29

From river to ridge: local governance and the implementation of improved water management

Julie Nimmo[#]

Abstract

Current water management problems include management by a multiplicity of remote agencies resulting in fragmented management and a failure to incorporate local government into water management solutions. Based on the literature review and review of North-American natural-resource planning agencies a survey of diverse catchment stakeholders was conducted within the Georges River catchment (Sydney, Australia). The survey aims to examine the credibility and transferability of the four sustainability preconditions identified through the North-American review at a catchment scale within the Georges River catchment. The survey asked stakeholders their views on water-agency jurisdiction, conflict, the priority given to the protection of riparian lands and waterways, and stakeholder participation. The survey results support the position that stakeholders perceive a greater involvement of local government in water management than other agencies and levels of government and that the sustainability preconditions are credible with diverse catchment stakeholders.

[#] University of Sydney, School of Architecture, Design Science and Planning, Faculty of Architecture, GO4, University of Sydney, 2007 NSW, Australia. E-mail: jnimmo@mac.com

Respondents reported a need for improvement to methods for resolving conflicting environmental priorities between agencies and that the respondents (as individuals) see themselves as giving a higher priority to the protection of waterways and riparian land than any other stakeholders within the catchment. In the future these preconditions could provide the basis for a more detailed model to ensure not only that sustainability is on the organizational agenda but also that programmes and projects have greater capacity to implement sustainability programmes and projects on the ground.
Keywords: river catchment; land-use planning; local government; model development; sustainability preconditions; stakeholder survey

Introduction

In this paper, I argue that improvements to water quality through improved management require an interdisciplinary and transdisciplinary approach. Effective or good water management is defined here as the use of incentive, education and regulatory measures in greenfield and redevelopment areas to implement a range of projects from individual houses and sites through to sub-catchments and infrastructure provision; the goal for good water management being to improve the quality of receiving waters, including groundwater, streams, rivers, lakes and oceans.

Government and water management

Problems in the areas of governance, democracy and water management have been identified internationally by authors such as Healey (1996; 1999), Ingram (Ingram and Kenneth 1985; Ingram and Schneider 1998), Milich and Varady (1999), UNESCO (1996); within Australia by Dennison and Abal (1999), Hullick (2002) and the Wentworth Group of Concerned Scientists (2003) and locally in the Georges River catchment (GRC) in Sydney Australia by the Healthy Rivers Commission (2000a; 2000b) and Colman (2001). These authors have collectively identified a number of issues related to water management.

The management of water remains fragmented as riparian states manage their own stretch of the water, even where there are international agreements and significant health concerns about water quality. Management agencies are often remote from the water catchment location (Milich and Varady 1999). The importance of integrated catchment management had been recognized for more than 50 years but “good examples of its implementation are rare” (UNESCO 1996, p. 3), with the responsibilities of management agencies often ambiguous and overlapping (Healthy Rivers Commission 2000b). Public agencies often experience problems coordinating with each other and state government fragmentation has meant that decision making has become clearly “nearer some people and some firms” (Healey 1996, p. 210-211).

In Australia, state government has generally failed to incorporate local government and others into water management solutions (Wentworth Group of Concerned Scientists 2003), yet Ingram contends that water-science experts “need to be more appreciative of the importance of broad public discussion” (Ingram and Schneider 1998, p. 21). Documentation such as that prepared by the Moreton Bay Study Group in Queensland, Australia provides an example of the translation of scientific information to ensure access by a wide group of stakeholders to allow public discussion. The purpose of the study was to provide scientific data, interpretation and rationale for developing the water quality strategy used in the Moreton Bay healthy-waterways campaign (Dennison and Abal 1999).

A number of authors have identified a key role for local government in environmental management (Balslev Nielsen 1999; Colman 1993; Hullick 2002; Healey 1996; 1999). Resource constraints restrict the action of local governments with limited rates base and transfer problems to areas further down the catchment (Whitten, Bennett and W. 2002). Further, many in the community have a distrust of those in government at any level (Healey 1996; Colman 1993). Local government requirements for the implementation of integrated catchment management include strong local leadership, the management of boundaries, alignment of local government and agency objectives with catchment objectives, combined with collaboration on land-use planning objectives and statutory mechanisms. Key issues are whether local government has the power, political will, administrative capacity, financial resources and networking prowess to act effectively in environmental matters (Hullick 2002, p. 46-47). Balslev Nielsen (1999), in a study on technical infrastructure provision, found that even the most ambitious municipality in terms of urban ecology barely influenced the municipal network, with new projects seen as incompatible or in competition with established systems (Balslev Nielsen 1999). Thus individual changes at a smaller scale may lead to more effective water outcomes. Local government can act locally, implement state policy, utilize local networks and act as a catalyst for local action. But they are also perceived as lacking in strategic focus, lacking a policy framework, are cash-strapped, lacking in technical skills and abilities and subject to innate conservatism (Hullick 2002).

