>
3. Stakeholder and community engagement underpins decision-making <i>(Stakeholder perspectives were similar)</i>	3. Organisations are receptive to engage productively with other stakeholders <i>(Developers and WMOs thought state government should be more open. State government recognised that increased stakeholder engagement would be beneficial)</i>
4. Adequate and consistent technical and financial resources are available <i>(Resources concerned local government)</i>	4. Open and transparent communication between organisations is essential <i>(Stakeholder perspectives were similar)</i>
5. Policy is coordinated and consistent across administrative boundaries <i>(Local government, consultants and developers identified this need)</i>	5. Information sharing is a dedicated and regular activity <i>(Local government saw state government as an information provider. State government and consultants considered themselves information providers)</i>

**Table 2.** Ideal Capacity Attributes and Stakeholder Observations (in italics) of a Water Sensitive City for the Intra-organisational and Individual Capacity Spheres

<b>Top 5 Capacity Attributes</b>	
<u>Inter-Organisational Capacity</u>	<u>Individual Capacity Sphere</u>
1. Culture is focused on sustainability, supportive of staff innovation and organisational learning <i>(Local government, consultants and developers thought this sustainability focus will increase)</i>	1. Technical knowledge, environmental communication and community engagement skills are essential <i>(All stakeholders identified these skills)</i>
2. Organisation has a clear strategic direction and plans for implementation <i>(WMOs, state government, consultants and developers identified this as important)</i>	2. Individuals are skilled at working with other professional disciplines <i>(State and local government and WMOs identified this as desirable)</i>
3. Organisation embraces an adaptive management approach and reports on action learning <i>(Local government and developers considered this would become more important)</i>	3. Both specialists and ‘big picture thinkers’ are valued within organisations <i>(State government thought there would be more specialists. Local government, consultants and developers thought people would also have a broader understanding of other areas)</i>
4. Human resources and organisational development are continually evaluated and improved <i>(WMOs, state government and consultants recognised the likely skills shortage)</i>	4. Staff are motivated to work towards the organisation’s objectives <i>(State government and developers considered this important)</i>
5. Organisation has leadership dedicated to inspiring and supporting staff <i>(Stakeholder perspectives were similar)</i>	5. Individuals identify sustainability values as critical to their work <i>(Developers and consultants considered this positive)</i>

### **Institutional Capacity Building in Practice**

The common capacity attributes identified provide the basis of what could form a foundation for future capacity building initiatives. While interview participants identified common attributes, which align with key scholars and have a common understanding of what changes are required, they also emphasised some barriers that prevent these attributes being realised. A lack of trust between organisations, a lack of understanding and consideration of the organisational roles and responsibilities and empathy of the constraints, drivers and operational limitations of organisations, a lack of vision and understanding how their organisation fits into this objective were identified as barriers by interviewees. These impediments are predominantly located in the inter- and intra-organisational capacity spheres, suggesting that these areas should be prioritised in capacity building initiatives. The following quotes represent typical views of interview participants.

“I think some people in the community and other organisations are often quick to blame councils without fully understanding the significant constraints councils are operating under and without being willing to assist.” (Local Government)

“But they think we’ve got an ulterior motive a lot of the time when a lot of the stuff that we do in engaging with other agencies isn’t even from a [organisational] perspective a lot of the time, it’s just a general public policy perspective.” (WMO)

“they need to understand what developers want too, that we want the continuity and we need the confidence that the designs and the community that we’re building and designing can be sustainable. So they need to not just think as a water authority but need to think that they’re community builders, too.” (Developer)

“...there needs to be, and I despair of this happening, but there needs to be a greater degree of vision.” (NGO)

Existing capacity building initiatives provide urban water management professionals with training and development, that is, they focus on the individual capacity sphere. Reform efforts and initiatives generally focus on the external rules and incentives capacity spheres through increased regulation (Brown and Keath, in press). While these capacity building and reform initiatives are aimed at improving urban water management they do not have intra- and inter-organisational capacity development as an explicit objective. Future urban water management systems are likely to have complex governance arrangements consisting of multiple organisations at different levels (Pahl-Wostl, 2008), which will further emphasise intra- and inter-organisational capacity. Focusing on one area of capacity without the others is unlikely to result in sustained and widespread change (Brown, 2008a), additionally the inter-relationships and linkages between capacity spheres need to be considered (de Loë and Lukovich, 2004). Links among capacity attributes and spheres are complex and often context dependent and this is being investigated as part of the ongoing doctoral research. The barriers identified in the interviews point to the need for intra- and inter-organisational capacity building as a priority and the need to address all capacity spheres to achieve long term change.