Organization capacity building and stakeholder involvement has been examined by a number of authors to improve natural-resource management (Shortall and Shucksmith 1998; Franks 1999; Brown and Ryan 2001; Curtis et al. 2000; UNESCO 1996; Bridge 1999; Wildavsky 1997). Franks says “capability refers to the knowledge, skills and attitudes of individuals … Capacity on the other hand, refers to the overall ability of the individual or group to perform the responsibilities” (Franks 1999, p. 52). Some requirements for the development of capacity include the recognition of the need to coordinate volunteers for example in Landcare programmes (Curtis et al. 2000, p. 360) in addition to the need to transfer knowledge from the specialists into a wider audience (UNESCO 1996, p. 48; Commonwealth of Australia 2002, p. 116). The development of capacity requires staff training, the understanding of processes and knowledge and structural changes to ensure an enabling environment (Franks 1999), accompanied by the provision of private investment with a regulatory and political environment of certainty and stability. This investment provides the opportunity to develop capacity through the transfer of capital, skills, managerial efficiency and technology (Bridge 1999).

Research objectives

Based on the literature review, I first argue that a strategic planning process is a precondition for sustainability. Secondly, that the involvement of local government is necessary as local government is a key player in improved water management, especially regarding land-use decisions (ICLEI 1996).

The Georges River catchment forms the basis of this research. Located in southern Sydney, the Georges River catchment contains fourteen local government areas and is home to more than one million people (see Figure 1).

Figure 1. Map of the Georges River catchment

This work is informed by the preference for local water management evident in the literature review and confirmed through the stakeholder survey within the Georges River catchment case study area and with both North-American and Australian key informants. For example, the NSW Healthy Rivers Commission said: "Commission inquiries have shown that communities generally have a sense of ownership of their local rivers. There is no doubt that citizens wish to be involved in the making of the many decisions that need to be made about how rivers will be used, protected and rehabilitated" (Healthy Rivers Commission 2000b, p. 21).

A hypothesis was generated as a result of the North-American interviews and based on a review of current practice and trends in water catchment management within Australia. This hypothesis is "If organizations and governments are to improve their capacity for improved water management, do the sustainability preconditions identified in North America have credibility and are these preconditions transferable to the local Georges River catchment?". To test the hypothesis, I identify actions by agencies that have implemented improved water management and examine

stakeholder perception of these actions by agencies for the implementation of improved water management. Improvement is defined as implementing water initiatives (projects and programmes) consistent with good water management (described earlier) and measured through biological indicators and social perceptions of the receiving waters.

This paper uses the definitions by Tress, Tress and Fry (2005), where interdisciplinary studies involve several unrelated academic disciplines in a way that requires them to cross subject boundaries to create new knowledge and where transdisciplinary studies integrate academic researchers from different disciplines with non-academic participants.

Methods

A range of methods were used in my research. The research process whereby each stage is informed by the previous stage, commencing with the North-American research of sustainability agencies is shown in Figure 2.

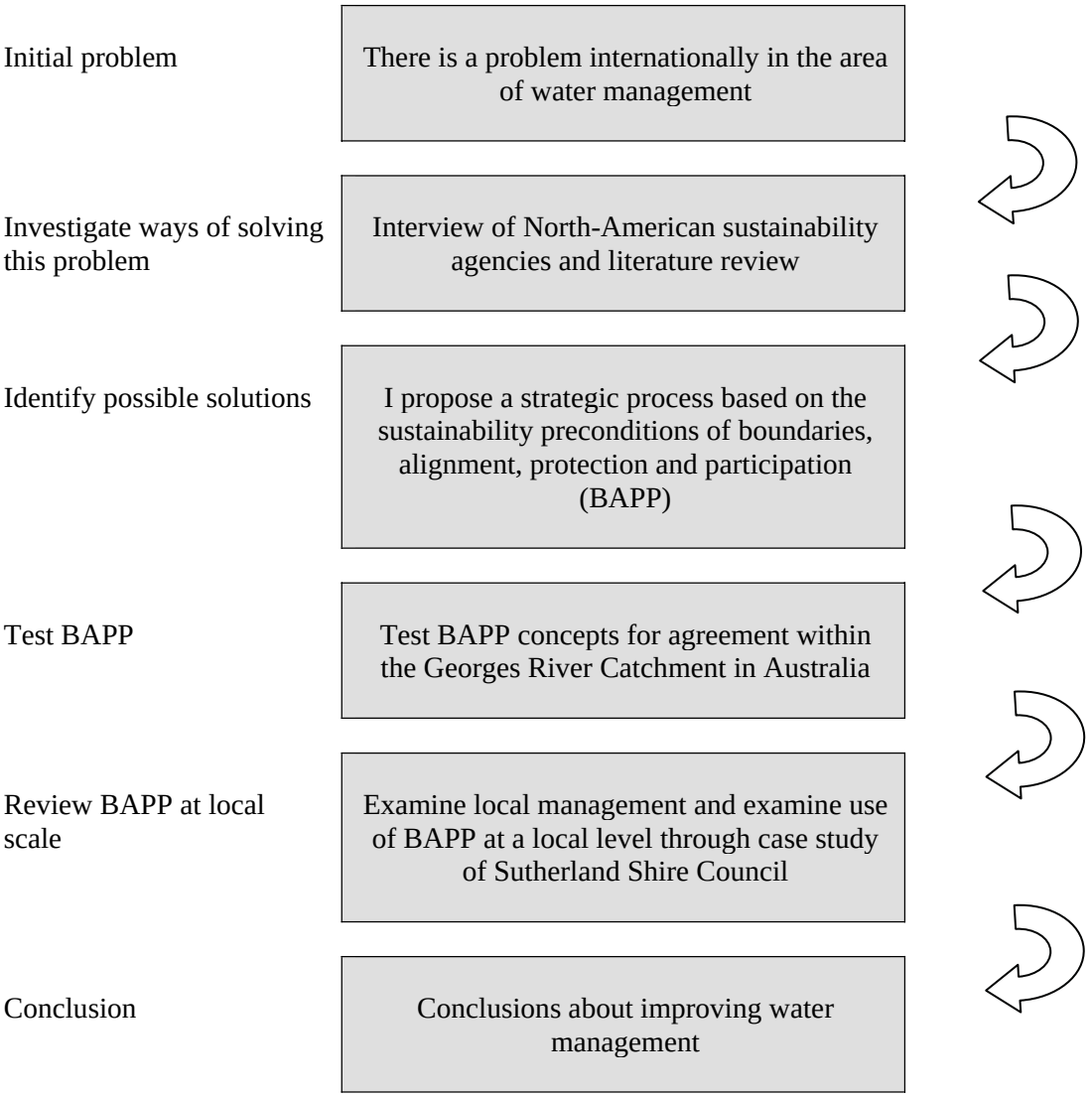

Figure 2. Research stage and area of investigation

The hypothesis was generated as a result of visits in 1999, to twenty-eight North-American agencies that had implemented sustainability projects. The agencies located in Seattle (US), Vancouver, Toronto and Hamilton (Canada) were identified by the International Council for Local Environmental Initiatives (ICLEI) in Toronto, Canada and the Institute for Sustainable Futures in Sydney, Australia, contact with academics and the literature review.

Agencies were examined through site visits to the agency headquarters and specific projects, through key informant interview on sustainability, document review and photographic documentation. The North-American key informant interviews were conducted as a semi-structured, guided interview using open-ended questions. The semi-guided structure allowed the freedom to delve further into some aspects of the research question whilst ensuring that questions were consistent between interviews, though question order did change according to responses by interviewees. Table 1 shows the interview questions.

Table 1. Key informant sustainability interview questions

Number	Question	Research objective
1	What is the role you see for local government in sustainability?	Introductory question which seeks to identify perceived roles for local government in environmental management
2	Do you think sustainability is an issue for (place) local government?	Identify particular concerns of areas and drawing on specific knowledge of interviewee
3	Is sustainability more of a federal priority?	Explore jurisdiction and relationship between levels of government
4	Please tell me about your role and the activities your organization is undertaking in sustainability	Identify activities taking place at a local level and start to examine the relationship between levels of government
5	What do you see still needs to be done?	Explore gaps in activities taking place at a local level of jurisdiction and relationship between levels of government
6	Are there conflicts between levels of government in relation to sustainability?	Examine what needs to be done, which level of government and if there is agreement on the gaps
7	Thank you for your time. As a process of exchange I have examples of the work I have been engaged in at Sutherland Shire Council. Would you like me to send you any of these?	Opportunity to exchange information by providing information on SSC activities
8	Have you anything else you would like to add? Have you any questions of me?	Opportunity to debrief, find out more about what I am doing and also to exchange information