## CONCLUSION

Building institutional capacity as a means to overcome the systemic and administrative barriers and lack of progress in water reforms requires the capacity deficits to be identified and then used to inform future policy and reform initiatives. However there is no empirically informed, holistic and practical institutional capacity assessment tool to advance the water sensitive city. This paper has reported the top five attributes for each of the external rules and incentives, inter- and intra-organisational and individual capacity spheres for a water sensitive city. These attributes form the basis of a preliminary institutional capacity assessment tool.

The research revealed, in the metropolitan Sydney context, that the intra- and inter-organisational capacity spheres require significant attention in order to build inter-organisational trust and understanding of drivers, constraints and operational limitations between organisations. These findings, while being explicitly relevant for the Australian context may also be relevant for other large, metropolitan areas in developed countries. The stakeholder groups agree that communication, collaborative inter-organisational relationships, community participation and engagement and information sharing are important for a water sensitive city, however, the lack of trust and understanding between organisations appears to be hampering the development of these shared capacity attributes. It is therefore recommended that existing capacity building and reform efforts focus more explicitly on building intra- and inter-organisational capacity.

## ACKNOWLEDGEMENTS

The author would like to thank the members of the National Urban Water Governance Program, particularly Associate Professor Rebekah Brown, Dr Megan Farrelly and Mr Peter Morison for their assistance in preparing this paper. The author acknowledges the Victorian

Department of Sustainability and Environment for financial support. Thanks also to the interview participants from the following organisations, without their time and ideas, this research would not have been possible: Australian Water Association, City of Sydney, Grassick SSG, Engineers Australia, Clean Up Australia, EDAW/AECOM, GHD, Hawkesbury-Nepean Catchment Management Authority, Hornsby Shire Council, Hunter and Central Coast Regional Environmental Management Strategy, Institute of Sustainable Futures, Kogarah Council, Ku-ring-gai Council, Landcom, LendLease, Lincoln Scott, Marrickville Council, Mirvac, Nature Conservation Council, New South Wales Department of Environment and Climate Change, New South Wales Department of Health, New South Wales Department of Planning, New South Wales Department of Water and Energy, Planning Institute of Australia, Services Sydney, Stockland, Sydney Catchment Authority, Sydney Metropolitan Catchment Management Authority, Sydney Water, Total Environment Centre, and Urban Development Institute of Australia.