The interviews were predominantly single interviews, though in three instances because of time restrictions and interviewee availability, two people were interviewed as part of a team. The times for interviews were arranged to suit the person being interviewed and respondents displayed a strong willingness to assist in my research. The interview was conducted personally and designed to demonstrate trust and emphasize confidentiality. The respondents were invited to advise if they wanted

some information excluded from the analysis and reporting process. Detailed notes were taken and efforts were made to limit bias in the nature of the questioning, bearing in mind that respondents were selected on the basis of their interests and commitment effectively determining their own bias. They were invited at the completion of the interviews to add anything further, and to ask if they had questions.

Interviews were conducted in offices, coffee shops, staff rooms, wherever the person being interviewed felt comfortable. Generally, there was no interruption during the course of the interview and interview length was agreed prior to the session commencement. The post-interview reflections were made as soon as possible after the completion of the interview. International key informants also had to be available during a reasonably short time period between 14 April 1999 and 20 May 1999, in response to a tight itinerary. This meant that 31 people (28 interviews) were interviewed for between 1 and 2 hours on sustainability issues, thus providing a reasonably comprehensive North-American overview of sustainability issues in the area of water, transport and consultation. The people, projects and sites visited included academics at the University of Hawaii and the University of British Columbia; state and provincial representatives in Seattle and Portland (US) and Montreal, Vancouver and Toronto (Canada); local government representatives in Portland, Seattle and Oahu (US), Hamilton, Toronto, Vancouver (Canada) and representatives of non-government organizations in each of these locations.

Documents selected for review described the overall operation of the organization that the key informant represented in addition to descriptions of specific projects that in their view represented best practice. Photographic review was made during site visits to projects with examples of best practice on the ground, representing a diversity of project types and actions the organization can take to improve water management.

Based on the work of Sarantakos (1998), the qualitative data from the North-American key informant interviews was grouped thematically and then tested for plausibility to confirm that the ideas made sense. The observed clustering of characteristics of agencies that had implemented sustainability activities reinforced the idea that there were key processes undertaken by agencies that had implemented sustainability improvements. The making of metaphors enabled the concepts to be cross-referenced to parallel processes within corporate strategic planning and mediation praxis (Sarantakos 1998). I reviewed the manifest content of the North-American key informant interviews and identified themes present within the transcripts. These themes included sustainability; the difficulty of implementing projects and sustainability programmes; comments on institutional and management structures; plans and regulations; specific issues in sustainability such as water, transport and waste; protection of land or specific values; agency and individual roles – the role of a champion local government role, the community role and roles of other agencies; conflicts and boundaries; planning, planners and urban form; science, monitoring and evaluation; education and awareness of good practice. Latent content in the North-American key informant interviews was examined by asking the question "what is common to these organizations and organizational processes that permitted implementation of sustainability activities?". It was in the latent content that it became clear that organizations that had implemented projects to improve sustainability had features in common. These organizational features reflected the sustainability-development planning process described by the International Council for Local Environmental Initiatives (ICLEI 1996); the administrative integration and close public participation outlined by Newman (1999) and drawing from corporate planning

in organizational analysis, the work on organizational culture and conflict by Dunford (1992).

I observed that organizations that had implemented improved water management projects had achieved a common goal and that was to ensure that sustainability was on their own organizations' and their operating partners' agenda. Key factors in ensuring that sustainability was addressed by these organizations was that the organization had jurisdiction (geo-spatial area and temporal) over which they could act sustainably. Secondly, as organizations do not act on their own these organizations had interacted with other stakeholder organizations to share a common agenda. Third, they had identified and documented values and locations that should be protected. Fourth, they had achieved these first three actions by engaging all stakeholders in participatory processes. These four key factors were identified as sustainability preconditions for improved water management to address issues associated with boundary definition, alignment of agencies and other stakeholders; the protection of values and non-urban lands and the participation of stakeholders giving the acronym BAPP (Nimmo 2001).

BAPP concepts were then tested for their credibility and transferability to Australia using survey research as part of the case study on the Georges River catchment in Sydney, Australia. The concept of boundaries was tested by asking stakeholders their views on organizational jurisdiction for the catchment, and stakeholder perception of administrative alignment of the multitude of stakeholders in the catchment was tested by asking about agreement between local state-agency policy and action. Questions on agency priority for the protection of riparian lands and waterways asked stakeholders to rank agencies for the priority given to the protection of areas within the catchment. A number of questions were asked to explore the importance of engaging stakeholders in the catchment management and water management improvements.

The case study followed methods described by Sarantakos (1998) and Yin (1994). The case study is a research strategy used within its real-life context for explanatory, descriptive or exploratory purposes requiring the use of multiple sources of evidence, the creation of a case-study data base and a demonstrated chain of evidence (Yin 1994). Consequently diverse sources of evidence were collected including the stakeholder survey, documents, interviews, speeches, news clippings, direct observation and participant observation (Yin 1994, p. 93) to achieve a 'sense of completeness' (Yin 1994, p. 148). Selection of the coastal Georges River water catchment with multiple agency and legislative activity was considered representative. Analysis utilized pattern matching and explanation building to verify findings. Pattern matching compares an empirically based pattern with a predicted one, the goal to identify challenges to validity. Explanation building is a particular type of pattern matching and it is an iterative process that builds an explanation of causal links but the "links may be complex and difficult to measure" Yin (1994, p. 106 -110).

The survey and questionnaire construction minimized problems associated with question design (Foddy 1996). Stakeholders including representatives of the disciplines responsible for local government water management within the Georges River catchment were surveyed and interviewed as part of my research. These disciplines include land-use planning, engineering, environmental science, political science and other social sciences, professionals whose praxis is based within state and local government agencies. The non-academic stakeholders interviewed and surveyed include practitioners from government agencies and community members within the Georges River catchment. Based on information from the pilot survey, questions superfluous to the project objectives were deleted. The survey was a self-completing

written questionnaire. Problems of anonymity were addressed through the use of remote collection boxes and the respondent demographic data did not provide sufficient detail that would identify any individual respondent. A total of 132 completed surveys were analysed; the average response rate was 35% ranging between 27% (low) to 50% (high) across five sub-groups.

Both open and closed questions were asked in the surveys. The data for the open-ended questions were typed for analysis. The open-ended questions were only asked of planning staff to provide information on their professional role and planning activities. The planning-staff responses were grouped thematically and recorded for the type of activities undertaken by planning staff. Provision was made for all respondents to make comments and these responses were used to provide qualitative information and reported verbatim. The closed questions used a Likert scale of 1-5 to record the respondent's views and other questions were analysed by recording the frequency of responses. Analysis used the SPSS software package to generate frequency tables to determine means for ranking priorities and cross-tabs to provide a variety of tests and measures of association for two-way tables.

Stakeholders in the Georges River catchment survey were identified as 'you' (the respondent themselves), non-government environmental organizations, local government officers, community, Southern Sydney Regional Organisations of Councils, local government planners, local politicians, statutory authorities, state government officers, federal government officers, state politicians, federal politicians, business and industry.

Results

Issues raised in the literature review were consistent with Georges River catchment issues and included fragmented water management, management by remote agencies and failure to incorporate local government into water management solutions. Water-quality and water-quantity issues are significant in Australia and as one survey respondent said, "water quality is one of the most important issues facing us and it will require a concerted effort by all parties to be successful" (Georges River catchment survey).

Boundaries and jurisdiction

A question on jurisdiction was asked to test the concept of boundaries to determine who stakeholders say should be given the responsibility, legislative power and ultimately funding for riparian lands and water management. Stakeholders within the Georges River catchment were asked "In your view, who do you think **should have jurisdiction** to manage riparian lands and waterways?" and local government officers generally ranked as a higher preference for jurisdiction of riparian lands and waterways over all other stakeholders.

Administrative alignment

Georges River catchment stakeholders were asked about their perception of administrative alignment and integration in a series of questions. These questions asked stakeholders about their perception of:

- local planners understanding of state government activities
- alignment of policies and action between state and local government
- state and local government action is in agreement
- the resolution of conflict where there are differing priorities between stakeholders.

In the area of policy there was close to even distribution of responses that agreed / strongly agreed and disagreed / strongly disagreed with alignment between local and state agencies. But on the question about action, the responses to the question suggest a perceived contradiction between state and local government in action and policy. Only 13% of respondents of the Georges River catchment survey agreed with the statement that "state and local government action is in agreement on environmental issues". On the issue of conflict resolution there is a perceived lack of effective mechanisms for conflict resolution with only 20% of respondents who strongly agreed or agreed with the statement that "there are effective mechanisms for resolving conflicting environmental priorities".