## REFERENCES

- ABS (2006) Population Projections, Australia, 2004 to 2101, Australian Bureau of Statistics, Canberra, Australian Capital Territory, available at: <<http://www.abs.gov.au/ausstats/abs@.nsf/ProductsbyCatalogue/5A9C0859C5F50C30CA25718C0015182F?OpenDocument>> accessed: 24 October 2006.
- Bolton, A., Edwards, P., Lloyd, S. and Lamshed, S. (2007) Needs analysis: an assessment tool to strengthen local government delivery of water sensitive urban design, in *Proc. 13th Int. Rainwater Catchment Systems Conf. and 5th Int. Water Sensitive Urban Design Conf.*, Sydney, Australia, 21-23 August 2007.
- Brown, R. and Farrelly, M. (2007) Institutional impediments to advancing sustainable urban water management: a typology, in *Proc. 13th Int. Rainwater Catchment Systems Conf. and 5th Int. Water Sensitive Urban Design Conf.*, Sydney, Australia, 21-23 August 2007.
- Brown, R. R. (2005) Impediments to integrated urban stormwater management: the need for institutional reform, *Environ. Manage.*, **36**(3): 455-468.
- Brown, R. R. (2008a) Local institutional development and organizational change for advancing sustainable urban water futures, *Environ. Manage.*, **41**(2): 221-233.
- Brown, R. R. (2008b) Social and institutional considerations, in *Data Requirements for Integrated Urban Water Management*, Fletcher, T. D. and Deletic, A. (Eds.), Taylor & Francis, London, pp. 159-169.
- Brown, R. R., Keath, N. and Wong, T. (2008) Transitioning to the Water Sensitive City: Historical, current and future transition states, Paper submitted to *11th Int. Conf. on Urban Drainage*, Edinburgh, Scotland, 01-05 September 2008.
- Brown, R. R. and Keath, N. A. (in press) Drawing on social theory for transitioning to sustainable urban water management: turning the institutional super-tanker, *Aust. J. Water Resources*.
- Brown, R. R., Mouritz, M. and Taylor, A. (2006a) Institutional Capacity, in *Australian Runoff Quality: A guide to water sensitive urban design*, Wong, T. H. F. (Ed.) Engineers Australia, Barton, ACT.
- Brown, R. R., Sharp, L. and Ashley, R. M. (2006b) Implementation impediments to institutionalising the practice of sustainable urban water management, *Water Sci. & Technol.*, **54**(6-7): 415-422.
- Cech, T. V. (2005) *Principles of water resources: history, development, management, and policy*, John Wiley & Sons, Hoboken, New Jersey.
- Chocat, B., Krebs, P., Marsalek, J., Rauch, W. and Schilling, W. (2001) Urban drainage redefined: from stormwater removal to integrated management, *Water Sci. & Technol.*, **43**(5): 61-68.
- Courtenay, G. C., Gladstone, W. and Schreider, M. (2005) Assessing the response of estuarine intertidal assemblages to urbanised catchment discharge, *Environ. Monit. Assess.*, **107**(1-3): 375-398.
- de Loë, R. C., Di Giantomasso, S. E. and Kreutzwiser, R. D. (2002) Local capacity for groundwater protection in Ontario, *Environ. Manage.*, **29**(2): 217-233.
- de Loë, R. C. and Kreutzwiser, R. D. (2005) Closing the groundwater protection implementation gap, *Geoforum*, **36**: 241-256.
- de Loë, R. C. and Lukovich, D. K. (2004) Groundwater protection on Long Island, New York: A study in management capacity, *J. Environ. Plann. Manage.*, **47**(4): 517-539.
- Dovers, S. (2005) *Environment and sustainability policy: creation, implementation, evaluation*, The Federation Press, Sydney.
- Fisher, T., Mahajan, V. and Topgyal, T. (1996) Institutional development in practice: a case-study from the Tibetan refugee community, *Develop. in Practice*, **6**(3): 217-227.