Protection of riparian lands and waterways

GRC stakeholders were asked about their perception of the importance of the protection of waterways and riparian lands to the various catchment stakeholders. Respondents ranked highest the group 'you' (respondents themselves) as giving the greatest importance to the protection of water and riparian lands. After 'you', respondents said 'non-government environmental organizations' and 'local government officers'. Protection was perceived as least important to Business, Industry and Federal politicians.

Discussion

Fragmented management and management remote from the catchment

Water-planning agencies must negotiate the competing demands of water stakeholders and these negotiations are typically characterized by conflict. Within many catchments there is often no central managing agency with the jurisdiction, funds and the political will to balance these competing demands. Fragmentation and conflict exists within the Georges River catchment with 21 pieces of state legislation, local government plans for the 14 local councils who control the majority of land-use decisions, and the activities and decisions of three main state government departments (as at 2002). But conflict is not confined to the relationships between planning agencies and levels of government, as one stakeholder said, "major disagreements are between policies and actions *within* levels of government, not between" (Georges River catchment survey). The Healthy Rivers Commission in Sydney said: "the commission has found a high degree of community unease, in particular, about the number of entities with management responsibilities relating to Botany Bay (receiving waters of the Georges River), the complexity of their relationships and the apparent lack of real accountability for results in terms of the overall health of the bay" (Healthy Rivers Commission 2000a, p. 4). Continuing this theme, one stakeholder said, "It is difficult to understand how the other organisations respond, liaise and react to the planning and implementation of catchment management" (Georges River catchment survey).

The boundary as a metaphor (Sarantakos 1998) has spatial, political, ecological and other meanings. Boundaries set limits to the physical footprint of our cities. By undertaking a process to define the boundaries, a number of other opportunities follow, such as the protection of non-urban lands, the identification of distinct places as culturally or geographically separated, and limits to the increase in resource consumption and waste. In a review of the Australian state of New South Wales' (NSW) planning system in 2002, the highest support from submissions received was for a regional solution (Department of Urban Affairs and Planning 1999), and within

the Georges River catchment survey participants gave priority for jurisdiction to local government over state government. This is consistent with international trends towards a preference for local management of water, though regional government is seen as most appropriate for environmental protection and system maintenance functions such as water, sewerage and transport (Baldassare et al. 1996).

Failure to incorporate local government into water management solutions

Administrative alignment and integration within a catchment refers to the need to bring together, establish and increase the number of common attitudes held by diverse stakeholders and for this alignment to take place across professional and administrative boundaries. In reality, local government is the level of government in which disparate state and federal policies become integrated and aligned at a particular location. Local government functions remain fixed in scope by the various pieces of legislation requiring accountability to the state, reliance on state and federal funding and organizational inertia. State government policy direction has historically failed to ensure that local government is empowered in the water management arena, yet the Healthy Rivers Commission observed that: "Citizens accept that government must be strongly involved in the effective management of rivers, because many of the available powers and financial resources can be exercised only by government, or by an entity to which those powers have been explicitly delegated" (Healthy Rivers Commission 2000b, p. 21).

The importance of including local government was underscored by the respondent who said "obviously local governments play an extremely important role as the majority of planning decisions along these areas are made by councils [at the local level, JN] (with input from other agencies / authorities). Therefore I see it as imperative that adequate 'tools' be provided for local governments, such as catchment management plans, policies and guidelines and most importantly training on the topic" (Georges River catchment survey).

Examination of the protection of waterways and riparian lands

The protection of areas within water catchments from land-use activities that would be detrimental to water quality was a common factor in projects reviewed in North America. A process that determines the areas for protection with diverse stakeholder groups assists the development of alignment on strategic directions for their catchments. The protection of non-urban lands including wilderness, agricultural lands and riparian lands seeks to contain and limit negative impacts of urban development. The protection of non-urban lands is not new as evidenced by the setting aside of Niagara Falls circa 1850 (US and Canada); the reservation of the Royal National Park (NSW, Australia) dedicated on 26 April 1879 and the protection of Sydney water catchments since 1888 (NSW, Australia). But more recently in Australia, the concept of river reserves (where riparian lands are protected from negative development) is not being applied in any jurisdiction with any commitment or apparent system (Whitten, Bennett and W. 2002, p. 127). The Healthy Rivers Commission recorded stakeholder interest in the protection of natural areas within the Georges River catchment noting that: "Many submissions stress that the protection of the remaining natural areas in the catchment is critical to ensuring the long-term health of the bay, its catchment and tributaries" (Healthy Rivers Commission 2000a, p. 10-11).

Include diverse water-catchment stakeholders in strategic process

Ingram and Schneider (1998), Berke and Conroy (2000) and Briassoulis (1999) discuss expectations by stakeholders of involvement in developing solutions to natural-resource problems to effect social change where communities 'own' the plan (Healey 1996, p. 207), or 'buy in' to solutions (Nimmo 2001, p. 251). Participation may have a role in the development of organizational capacity and staff capability to deal with complex technical information. Professionals have an important role and in the survey demonstrated a personal as well as professional commitment as 'you' (respondents themselves) is the group identified as having the greatest importance to the protection of water and riparian lands. Increasingly, government requires the inclusion of multiple stakeholders in planning and natural-resource management processes. Participation and capacity building are tools local government can use, especially where activities require credibility and trust (such as research). Without drawing together the diverse stakeholders one survey respondent was concerned that "the Georges River is not well connected. In bringing people together what are we going to do? There is a great deal of good will, but things aren't well connected and may atrophy rather than accomplish" (Georges River catchment survey).

The value of participation was underscored by three Georges River catchment survey respondents who said at a symposium, "this symposium is an excellent opportunity for the beginning of communication that will lead to the definition of common goals … leading to establishing / changing structures to achieve them" and "integrated community consultation and education will lead to credible and successful outcomes for this process" and "I am very encouraged to see this happening. It's a vital issue that needs real commitment and community power to bring to satisfactory outcome … a sustainable future for all" (Georges River catchment survey).

Overall the work has drawn on multiple methodologies, allowing deeper reflection of the material. But this diversity of methods complicates the analysis and research process. North-American key informant interviews were subject to the usual limitations including selective hearing, bias, lack of anonymity, but particularly the delay in transcribing the interviews (Sarantakos 1998). The Georges River catchment survey was subject to limitations that generally apply to surveys. For example sometimes respondents make invalid responses; the relationship between what respondents say they do and actually do may be poor; and misinterpretations of questions and the influence of question order. There is inherent bias in the selection of survey respondents, specifically professionals known to have an interest in the Georges River catchment rather than a random sample of people in the catchment.

Despite these limitations, further research could amplify the useful results on stakeholders' perceptions of activities within the Georges River catchment and the transferability of a set of sustainability preconditions drawn from the review of North-American agencies.

Conclusion

Water sustainability is one of the most important issues facing Australia. The examination of North-American agencies identified four areas for investigation through a survey within the Georges River catchment, Australia. The survey focused on testing the credibility of sustainability preconditions identified by the literature review and the examination of North-American agencies.

The complexity and lack of clarity in agency responsibility for water catchment management means that the geographic and subject boundaries between state, local

and other agencies require clarification in the Georges River catchment. Respondents have identified that their preference for management and jurisdiction of riparian lands and waterways is local government officers.

The need to achieve alignment and integration in action as well as policy was also identified by the Georges River stakeholders, in addition to the need to establish effective measures for resolving conflicting environmental values between levels of government and other agencies. Stakeholders recognized the importance of the local government role, ranking local government officers as having a higher priority for protection of waterways and riparian lands after 'you' (the survey respondents themselves) highlighting the need to include the diverse catchment stakeholders in a strategic process.

The Georges River catchment survey allowed the examination at a local level of the credibility of four sustainability preconditions that may assist organizations and governments to make changes in the area of water management in the future. The change process may benefit from further testing in other water catchments to examine the transferability of results to other catchments and the development of a model based on these four preconditions.

References

Baldassare, M., Hassol, J., Hoffman, W., et al., 1996. Possible planning roles for regional government: a survey of city planning directors in California. *American Planning Association Journal,* 62 (1), 17-28.

Balslev Nielsen, S., 1999. Urban ecology and transformation of technical infrastructure. *International Planning Studies,* 4 (2), 253-265.

Berke, P.R. and Conroy, M.M., 2000. Are we planning for sustainable development? An evaluation of 30 comprehensive plans. *Journal of the American Planning Association,* 66 (1), 21-33.

Briassoulis, H., 1999. Who plans whose sustainability? Alternative roles for planners. *Journal of Environmental Planning and Management,* 42 (6), 889-902.

Bridge, G., 1999. Harnessing the bonanza: economic liberalization and capacity building in the mineral sector. *Natural Resources Forum,* 23 (1), 43-55.

Brown, R. and Ryan, R., 2001. Le paradoxe du contrôle à la source: le professionnalisme, la connaissance et la compétence. *In: Novatech 2001, Lyon France, 25-27 Juin 2001*.