- Gehrke, P. C., Astles, K. L. and Harris, J. H. (1999) Within-catchment effects of flow alteration on fish assemblages in the Hawkesbury-Nepean river system, Australia, *Regul. Rivers: Res. Manage.*, **15** (1-3): 181-198.
- Grindle, M. S. and Hilderbrand, M. E. (1995) Building sustainable capacity in the public sector: what can be done, *Public Admin. Develop.*, **15**: 441-463.
- Harding, R. (2006) Ecologically sustainable development: origins, implementation and challenges, *Desalination*, **187**: 229-239.
- Harremoës, P. (2002) Integrated urban drainage, status and perspectives, *Water Sci. & Technol.*, **45**(3): 1-10.
- Hatton MacDonald, D. and Dyack, B. (2004) *Exploring the institutional impediments to conservation and water reuse – national issues*, Policy and Economic Research Unit, CSIRO Land and Water.
- Healey, P. (1998) Building institutional capacity through collaborative approaches to urban planning, *Environ. Plann. A*, **30**: 1531-1546.
- Hennessy, K., Fitzharris, B., Bates, B. C., Harvey, N., Howden, S. M., Hughes, L., J., S., Warrick, R., Eds., and Cambridge University Press, C., UK, 507-540. (2007) Australia and New Zealand, in *Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Parry, M. L., Canziani, O. F., Palutikof, J. P., van der Linden, P. J. and Hanson, C. E. (Eds.), Cambridge University Press, Cambridge, UK, pp. 507-540.
- Hussey, K. and Dovers, S. (2006) International perspectives on water policy and management: emerging principles, common challenges, in *Managing Water for Australia: The Social and Institutional Challenges*, Hussey, K. and Dovers, S. (Eds.), CSIRO Publishing, Collingwood, Australia, pp. 141-154.
- Ivey, J. L., de Loë, R., Kreutzweiser, R. and Ferreyra, C. (2006) An institutional perspective on local capacity for source water protection, *Geoforum*, **37**: 944-957.
- McKay, J. (2005) Water institutional reforms in Australia, *Water Policy*, **7**: 35-52.
- Miles, M. B. and Huberman, A. M. (1994) *Qualitative data analysis : an expanded sourcebook*, Sage Publications, Thousand Oaks.
- Mouritz, M. (2000) Water sensitive urban design - where to now?, Keynote address in *National Conf. on Water Sensitive Urban Design - Sustainable Drainage Systems for Urban Areas*, Melbourne, 30-31 August 2000.
- Niemczynowicz, J. (1999) Urban hydrology and water management - present and future challenges, *Urban Water*, **1**: 1-14.
- Pahl-Wostl, C. (2008) Requirements of Adaptive Water Management, in *Adaptive and Integrated Water Management: Coping with Complexity and Uncertainty*, Pahl-Wostl, C., Kabat, P. and Möltgen, J. (Eds.), Springer-Verlag, Berlin, pp. 1-22.
- Patton, M. Q. (2002) *Qualitative research and evaluation methods*, Sage, Thousand Oaks.
- Peltenburg, M., de Wit, J. and Davidson, F. (2000) Capacity building for urban management: learning from recent experiences, *Habitat Int.*, **24**: 363-373.
- Raadschelders, J. C. N. (2005) Freshwater management as collective action in time: a multi-dimensional and multi-level challenge of governance in an inter-disciplinary context, in *The institutional arrangements for water management in the 19th and 20th centuries*, Raadschelders, J. C. N. (Ed.) IOS Press, Amsterdam, the Netherlands, pp. 1-21.
- Rauch, W., Seggelke, K., Brown, R. and Krebs, P. (2005) Integrated approaches in urban storm drainage: where do we stand?, *Environ. Manage.*, **35**(4): 396-404.
- Saleth, R. M. and Dinar, A. (2005) Water institutional reforms: theory and practice, *Water Policy*, **7**: 1-19.
- Schreider, S. Y., Smith, D. I. and Jakeman, A. J. (2000) Climate Change Impacts on Urban Flooding, *Clim. Change*, **47**: 91-115.
- Taylor, S. E., Birch, G. F. and Links, F. (2004) Historical catchment changes and temporal impact on sediment of the receiving basin, Port Jackson, New South Wales, *Aust. J. Earth Sci.*, **51**(2): 233-246.
- van de Meene, S. and Brown, R. (2007) Towards an Institutional Capacity Assessment Framework for Sustainable Urban Water Management, in *Proc. 11th Int. Rainwater Catchment Systems Conf. and 5th Int. Water Sensitive Urban Design Conf.*, Sydney, Australia, 21-23 August 2007.
- Vlachos, E. and Braga, B. (2001) The challenge of urban water management, in *Frontiers in Urban Water Management: Deadlock or Hope*, Maksimovic, C. and Tejada-Guibert, J. A. (Eds.), IWA Publishing, London, pp. 1-36.
- Wong, T. H. F. (2006) Water sensitive urban design - the story so far, *Aust. J. Water Resources*, **10**(3): 213-221.
- Wong, T. H. F. and Brown, R. R. (2008) Transitioning to the Water Sensitive City: Ensuring Resilience through a New Hydro-social Contract, Paper submitted to *11th Int. Conf. on Urban Drainage*, Edinburgh, Scotland, 01-05 September 2008.
- Yin, R. K. (2003) *Case study research: design and methods*, Applied Social Research Methods Series, Sage, Thousand Oaks.