Colman, J., 1993. Planning education in the 90's. *Australian Planner,* 31 (1), 19-23.

Colman, J., 2001. *The tide is turning: final report of the Botany Bay Program.* Southern Sydney Regional Organisation of Councils, Botany.

Commonwealth of Australia, 2002. *Economic development…the basic steps: sustaining regions*. Commonwealth of Australia, Canberra.

Curtis, A., Van Nouhuys, M., Robinson, W., et al., 2000. Exploring landcare effectiveness using organisational theory. *Australian Geographer,* 31 (3), 349-366.

Dennison, W. and Abal, E., 1999. *Moreton Bay Study: a scientific basis for the healthy waterways campaign*. Brisbane City Council, Brisbane.

Department of Urban Affairs and Planning, 1999. *Review of the planning system: white paper*. NSW Government, Sydney.

Dunford, R.W., 1992. *Organisational behaviour: an organisational analysis perspective*. Addison-Wesley Publishing Company, Sydney.

Foddy, W., 1996. *Constructing questions for interviews and questionnaires: theory and practice in social research*. Cambridge University Press, Melbourne.

Franks, T., 1999. Capacity building and institutional development: reflections on water. *Public Administration and Development,* 19 (1), 51-61.

Healey, P., 1996. Consensus-building across difficult divisions: new approaches to collaborative strategy making. *Planning Practice and Research,* 11 (2), 207-216.

Healey, P., 1999. Institutionalist analysis, communicative planning, and shaping places. *Journal of Planning Education and Research,* 19 (2), 111-121.

Healthy Rivers Commission, 2000a. *Independent inquiry into the Georges River-Botany Bay System: draft report*. Healthy Rivers Commission, Sydney.

Healthy Rivers Commission, 2000b. *Securing healthy rivers: a strategic perspective*. Healthy Rivers Commission, Sydney.

Hullick, J., 2002. *Report of scoping study to investigate local government's role in integrated management including natural resource management*. Murray Darling Association Inc., Adelaide.

ICLEI, 1996. *The local agenda 21 planning guide: an introduction to sustainable development planning*. International Council for Local Environmental Initiatives ICLEI, Toronto.

Ingram, H. and Kenneth, R. (eds.), 1985. *Public policy and the natural environment*. JAI Press, Greenwich.

Ingram, H. and Schneider, R., 1998. Science, democracy, and water policy. *In:* Graffy, E.A. ed. *Decisionmaking under uncertainty: the nexus between science and policy*. Universities Council on Water Resources UCOWR, Carbondale, 21-28. Water Resources Update no. 113. [http://www.ucowr.siu.edu/updates/113/]

Milich, L. and Varady, R.G., 1999. Openness, sustainability, and public participation: new designs for transboundary river basin institutions. *Journal of Environment and Development,* 8 (3), 258-306.

Newman, P., 1999. Sustainability and Australian cities. *Australian Planner,* 36 (2), 93-100.

Nimmo, J., 2001. From river to ridge: a blueprint for the Georges River. *Water Science and Technology,* 43 (9), 251-262.

Sarantakos, S., 1998. *Social research*. 2 edn. McMillan, Melbourne.

Shortall, S. and Shucksmith, M., 1998. Integrated rural development: issues arising from the Scottish experience. *European Planning Studies,* 6 (1), 73-88.

Tress, B., Tress, G. and Fry, G., 2005. Integrative studies on rural landscapes: policy expectations and research practice. *Landscape and Urban Planning,* 70 (1/2), 177-191.

UNESCO, 1996. *Hydrology and water resources: development in a vulnerable environment*. International Hydrological Programme, UNESCO, Paris. [http://unesdoc.unesco.org/images/0010/001046/104693e.pdf]

Wentworth Group of Concerned Scientists, 2003. *Blueprint for a national water plan*. World Wildlife Fund, Sydney. [www.wwf.org.au/News_and_information/Publications/PDF/Report/blueprint_national_water_plan.pdf]

Whitten, S., Bennett, J. and W., Moss., 2002. *Incentive measures for conserving freshwater ecosystems: review and recommendations for Australian policy makers*. Environment Australia, Canberra. [http://www.deh.gov.au/water/policy/incentive/pubs/incentive.pdf]

Wildavsky, A., 1997. *But is it true? A citizens guide to environmental health and safety issues*. Harvard University Press, Cambridge.

Yin, R.K., 1994. *Case study research: design and methods*. 2 edn. Sage, Thousand Oaks. Applied Social Research Methods Series no. 5.